

REPORT

A Review of Marine Protected Area Outcomes: Evidence for Development Cooperation

A rapid review of the interactions between Marine Protected Areas and environmental and socioeconomic outcomes with emphasis on outcomes in low-income and low- and middle-income countries.

Written by E. A. Willsted & M. Mehra (Itad)



A Review of Marine Protected Area Outcomes: Evidence for Development Cooperation

A rapid review of the interactions between Marine Protected Areas and environmental and socioeconomic outcomes with emphasis on outcomes in low-income and low- and middle-income countries.

Authors:

E. A. Willsteed & M. Mehra (Itad)

ISBN: 978-82-8369-226-6

Published: February 2026

norad.no

Acknowledgements

Our thanks go to the Norad commissioning team for supporting and contributing to the inception phase and for the review comments.

Thanks also to the Itad project team for supporting the delivery, editing and quality assurance of the review, and to the external peer reviewer for their constructive comments that have led to a stronger review.

Disclaimer

The views expressed in this report are those of the reviewers. They do not necessarily represent those of the funder Norad or any individuals and organisations referred to in the report.

Suggested citation

Itad (2025) 'A rapid review of the interactions between Marine Protected Areas and environmental and socioeconomic outcomes with emphasis on outcomes in low-income and low- and middle-income countries'. Brighton: Itad

Table of contents

Acknowledgements	ii
Disclaimer	ii
Suggested citation	ii
List of acronyms	vi
1. Summary	7
1.1. Context and approach	7
1.2. Key findings.....	7
1.3. Critical recommendations for development cooperation	8
1.4. Final remark.....	11
1.5. Structure of this report.....	12
1.6. A note on referencing.....	12
2. Introduction	13
2.1. Marine Protected Areas and development aid	13
2.2. Review objectives.....	14
2.3. Review boundaries and approach	14
3. Conclusion and recommendations	16
3.1. Concluding comments	16
3.2. Recommendations for development cooperation.....	18
3.2.1. Ecological conservation outcomes.....	19
3.2.2. Fisheries management outcomes	20
3.2.3. Economic and livelihood outcomes.....	21
3.2.4. Gender and social equity outcomes.....	23
3.2.5. Governance and institutional outcomes.....	24
3.2.6. Cross-cutting implementation principles.....	25
3.2.7. Knowledge and research priorities.....	26
3.3. Final reflections for development cooperation.....	28
3.4. Understanding the evidence base: A note on the following sections	29
4. Ecological outcomes	31
4.1. Theme 1: Enhancement of fish stocks and biodiversity.....	32
4.2. Theme 2: Protection and restoration of critical habitats	33

4.3.	Theme 3: Ecosystem resilience and climate adaptation.....	34
4.4.	Theme 4: Effectiveness, conditionality and design principles	34
4.5.	Theme 5: Major ecological threats and negative outcomes	35
5.	Fisheries management outcomes	37
5.1.	Theme 1: Fisheries governance and management frameworks.....	37
5.2.	Theme 2: Socioeconomic impacts and livelihood conflicts	38
5.3.	Theme 3: External threats to fisheries outcomes	39
6.	Economy and livelihood outcomes	41
6.1.	Theme 1: Livelihoods, poverty alleviation and employment.....	42
6.2.	Theme 2: Tourism, financial stability and diversification.....	43
6.3.	Theme 3: Food and nutrition security	45
7.	Observed gender and social equity outcomes	46
7.1.	Theme 1: Gender roles and participation in marine resource use	46
7.2.	Theme 2: Initiatives for women's empowerment.....	47
7.3.	Theme 3: Marine tenure, use rights and community engagement	50
8.	Governance and institutional outcomes	52
8.1.	Theme 1: Multi-stakeholder and co-management models	52
8.2.	Theme 2: Capacity building and institutional strengthening.....	53
8.3.	Global South and Global North perspectives.....	54
9.	Conditions attached to MPA outcomes.....	56
9.1.	Introduction.....	56
9.2.	Theme 1: The implementation gap and defining effectiveness	56
9.3.	Theme 2: Financial and enforcement conditionality	56
9.4.	Theme 3: Socio-political conditions, equity and livelihoods	57
9.5.	Theme 4: Design, planning and adaptive management	57
9.6.	Global South and Global North perspectives.....	58
10.	MPA purpose and priorities.....	59

11. Strength of evidence assessment.....	60
11.1. Approach to evidence assessment.....	60
11.2. Overall evidence landscape	60
11.3. Strength of evidence by outcome theme	61
11.3.1. Ecological and biodiversity outcomes.....	62
11.3.2. Fisheries management outcomes.....	63
11.3.3. Economic and livelihood outcomes.....	64
11.3.4. Gender and social equity outcomes	66
11.3.5. Governance and institutional outcomes	67
11.4. Cross-cutting observations.....	68
11.5. Confidence in review findings	69
12. Methodology.....	71
12.1. Approach and overview	71
12.2. Search strategy	71
12.3. Screening and selection	72
12.4. Data extraction.....	73
12.5. Analysis and synthesis	73
12.6. Quality assessment.....	74
12.7. Evidence synthesis approach.....	76
12.8. Strengths and limitations	77
12.9. Reporting.....	78
12.10. PRISMA diagram.....	79
Bibliography.....	80

List of acronyms

AI	artificial intelligence
BMP	best management practices
CERP	Comprehensive Everglades Restoration Plan
EAFM	Ecosystem Approach to Fisheries Management
GEDSI	gender, equality, disability and social inclusion
GMMTP	Gili Matra Marine Tourism Park
ICZM	Integrated Coastal Zone Management
IMOS	Integrated Marine Observing Systems
IPLC	indigenous peoples and local communities
IUCN	International Union for the Conservation of Nature
IUU	illegal, unreported and unregulated
LICs	low-income countries
LMICs	low- and middle-income countries
LMMA	Locally Managed Marine Areas
MENA	Middle East and North Africa
MPA	Marine Protected Area
M&E	monitoring and evaluation
METT	Management Effectiveness Tracking Tool
MSP	Marine Spatial Planning
NbS	Nature-based Solutions
NEOLI	no-take, enforced, old, large, and isolated
NGO	non-governmental organisation
PES	Payment for Ecosystem Services
PF	process frameworks
POP	persistent organic pollutants
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	randomised controlled trials
TURF	Territorial User Rights for Fisheries
WTP	willingness to pay
USAID	US Agency for International Development

1. Summary

1.1. Context and approach

Marine Protected Areas (MPAs) are spatially defined areas that seek to maintain or recover marine species, habitats, and associated ecosystem services. MPAs typically have set environmental protection objectives and may be termed marine reserves, sanctuaries, locally managed marine areas, no-take zones or other designations, but are hereafter collectively termed MPAs.

Marine Protected Areas (MPAs) are increasingly promoted as tools for achieving both conservation and development objectives, particularly as the global community pursues the '30x30' target under the Kunming-Montreal Global Biodiversity Framework. As calls for expansion grow, there is a strong reason to investigate what this means for coastal communities generally. For development cooperation organisations, a critical question emerges: under what conditions can MPAs deliver positive outcomes for both marine ecosystems and the human communities that depend on them?

This rapid review synthesises evidence from 140 sources – including academic reviews, reports and reviews from the World Bank and USAID, and NGO reports – published between 2015 and 2025. The review deliberately emphasises observed and documented outcomes over modelled projections and focuses on contexts where MPAs and human livelihoods overlap, particularly in low-income countries (LICs) and low- and middle-income countries (LMICs) where development cooperation plays a significant role.

1.2. Key findings

Ecological outcomes are substantially positive under the right conditions. Where MPAs operate with high protection levels (particularly no-take zones), active management and enforcement and adequate resourcing, they consistently deliver substantial ecological benefits. Fish biomass often doubles or more, threatened species can recover and habitat integrity is maintained relative to unprotected areas. These gains are well documented across diverse geographic contexts.

Socioeconomic outcomes are highly variable and context dependent. The review identified substantial evidence of both positive and negative socioeconomic impacts. Positive outcomes – including income gains through more resilient fisheries, tourism, women's economic empowerment and poverty reduction – are documented but require deliberate, well-designed interventions. Negative outcomes – displaced fishers without compensation, exclusion of marginalised groups from decision-making, tourism benefits captured externally, and 'paper parks' failing to deliver benefits – typically reflect inadequate resources, siloed design, top-down governance or neglect of equity considerations.

Context determines everything. There is no universal MPA model. Geographic setting, ecological characteristics, social structures, governance capacity, economic dependencies, cultural context and external pressures all shape outcomes. MPA scale and networks – where individual MPAs are strategically linked to greater effect - are critical. Success depends on understanding and responding to local realities through careful analysis, inclusive design and adaptive implementation.

The implementation gap is severe. The most sobering finding is the widespread gap between MPA designation and effective implementation. Many MPAs globally lack the resources, enforcement or management capacity to achieve their objectives – creating ‘paper parks’ that risk delivering neither conservation nor development benefits. This deficit is particularly acute in LICs and LMICs.

External pressures undermine isolated efforts. MPA success depends on conditions beyond protected boundaries. Marine heatwaves, land-based pollution, overfishing and displaced fishing effort can all negate protection benefits. Integration within regional approaches and broader spatial planning frameworks – including Marine Spatial Planning (MSP), Ecosystem Approach to Fisheries Management (EAFM), and Integrated Coastal Zone Management (ICZM) – is key.

1.3. Critical recommendations for development cooperation

From the 22 detailed recommendations presented in this review, five emerge as most critical and actionable for development cooperation organisations:

1. Prioritise operation over expansion: Finance effectiveness

Most MPAs have insufficient budgets for basic management and lack adequate staffing. Chronic under-resourcing creates paper parks delivering neither conservation nor development benefits. Development cooperation should prioritise adequate, sustained financing for existing MPAs over expanding under-resourced protected area networks. This means:

- Upfront operational cost assessments
- Multi-year financing commitments
- Funded transition strategies to manage livelihood impacts and the move to sustainable financing models
- Supporting operational capacity over coverage targets

Funding is identified as the most robust predictor of MPA effectiveness. Without operational capacity, MPAs cannot achieve ecological objectives or deliver development benefits.

2. Adopt integrated socioecological systems approaches: Conservation and development are inseparable

There are multiple examples of MPAs and MPA research that treat conservation as primary and socioeconomic considerations as secondary constraints. Across geographies, where MPAs overlap with human communities, this approach generates conflict, undermines compliance, and compromises both conservation and development outcomes. Development cooperation should require that MPA projects be designed and implemented as socioecological systems where ecological integrity and human wellbeing are addressed with equal weight. This means:

- Monitoring frameworks tracking both ecological and socioeconomic indicators with equal rigour and success defined against ecological and socioeconomic outcomes
- Theories of change explicitly addressing both dimensions
- Genuine participation integrating local knowledge with scientific assessment
- Early identification of synergies and trade-offs.

Evidence consistently demonstrates that conservation success is fundamentally dependent on people. Unless MPAs are strictly no-access zones (rare and often inequitable), achieving conservation objectives requires cooperation, compliance and often active stewardship from communities. Projects focused narrowly on conservation without attention to livelihood impacts can generate conflict that undermines conservation outcomes, for example limiting livelihood opportunities without adequate consideration of alternative means of income and food security.

3. Understand livelihoods, adaptation potential and compensation

Restrictions on resource access generate immediate negative impacts for fishers and resource-dependent communities. Without mitigation through supported adaptation or compensation, these impacts create conflict, undermine compliance and can push vulnerable households into poverty. Where MPAs impose restrictions on resource access, funders should require:

- The application of structured processes to identify affected populations, assess livelihood impacts and develop mitigation measures
- Timely and adequate compensation covering transition periods (Payment for Ecosystem Services, Cash-for-Work during closures)
- Investment in alternative and supplemental livelihoods sustained over longer periods and supported by training, market access, credit access and business development
- Strategic sequencing: addressing immediate livelihood needs before imposing restrictions to build trust and enable voluntary compliance.

Strong evidence demonstrates that unmitigated restrictions generate conflict and compliance failures, while timely compensation and alternative livelihood support increase acceptance. The difference between successful and failed MPAs often hinges on whether affected communities have viable alternatives and perceive net benefits over time.

4. Mandate gender-transformative approaches and secure tenure rights

Despite women constituting 40–50% of the global small-scale fisheries workforce, they are frequently disadvantaged, limiting governance participation and resource access. Similarly, lack of formalised tenure rights for indigenous peoples, local communities and small-scale fishers can create insecurity and conflict. MPAs can perpetuate or exacerbate these inequalities, or can improve equity through:

- **Moving** beyond acknowledging gender differences to addressing structural inequalities through specific targets for women's representation in governance, capacity building designed for women's participation, transparent decision-making structures, attention to gender-based violence and gender-disaggregated monitoring
- **Women's economic empowerment through, for example,** targeting women in the harvest and post-harvest value chains with technical training, business development, finance and support for women's economic cooperatives
- **Tenure formalisation:** Secure long-term tenure rights for indigenous peoples, local communities and small-scale fishers through legal recognition of customary tenure, co-management agreements with clear authority delegation, and benefit-sharing mechanisms that lead to equitable distribution.

Without explicit intervention, MPAs can reproduce existing inequalities. Evidence shows targeted gender-transformative programmes deliver substantial economic gains (doubling/tripling incomes in documented cases) while strengthening conservation outcomes. Secure tenure is consistently linked to improved compliance, sustainability and equity. These interventions directly address poverty and inequality – core development objectives.

5. Integrate MPAs within broader approaches to address regional pressures

MPAs cannot succeed in isolation. External pressures can negate benefits, and environmental change is accelerating, being driven by a less stable and warming climate. Where MPAs are promoted as fisheries tools without complementary fisheries management, displacement of effort or a failure to address excess fishing capacity can negate conservation and livelihood benefits. This requires:

- Support for regional MSP, adoption and implementation of the EAFM and ICZM processes
- Explicit consideration of and ideally parallel commitments to reduce overall fishing effort, strengthen fisheries regulation beyond boundaries, improve stock assessment and implement complementary spatial measures
- Designing MPA networks for ecological connectivity and climate resilience rather than isolated, opportunistic sites.

Even well-managed MPAs fail when external stressors are unaddressed. Good evidence indicates MPAs alone are insufficient for fisheries sustainability. Positive spillover effects emerge most clearly where MPAs are embedded in comprehensive management systems. Regional or networked approaches are necessary to address threats at appropriate scales and to support broader ecological and socioeconomic improvement.

1.4. Final remark

MPAs hold great promise to improve outcomes by increasing the resilience of ecosystems and of livelihoods linked to those ecosystems. There are opportunities in expanding MPAs which are well communicated in predictions of eye-catching global economic benefits for example. There are, however, substantial risks attached to expansion where livelihoods are involved, and the risk falls disproportionately on fragile coastal communities. Development cooperation can realise the opportunity while mitigating the risk by insisting on quality alongside quantity – requiring that MPA expansion be accompanied by adequate financing, inclusive governance, equity safeguards, and realistic monitoring of progress towards both conservation and development objectives. The evidence synthesised in this review demonstrates that when the right conditions are met and at certain scales, positive outcomes are achievable: communities can prosper alongside healthy ecosystems, fisheries can recover while supporting livelihoods, and governance can be strengthened through participatory processes. The challenge is translating this potential into a more widespread reality.

1.5. Structure of this report

Following this summary and the introduction (Section 2), **Section 3 presents conclusions and 22 evidence-based recommendations** organised by outcome area. Section 3 concludes with a brief introduction to the understanding of the evidence synthesis presented in the subsequent chapters.

The bulk of the report (Sections 4–10) then provides the detailed evidence synthesis supporting these conclusions and recommendations, organised thematically around ecological outcomes, fisheries management, economy and livelihoods, gender and social equity, governance and institutions and conditions for effectiveness, while Section 10 reflects on the diversity of purposes and priorities underpinning MPAs. A strength of evidence statement will be found in **Section 11**, and the methodology is detailed in Section 12. The collated evidence base, including extracted summaries by theme, are available in a supporting annex.

1.6. A note on referencing

Throughout the review, reference numbers correspond with the numbering in the bibliography. References 1 to 140 are references identified and collated to generate the evidence base. For the evidence syntheses, the intention has been to provide indicative references per theme that support specific insights, rather than a comprehensive listing of all pertinent references per theme.

2. Introduction

2.1. Marine Protected Areas and development aid

Marine Protected Areas (MPAs) have become a central tool through which nations, development organisations and environmental non-governmental organisations seek to maintain or recover marine species, habitats and associated ecosystem services. MPAs are gazetted and geographically defined areas for which environmental protection objectives are set. Such areas may be termed marine reserves, sanctuaries, locally managed marine areas, no-take zones or other designations, but are hereafter collectively termed MPAs.

Global momentum for MPA expansion has intensified under the Kunming-Montreal Global Biodiversity Framework, with Target 3 calling for 30% of land, waters and seas to be conserved and managed through protected areas or other effective area-based conservation measures by 2030 ('30x30'). This ambitious target has significant implications for development cooperation, as many biodiversity-rich coastal and marine areas are located in low-income countries (LICs) and low- and middle-income countries (LMICs) where human communities depend directly on marine resources for food security, livelihoods and economic development.

While the biological and ecological benefits of well-managed MPAs for resources within protected boundaries are reasonably well established, the wider socioeconomic implications – including spillover effects, livelihood impacts, equity considerations and poverty alleviation outcomes – are more complex and context dependent. Research suggests that protection targets can be economically justified at the global scale, yet translating these aggregate projections into equitable local costs and benefits remains deeply uncertain and highly conditional.

This presents a critical question for development cooperation: under what conditions can MPAs contribute positively to both conservation and development objectives? Where human communities and marine ecosystems overlap, the success of conservation measures becomes inextricably linked to socioeconomic outcomes. Restrictions that fail to account for local livelihoods can generate conflict, undermine compliance and compromise both conservation and development goals.

2.2. Review objectives

This rapid review responds to the need for evidence-based guidance on MPAs in the context of development aid. The overarching objective is to synthesise available evidence to assess the interactions between MPAs and key development outcomes, with particular emphasis on socioeconomic impacts in LICs and LMICs.

Specifically, this review aims to:

Synthesise key information to assess evidence and evidence gaps for the impacts (positive and negative) of MPAs relative to common development aid outcomes, including poverty alleviation, inequality, livelihoods, food security, gender equity and governance.

Identify conditions under which MPAs are more likely to deliver positive outcomes for both conservation and development, recognising the importance of context-specific design and implementation.

Reach evidence-based recommendations for development cooperation organisations interested in supporting MPAs as tools for sustainable development, balancing ecological conservation with human wellbeing.

The review question guiding this synthesis is: **What strength of evidence exists for interactions between MPAs and defined development aid outcomes, and under what conditions are positive outcomes most likely to be achieved?**

2.3. Review boundaries and approach

This rapid review employed a streamlined systematic methodology adapted from Cochrane guidance for systematic reviews. The approach prioritised transparency, auditability and efficient synthesis of a large and heterogeneous evidence base within a compressed timeframe.

Scope and sources: The review focused on literature published between 2015 and 2025, accessible through two major academic databases (Lens and OpenAlex), supplemented by targeted searches of development agency repositories (USAID Development Experience Clearinghouse and World Bank Open Knowledge Repository). To manage the volume of literature efficiently, the academic search was restricted to review-type publications, creating a 'review of reviews' supplemented by development organisation reports and evaluations. This approach enabled broad coverage while maintaining depth on key themes. A total of 140 documents were included in the final evidence synthesis, including 67 academic publications from database searches and 9 further academic publications from snowballing.

Geographic focus: While the search encompassed global literature, the analysis emphasised findings relevant to LICs and LMICs and contexts where development cooperation plays a significant role. Throughout the report, MPAs are discussed under the assumption that MPA effects and human populations overlap – that is, MPAs and livelihoods are in close proximity. The review does not consider oceanic MPAs with minimal human interaction.

AI-assisted synthesis: Given the compressed timeline and large volume of records, this review employed Google NotebookLM as an analytical tool to support systematic extraction and thematic synthesis. Both reviewers used standardised prompts to ensure consistency and conducted regular checks to test fidelity to source material, and all outputs were manually reviewed, verified and refined to ensure fidelity and alignment with systematic review standards. This approach enhanced efficiency while maintaining rigorous human oversight and quality control.

Limitations: Several important limitations should be noted:

- **Database coverage:** Restriction to two academic databases and English-language, open-access publications means some relevant literature may have been excluded, particularly non-English sources and paywalled research.
- **Publication type:** Prioritising reviews over primary studies enabled efficient synthesis but may have introduced lag in capturing the most recent primary research findings.
- **Heterogeneity:** The evidence base spans diverse geographies, methodologies and outcome types, making direct comparison challenging. Findings represent broad patterns, and recommendations are generalised insights rather than universal truths.
- **Time constraints:** The rapid review timeframe (one month with 50% effort) necessitated trade-offs between comprehensiveness and depth.
- **Causality:** Reviewed literature frequently reported associations rather than causal relationships, limiting the ability to make definitive claims about MPA impacts.

Despite these limitations, the breadth of evidence sources (academic reviews, development agency and NGO reports, and development agency evaluations), the systematic approach to synthesis, and the dual independent review process provide reasonable confidence that the findings reflect genuine patterns across the evidence base and offer meaningful guidance for development cooperation decision-making. In addition, the report underwent external peer review prior to submission as an additional quality check. A strength of evidence statement will be found in Section 11 and a detailed methodology statement in Section 12.

3. Conclusion and recommendations

3.1. Concluding comments

MPAs are frequently promoted with compelling projections of global or regional benefits. Claims that expanding protection to 10–30% of marine and coastal areas could yield benefits worth three times implementation costs or generate hundreds of billions of dollars in net benefits, creating powerful narratives for conservation advocacy.^{83,85} However, these aggregate projections are highly conditional, and it remains deeply unclear how such benefits translate into equitable costs and benefits at the local scale where MPAs are experienced.^{5,74}

This review deliberately emphasised observed, documented outcomes rather than modelled projections. Drawing on 140 sources spanning academic reviews, development agency reports and evaluations, and NGO reports, a more nuanced picture emerges: **MPAs can deliver measurable improvements in ecological and socioeconomic outcomes, but success is neither automatic nor universal.** There are multiple examples of successful MPAs for ecological outcomes^{42, 62, 79} and socioeconomic (or socioecological) outcomes,^{81, 82, 135} but these are localised examples that rely on good planning, and consistent and long-term support.⁵ Compelling evidence points to generalised positive human wellbeing outcomes from protected areas,¹⁴⁷ but, as this review highlights, positive outcomes are highly context dependent and require local knowledge.^{5, 25, 60, 73}

Ecological outcomes: From an ecological perspective, the rationale for MPAs is strong. Where MPAs operate under conditions of high protection (particularly no-take zones), active enforcement and adequate resourcing, they consistently deliver substantial benefits: fish biomass often doubles or more, threatened species recover and habitat integrity is maintained relative to unprotected areas. These gains are well documented across diverse geographic contexts and provide a solid foundation for conservation investment.^{5, 29, 42, 62, 79, 80}

The human dimension: Where MPAs overlap with human communities – as they do throughout most of the developing world – ecological outcomes become inseparable from socioeconomic realities. The evidence demonstrates that conservation success is fundamentally dependent on people.^{69,75,97} Unless MPAs are strictly no-access zones (rare and often inequitable), achieving conservation objectives requires the cooperation, compliance and often active stewardship of those living within or adjacent to protected areas.^{48, 110}

This dependency creates both challenges and opportunities. Restrictions that fail to account for livelihoods, food security, and customary rights generate conflict, undermine compliance and ultimately compromise conservation outcomes.³⁰ Conversely, MPAs designed and implemented through inclusive processes, with attention to equity and livelihood impacts,

demonstrate that communities can become powerful conservation allies.^{30, 71} There are examples of engaged communities accepting restrictions on resource use based on expected long-term benefits – providing precedents for translating global MPA expansion goals into locally supported effective conservation.^{60, 121}

Socioeconomic outcomes are variable: The review identified substantial evidence of both positive and negative socioeconomic impacts. Positive outcomes – including income gains through tourism,⁹⁹ improved governance,¹⁰⁰ economic empowerment of women through targeted interventions,¹²¹ enhanced food security through sustainable fisheries,⁷⁹ and poverty reduction near tourism-associated protected areas^{79, 147} – are documented across multiple contexts. However, these benefits are not automatic. They require deliberate, well-designed interventions that address livelihood security, ensure equitable benefit distribution, formalise tenure rights and provide sustained institutional support.^{5, 25, 60}

Negative outcomes are also well documented: displaced fishers experiencing income loss without compensation,^{36, 92} women and marginalised groups excluded from decision-making despite bearing disproportionate costs,^{5, 30} tourism benefits captured by external operators while local communities bear restrictions,⁷⁸ and ‘paper parks’ failing to deliver either conservation or development benefits.^{69, 81} These failures typically reflect inadequate resources, top-down governance, neglect of equity considerations or lack of integration with broader development planning.

Context is everything: The single most important finding for development cooperation is that context determines outcomes. There is no universal MPA model that succeeds everywhere. Geographic setting, ecological characteristics, social structures, governance capacity, economic dependencies, cultural context and external pressures all shape whether an MPA delivers positive, mixed or negative outcomes. This contextual complexity demands that development cooperation approaches MPAs not as standardised interventions but as context-specific processes requiring careful analysis, inclusive design and adaptive implementation.⁴⁰

Beyond MPA boundaries: The evidence compellingly demonstrates that MPA success depends on conditions beyond protected area boundaries. Marine heatwaves bleach corals regardless of protection status.⁴ Overfishing outside MPAs can negate spillover benefits.^{39, 41} Land-based pollution degrades marine ecosystems despite strict access controls.⁵⁰ Displaced fishing effort concentrates pressure on remaining grounds.¹⁴⁶ These external pressures point to the critical importance of integrating MPAs within broader spatial planning frameworks – including MSP, EAFM and ICZM – that address threats at appropriate scales.

The implementation gap: Perhaps the most sobering finding is the widespread gap between MPA designation and effective implementation.⁸¹ Most MPAs lack the resources, enforcement or management capacity to achieve objectives.⁷⁹ This implementation deficit is

particularly acute in LICs and LMICs where financing constraints, capacity limitations and competing priorities undermine effectiveness. Addressing this gap through sustained development cooperation support for operationalisation beyond designation, particularly of staff positions, is essential.

Evidence gaps remain: While the review identified substantial evidence on ecological outcomes, fisheries, tourism and governance, significant gaps persist. Academic literature on poverty alleviation, gender equity beyond participation rates, youth engagement, long-term distributional impacts and cross-scale socioecological resilience remains limited. Development agency reports partially fill these gaps but would benefit from more rigorous evaluation designs and systematic monitoring of socioeconomic indicators. Across the board, studies considering human rights were thin. Strengthening the evidence base for socioeconomic outcomes should be a priority for development cooperation research agendas.

Realistic optimism: This review supports neither uncritical MPA advocacy nor blanket scepticism. Rather, the evidence suggests realistic optimism: when conditions for success are met, MPAs can be valuable tools for achieving balanced conservation and development outcomes. Those conditions – high protection, adequate financing, effective enforcement, inclusive governance, secure tenure, livelihood support and integration with broader planning – are demanding but achievable. Development cooperation has a critical role in helping create these conditions beyond simply funding MPA designation.

3.2. Recommendations for development cooperation

The following recommendations synthesise evidence from across the review, organised by key outcome areas. They are intended to guide development cooperation organisations in designing, funding and evaluating MPA-related interventions that maximise the likelihood of achieving balanced conservation and development outcomes.

Recommendation 1: Adopt an integrated socioecological systems approach rather than treating conservation and development as separate objectives.

As a core principle and relative to development contexts, MPAs should be conceptualised and implemented as socioecological systems where ecological integrity and human wellbeing are interdependent. Monitoring frameworks, theories of change and success criteria should explicitly address both dimensions with equal weight. Projects should employ participatory tools that integrate local ecological knowledge with scientific assessment, identify synergies and trade-offs early, and design interventions that optimise across both ecological and social outcomes rather than maximising one at the expense of the other.

Evidence: Successful development projects reviewed addressed ecological, governance, livelihood and equity dimensions from the outset. Where sequencing of outcomes was necessary, projects required livelihood support mechanisms. Not giving sufficient attention to livelihood impacts frequently generated conflict undermining conservation outcomes.

3.2.1. Ecological conservation outcomes

Recommendation 2: Prioritise high protection levels combined with support for voluntary compliance and adequate enforcement to achieve conservation objectives.

Where conservation outcomes are the primary objective, support should focus on establishing and maintaining strictly protected zones (no-take/no-access) with adequate enforcement capacity that supports a culture of voluntary compliance. Partially protected areas with complex zoning often deliver ambiguous benefits and risk, creating an 'illusion of protection'. Development assistance should prioritise operationalisation – financing patrol capacity, training rangers, establishing surveillance systems and building institutional capacity – over expanding the footprint of under-resourced designations.

Evidence: Strong, consistent evidence demonstrates that ecological outcomes are directly related to protection level and enforcement effectiveness. Fully protected, well-enforced MPAs consistently deliver biomass increases of 100–600%, while partially protected areas show highly variable and often negligible benefits.

Recommendation 3: Integrate MPAs within broader spatial planning and ecosystem-based management frameworks to address external pressures.

MPAs cannot succeed in isolation when facing pressures originating beyond their boundaries. Development cooperation should support national and regional Marine Spatial Planning (MSP) processes, Ecosystem Approach to Fisheries Management (EAFM) implementation, and Integrated Coastal Zone Management (ICZM) that address fisheries management, pollution control, climate adaptation and cross-sectoral coordination at appropriate scales. Technical assistance for MSP capacity building, spatial data infrastructure and inter-agency coordination mechanisms should be prioritised.

Evidence: Moderate evidence supports MSP/EAFM as effective frameworks for addressing multi-scale pressures. How to implement cross-sectoral approaches is an open and pressing question. Examples from the Great Barrier Reef, Mediterranean and Southeast Asia demonstrate that even well-managed MPAs fail when external stressors (pollution, overexploitation, climate change) are unaddressed.

Recommendation 4: Design MPA networks for connectivity and climate resilience rather than isolated sites.

Support should prioritise MPA networks designed for ecological connectivity (larval dispersal, migration corridors) and climate resilience (protecting climate refugia, diversity of

habitats and depths) rather than isolated, opportunistic sites. Network design should incorporate climate projections to anticipate range shifts and identify areas likely to maintain ecological function under warming scenarios. It is critical to recognise that dynamic boundaries raise significant governance and socioeconomic challenges. Support for regional coordination mechanisms (e.g., Coral Triangle Initiative) can enhance network effectiveness and reduce management costs.

Evidence: Moderate empirical evidence but strong theoretical support for network approaches. Climate impacts documented across all regions demonstrate that static boundaries are insufficient without consideration of dynamic environmental conditions.

3.2.2. Fisheries management outcomes

Recommendation 5: Link MPA establishment explicitly to broader fisheries management reforms including effort reduction.

Where MPAs are promoted as fisheries management tools, development support should be conditional on parallel commitments to reduce overall fishing effort, strengthen fisheries regulation beyond MPA boundaries, improve stock assessment and implement complementary spatial measures. MPAs should not be positioned as substitutes for fisheries management but as components of comprehensive EAFM strategies. Support for fishing effort 'right-sizing', vessel registration systems, catch documentation and co-management frameworks should accompany MPA investment.

Evidence: Good evidence indicates that MPAs alone are insufficient for fisheries sustainability. Positive spillover effects are strongest in small coastal areas under high fishing pressure with complementary fisheries management. Displacement of effort without system-wide reduction can negate benefits.

Recommendation 6: Prioritise small-scale fishers as primary beneficiaries through secure tenure and preferential access rights.

Development support for MPAs affecting small-scale fisheries should include formalisation of tenure rights (Territorial User Rights for Fisheries (TURF) and locally managed marine areas (LMMA)) that secure preferential access for artisanal fishers in surrounding areas and ensure they are primary beneficiaries of any spillover effects. Legal frameworks should recognise customary tenure systems and prohibit industrial fishing vessels from artisanal fishing grounds adjacent to MPAs.

Evidence: Good evidence links secure tenure to improved management outcomes, compliance and livelihood benefits. Examples from Indonesia, Philippines, and Pacific Islands demonstrate effectiveness of TURF/LMMA models for small-scale fisheries integrated with MPAs.

3.2.3. Economic and livelihood outcomes

Recommendation 7: Require process frameworks and compensation mechanisms to address livelihood impacts of restrictions.

Development-funded MPA projects that impose restrictions on resource access should include process frameworks (PF) that identify affected populations, assess livelihood impacts, develop mitigation measures and establish transparent compensation mechanisms. Compensation should be timely and adequate to cover transition periods. Payment for Ecosystem Services (PES) schemes, Cash-for-Work programmes during closed seasons and livelihood transition support should be budgeted as core project components rather than afterthoughts, including sufficient time and resources to generate buy-in to mitigation and compensation measures.

Evidence: Moderate evidence from development agency reports demonstrates that unmitigated restrictions generate conflict and compliance failures, while timely compensation and alternative livelihood support increase acceptance.

Recommendation 8: Invest substantially in alternative and supplemental livelihoods designed for long-term sustainability.

Development support should fund diversified, conservation-compatible livelihoods tailored to local context and capacities. Successful models include ecotourism services, sustainable aquaculture, value-added fish processing, and crafts/artisanal production. Interventions may need to emphasise livelihood diversification (supplementing rather than replacing fishing) over complete livelihood replacement, to maintain resilience to shocks such as COVID-19. Support should be sustained over three to five years and be practical, for example providing technical training, market access facilitation, credit access and business development services.

Evidence: Moderate evidence shows variable success rates for alternative livelihoods. Success factors consistently include sustained institutional support, access to credit, market integration and alignment with local capacities. Tourism-based livelihoods show strongest evidence of success but require management of carrying capacity and equitable benefit distribution.

Recommendation 9: Transition to sustainable MPA financing through transparent local mechanisms rather than reliance on aid.

Projects should support transition to self-financing models where feasible, particularly through tourism user fees. Revenue mechanisms should be managed transparently by local government public service agencies or trusted environmental NGOs rather than central government agencies, ensuring funds remain locally available for management operations

and community benefit-sharing. Financial models should be designed during project inception with clear plans for post-project sustainability.

Evidence: Strong evidence demonstrates substantial tourism revenue generation potential. Examples include Saba Marine Park, Raja Ampat BLUD system and the Great Barrier Reef. However, revenue leakage to central government and unequal distribution remain risks requiring transparent governance.

Recommendation 10: Ensure tourism development is sustainable, regulated by carrying capacity and benefits local economies.

Where tourism is promoted as an alternative livelihood, development support should include carrying capacity assessments (both environmental and social), enforcement of visitor limits, tourism planning that prioritises local employment and enterprise development, and monitoring of both environmental impacts and benefit distribution. Tourism infrastructure should be scaled appropriately to avoid overwhelming local capacities and communities.

Evidence: Moderate evidence shows tourism can generate employment and income but poorly regulated tourism damages ecosystems, creates dependencies vulnerable to shocks (COVID-19), and can concentrate benefits with external operators. Carrying capacity enforcement examples from Morotai MPA and benefit distribution monitoring provide positive models.



Photo: Bjørnulf Remme/Norad

3.2.4. Gender and social equity outcomes

Recommendation 11: Mandate gender-transformative approaches with explicit targets for women's participation and benefit.

MPA projects should move beyond gender-sensitive approaches (acknowledging differences) to gender-transformative approaches (addressing structural inequalities). This may require: (a) specific targets for women's representation in governance bodies; (b) capacity building specifically designed for women's participation; (c) revision of decision-making structures to ensure transparency and accountability; (d) explicit attention to addressing gender-based violence and social norms that inhibit participation; and (e) gender-disaggregated monitoring of all outcomes.

Evidence: Limited but growing evidence shows that positive gender outcomes require explicit, transformative programming. Without deliberate intervention, MPAs can reproduce existing social structures that limit women's participation. Successful examples include Madagascar's Fisherwomen Leadership Programme¹³⁸ and women's cooperatives in Senegal achieving 2–3× price increases.¹⁰⁷

Recommendation 12: Invest in women's economic empowerment through targeted value chain support.

Development support should specifically target women in post-harvest value chains (processing, marketing) through technical training in improved processing and hygiene, business management capacity building, revolving credit funds or microfinance access, and support for women's economic groups/cooperatives. Women's Economic Interest Groups (GIEs) have demonstrated effectiveness and should be prioritised as vehicles for support.

Evidence: Moderate evidence consistently shows women constitute a significant share of fisheries workforce but face structural disadvantages. Targeted interventions in Senegal, Indonesia, Philippines and Madagascar demonstrate substantial gains when women receive technical and financial support.

Recommendation 13: Formalise tenure rights and ensure equitable benefit-sharing to address distributional injustice.

Projects must prioritise securing and formalising long-term tenure rights for indigenous peoples and local communities and small-scale fishers. Development support should facilitate legal recognition of customary tenure, co-management agreements with clear authority delegation, and benefit-sharing mechanisms that ensure tourism revenues and other MPA-generated benefits flow equitably to and within affected communities, particularly those bearing restriction costs. Transparent monitoring of benefit distribution should be required.

Evidence: Moderate evidence consistently links tenure security to compliance, sustainability and equity. Lack of tenure formalisation or unequal benefit distribution generates conflict and undermines conservation. Positive examples include TURF/LMMA formalisation in Pacific Islands and Coral Triangle regions.

3.2.5. Governance and institutional outcomes

Recommendation 14: Build institutional capacity systematically using competency frameworks and sustained investment.

Rather than ad hoc training, development support should focus on systematic and sustained capacity building using national competency standards (for example, Indonesia's SK3 for MPA managers), certification systems and institutional strengthening of management agencies. Support should span multiple years, include ongoing mentoring, and address both technical skills (ecological monitoring, enforcement) and governance competencies (participatory planning, conflict resolution, adaptive management).

Evidence: Moderate evidence shows that effective management requires sustained capacity building. Short-term training events show limited lasting impact. Systematic competency-based approaches and multi-year support demonstrate better results in building capable institutions.

Recommendation 15: Require inclusive co-management with meaningful authority devolution and integration of local knowledge.

Projects should support co-management models where local communities have genuine decision-making authority, not merely consultative roles. This requires: (a) legal frameworks recognising community management rights; (b) clear co-management agreements specifying roles, responsibilities, and benefit-sharing; (c) capacity building for community governance; (d) formal integration of traditional ecological knowledge and customary management practices; and (e) participatory monitoring systems that value local observations alongside scientific data.

Evidence: Strong evidence consistently links participatory co-management to compliance, sustainability and social acceptance. Top-down governance models frequently fail due to lack of legitimacy and local buy-in. Positive examples include Indonesia's *adat*-based management, Pacific Island LMMA networks and various community-based surveillance systems.

Recommendation 16: Ensure adequate and sustained financing prioritising operational capacity over expansion.

Development cooperation should prioritise adequate financing for existing MPAs over expanding under-resourced protected area networks. Global studies indicate 65% of MPAs have insufficient budgets for basic management and 91% lack adequate staffing,⁷⁹ Support

should focus on: (a) realistic operational cost assessments; (b) multi-year financing commitments for core operations; (c) staff salaries, equipment and patrol capacity; (d) transition strategies to sustainable financing (user fees, trust funds); and (e) innovative financing mechanisms such as Collaborative Management Partnerships that can attract private investment.

Evidence: Strong evidence identifies funding as the most robust predictor of MPA effectiveness. Chronic under-resourcing and ineffective MPAs do not deliver conservation or development benefits. Examples of innovative financing (e.g., delegated management yielding 14.6× baseline budgets⁹⁹) demonstrate potential when adequate investment is secured.

Recommendation 17: Implement robust monitoring frameworks tracking both ecological and socioeconomic indicators.

MPA projects should establish monitoring frameworks that track progress across ecological, economic, social and governance dimensions with equal rigour. This requires: (a) baseline assessments before restrictions are implemented; (b) clearly defined, measurable (SMART) objectives aligned with both conservation and development goals; (c) regular monitoring using standardised indicators (e.g., protected area management effectiveness tools such as METT and Indonesia's E-KKP3K); (d) gender-disaggregated and equity-focused socioeconomic monitoring; (e) participatory monitoring engaging local communities; and (f) adaptive management protocols that use monitoring data to inform course corrections.

Evidence: Moderate evidence demonstrates that management effectiveness tools and systematic monitoring improve performance. However, inconsistent application of monitoring protocols is identified as a major obstacle to measuring MPA contributions globally. Socioeconomic monitoring lags substantially behind ecological monitoring.

3.2.6. Cross-cutting implementation principles

Recommendation 18: Define MPA objectives explicitly with measurable success criteria spanning conservation and development outcomes.

MPA designation should be accompanied by clear statements of purpose and measurable objectives. Where multiple objectives exist (e.g., biodiversity conservation, fisheries management, poverty alleviation, climate adaptation), potential trade-offs should be identified early and management prioritisation made transparent through participatory processes. Success criteria should include both ecological metrics (biomass, diversity, habitat condition) and socioeconomic indicators (household income, food security, governance quality, gender equity) weighted according to stated priorities.

Evidence: Implementation experiences consistently show that ambiguous or conflicting objectives undermine effectiveness. Clear objective-setting linked to context-appropriate indicators supports adaptive management and accountability.

Recommendation 19: Adopt adaptive management as a core principle with institutional support for learning and flexibility.

Projects should explicitly adopt adaptive management frameworks that: (a) treat initial interventions as hypotheses to be tested; (b) establish learning systems that capture and disseminate lessons; (c) create institutional flexibility to adjust strategies when monitoring indicates poor performance; (d) build capacity for adaptive decision-making; and (e) ensure sufficient funding for both monitoring and adaptation. Governance structures should permit mid-course corrections without requiring complete project redesign.

Evidence: Limited implementation evidence despite widespread recommendation. Climate change, dynamic social conditions and inevitable uncertainties point to adaptive management as a necessary principle, but institutional rigidity often prevents effective adaptation.

Recommendation 20: Sequence interventions strategically, addressing immediate livelihood needs before imposing restrictions.

Where restrictions will impact livelihoods, implementation should be sequenced to build trust and demonstrate benefits before imposing costs, as well as enabling a culture of voluntary compliance. Effective sequences typically involve: (a) participatory planning establishing shared objectives; (b) tenure security and rights formalisation; (c) alternative livelihood support and capacity building initiated; (d) phased introduction of restrictions with monitoring of impacts; (e) compensation mechanisms in place; and (f) enforcement scaled gradually as compliance culture develops. Approaches imposing restrictions without adequate preparation can lead to failed MPAs.^{36, 96}

Evidence: Development agency reports demonstrate that sequenced approaches building from community engagement through benefit delivery before restrictions generate better compliance and sustainability than top-down imposition of immediate controls.

3.2.7. Knowledge and research priorities

Recommendation 21: Invest in strengthening the socioeconomic evidence base and address knowledge gaps.

Development cooperation research agendas should prioritise filling evidence gaps identified in this review, particularly: (a) longer-term evaluations of socioeconomic outcomes; (b) distributional impacts across wealth, gender and age groups; (c) mechanisms of poverty alleviation beyond simple correlation; (d) youth engagement effectiveness; (e) cross-scale socioecological resilience; (f) effectiveness of alternative livelihood interventions with



rigorous counterfactuals; and (g) governance models that successfully balance conservation and equity. Research should employ stronger causal inference designs (randomised controlled trials (RCTs), quasi-experimental methods) where ethical and feasible.

Evidence: Relative to socioeconomic outcomes, evidence gaps were identified across the review. Socioeconomic evidence relies heavily on case studies and project reports; experimental or quasi-experimental evidence is rare. Gender, poverty and equity outcomes were noticeably less represented in the academic literature returned from the literature search.

Recommendation 22: Support local research capacity and address 'parachute science' inequities.

Development cooperation should invest in building research capacity within national institutions in LICs and LMICs, ensuring that MPA research is led by or meaningfully involves local researchers. This requires: (a) funding for local universities and research institutions; (b) equitable partnerships with international researchers that prioritise capacity transfer; (c) support for publication and dissemination in accessible formats; (d) data sovereignty respecting local ownership of information; and (e) research agendas responsive to local priorities rather than solely external interests.

Evidence: Multiple sources identify capacity shortfalls and 'parachute science' as perpetuating knowledge inequities and limiting policy relevance. Building genuine local capacity promotes sustainable knowledge systems and empowers evidence-based local management.

3.3. Final reflections for development cooperation

The evidence synthesised in this review supports a clear conclusion: **MPAs can be valuable tools for achieving balanced conservation and development outcomes, but only when specific conditions are met.** Those conditions – high protection, adequate financing, effective enforcement, inclusive governance, secure tenure, livelihood support and integration with broader planning – are demanding but achievable; numerous precedents exist.

Development cooperation organisations have a critical role to play both in terms of funding and in co-creating the conditions for effectiveness. This requires:

- **Long-term commitment:** Success requires sustained engagement over five to 10+ years, as opposed to short-term project cycles. Financing mechanisms should reflect realistic timescales for achieving ecological recovery and livelihood transitions.
- **Holistic design:** Projects must address ecological, economic, social and governance dimensions simultaneously rather than treating conservation as primary and socioeconomic considerations as secondary constraints.
- **Context responsiveness:** There is no universal MPA model. Success depends on understanding and responding to local ecological conditions, social structures, economic dependencies, governance capacities and cultural contexts.
- **Equity as a core principle:** Where restrictions affect livelihoods, equity considerations – including gender, distributional justice and rights of marginalised groups – must be central to design, not afterthoughts. Failing to address equity undermines both conservation and development outcomes.
- **Realistic expectations:** Development cooperation should resist pressure to rapidly expand protected area coverage without corresponding investment in effectiveness. Supporting fewer, well-resourced, effectively managed MPAs delivers better outcomes than proliferating under-resourced ‘paper parks’.
- **Learning orientation:** Given inevitable uncertainties and context-specificity, projects should be designed as learning opportunities with robust monitoring, honest evaluation and willingness to adapt when evidence indicates poor performance.

The 30x30 target presents both opportunities and risks. The opportunity lies in catalysing investment in marine conservation and potentially securing significant conservation gains. The risk is that pressure to meet quantitative targets drives designation without operationalisation, creating conflict that delivers neither conservation nor development benefits while potentially harming vulnerable communities through poorly designed restrictions.

Development cooperation can help realise the opportunity while mitigating the risk by insisting on quality alongside quantity – demanding that MPA expansion is accompanied by adequate financing, inclusive governance, equity safeguards and realistic monitoring of progress towards both conservation and development objectives.

This review demonstrates that when these conditions are met, positive outcomes are achievable. Communities can prosper alongside healthy ecosystems. Fisheries can recover while supporting livelihoods. Tourism can generate income while protecting natural assets. Women can be empowered economically while contributing to conservation. Governance can be strengthened through participatory processes. These outcomes are documented across diverse contexts, providing proof of concept that MPAs – properly designed and implemented – can contribute to sustainable development.

3.4. Understanding the evidence base: A note on the following sections

The conclusions and recommendations presented in Section 3 are grounded in systematic synthesis of 140 documents spanning academic reviews, development agency evaluations and NGO reports. The following sections (4–10) present this evidence base in detail, organised thematically to allow readers to examine the foundation for the recommendations and to gain insight into the nuances and contextual dependencies.

These synthesis chapters reveal both the strengths and limitations of current knowledge. **Ecological outcomes** (Section 4) are supported by the most robust evidence base, with consistent patterns across diverse contexts demonstrating that high protection yields substantial biological benefits when effectively enforced. **Fisheries management outcomes** (Section 5) show more complexity, with positive outcomes highly conditional on integration with broader management frameworks and attention to displaced effort. **Economic and livelihood outcomes** (Section 6) demonstrate tourism’s potential but also reveal uneven benefit distribution and vulnerability to shocks. **Gender and social equity outcomes** (Section 7) highlight both the critical role of women in marine resource systems and the systematic disadvantages they face without targeted interventions. **Governance and institutional outcomes** (Section 8) underscore that effective management depends on capacity, resources and inclusive decision-making. **Section 9** synthesises the conditions under which positive outcomes are most likely across all these domains.

Throughout these chapters, contrasts and connections between Global South and Global North contexts are highlighted where meaningful, recognising that specific challenges, priorities and enabling conditions vary significantly across contexts.

Two important notes for readers:

First, the evidence base is inherently heterogeneous. It spans diverse geographies, time periods, disciplines, methodologies, study designs and outcome types. The synthesis extracts generalised insights from context-specific findings. The following chapters emphasise where there are clear patterns and the recommendations are well grounded. However, it is essential to again flag that MPA contexts are hugely variable. The evidence and this review are intended to inform but not to dictate design decisions, which must also incorporate local knowledge, stakeholder priorities and contextual analysis.

Second, the evidence base is stronger for some outcomes than others. Where evidence is limited or inconsistent, this is noted. Evidence gaps – particularly regarding long-term socioeconomic outcomes, distributional impacts and mechanisms of change – are suggested as candidates for prioritised future research. Sections 11 and 12 provide structured assessments of evidence strength and knowledge gaps to equip readers with the contextual background to the recommendations and to support adaptation and application to specific development cooperation contexts.

4. Ecological outcomes

The collated sources contain extensive information regarding the ecological outcomes of MPAs and related conservation strategies globally, providing a good evidence base from which to summarise MPA-ecological outcomes. Empirical and modelled observations consistently document significant, positive ecological outcomes associated with high levels of protection, particularly within fully protected reserves (no-take zones) that are actively managed.

A primary outcome of functional MPAs is the dramatic enhancement of populations of exploited species. Across multiple studies, total fish biomass is observed to be substantially greater inside fully protected MPAs, reported as nearly double or, in some cases, over 670% higher compared to surrounding unprotected areas. Protection rapidly yields increases in density, size and overall biomass. For instance, fish biomass was found to increase by 24% across Marine Key Biodiversity Areas in Philippines, while substantial recoveries in specific indicator species like sharks have been observed in Indonesia.

These increases can translate into broader ecological recovery, evidenced by the restoration of trophic interactions, such as a significant decrease in sea urchin density following the recovery of large predators in the Mediterranean, and reduced outbreaks of coral-eating crown-of-thorns starfish on the Great Barrier Reef. MPAs also support habitat integrity: coral cover has been observed to be more stable in protected areas while declining outside, and targeted restoration efforts have resulted in a five-fold increase in coral cover in the Seychelles. There are, though, clear signs that pressures exerted by external drivers, such as marine heatwaves and pollution, are a significant threat to any gains.

High levels of protection promote vital life cycle outcomes, including increased fecundity and larval export, which in some cases has been observed to result in a spillover effect that benefits adjacent fisheries, though see also Section 4.1. The variability in documented outcomes – ranging from high success to an ‘illusion of protection’ in partially protected areas – underscores the crucial role of enforcement and effective management in achieving demonstrable and lasting ecological benefits. The variability also points to the driving role of local context and adapted design as determinants of success.

Analysing the collated literature for evidence of MPA-ecological interactions, five major themes emerged: (1) Enhancement of Fish Stocks and Biodiversity; (2) Protection and Restoration of Critical Habitats; (3) Ecosystem Resilience and Climate Adaptation; (4) Effectiveness, Conditionality and Design Principles; and (5) Major Ecological Threats and Negative Outcomes.

4.1. Theme 1: Enhancement of fish stocks and biodiversity

MPAs are fundamentally established to protect and restore marine life, and the sources strongly confirm their positive impact on, for example, biomass and density, when effectively managed. The significance of positive impacts beyond MPA boundaries is heavily context dependent and is often unclear.

Biomass and abundance gains: Fully protected MPAs demonstrably lead to significant increases in population metrics.^{5, 42, 62, 79} Globally, fish biomass inside 218 MPAs was nearly double that in non-protected sites.⁷⁹ There are examples of huge gains, such as of MPAs where fish biomass is, on average, more than 670% higher in fully protected MPAs than in surrounding unprotected areas.⁸⁰

Top predator recovery: Protection is particularly effective for large and commercially important species.^{29, 72} Fully protected MPAs have been shown to host five times more large fish biomass and 14 times more shark biomass compared to unprotected areas.^{90, 100, 101} This includes significant recovery of species like the dusky grouper in the Mediterranean, where biomass and density were 10.5 and seven times greater, respectively, under full protection.²⁰

Wider benefits: Protection can restore trophic interactions.^{32, 85, 29, 20} These gains can lead to increased reproductive output and spillover effects, sustaining adjacent fisheries.^{5, 42, 81, 72, 84} The spillover effect is strongly influenced by the scale of the MPA, the intensity of fishing and the characteristics of species. Outcomes for highly migratory species are much less certain than for coastal habitat-associated species.

Global South and Global North perspectives: Both the Global North and Global South report success in stock recovery under high protection. In the Global North (Mediterranean), fully protected areas showed fish biomass 2.3 times greater than adjacent unprotected areas.²⁰ In the Global South (Indonesia), the Misool Marine Reserve achieved an average biomass recovery of 250% between 2007 and 2013, with shark populations being 25 times higher inside the reserve.^{117, 135} Similarly, the USAID ECOFISH project in Philippines achieved a substantial 24% increase in fisheries biomass across target areas.¹¹²

Both Global North and Global South MPAs report a relationship between the level of protection and ecological outcomes. The Global North example of the Great Barrier Reef (Australia) showed a distinct ecological difference between protection levels: no-entry (human exclusion) reserves were found to be significantly better than no-take reserves in rebuilding shark populations, reaching densities more than double, probably due to enforcement challenges.⁴³

Successful initiatives in the Global South focus on excluding industrial or destructive fishing activities. MPAs in Latin America and the Caribbean effectively excluded industrial fishing vessels and halted habitat destruction from shrimp farm expansion.⁵¹ In Indonesia, the use

of banned trawlers which damage coral reefs remains a source of conflict and, again, enforcement is key.²²

4.2. Theme 2: Protection and restoration of critical habitats

MPAs have been demonstrated to protect the physical marine landscape, including critical coastal ecosystems of importance to carbon sequestration including mangroves, seagrass and coral reefs.^{32, 104, 105}

Blue carbon value: Mangroves and seagrasses provide significant ecological benefits by sequestering greenhouse gases and storing substantial organic carbon, often exceeding the storage capacity of terrestrial forests.^{13, 32, 104} For instance, mangroves in Mexico are estimated to store 237.7 Tg Corg.¹³

Coral health: Effective MPAs can contribute to maintaining or recovering coral health.^{5, 12, 53} A meta-analysis identified that coral cover remained stable within MPAs while declining in surrounding fished zones,²³ though see Theme 5, which notes that external stressors can overwhelm corals within MPAs (Section 4.5).

Ecosystem services: These habitats provide essential services, acting as nurseries and feeding grounds for marine biota (e.g., sea turtles, fish),^{12, 56, 104, 132} and contributing to elemental cycling.⁶

Global South and Global North perspectives: Both Global South and Global North references emphasise restoration as a key adaptation strategy. Restoration efforts in the Global South (Jamaica) resulted in a 350% increase in mangrove seedling recruitment and height growth in the Portland Bight Protected Area.⁶⁰ Similarly, mangrove rehabilitation and afforestation are major priorities in the Middle East and North Africa (MENA) region.^{34, 35} In the Global North, the Comprehensive Everglades Restoration Plan (CERP) in the US focuses on restoring hydrological conditions and controlling invasive species to protect biodiversity.²⁸

While mangroves and coral reefs are threatened globally, specific threats vary. In the Global South (Indonesia), the establishment of the Gili Matra Marine Tourism Park (GMMTP) is hindered by negative impacts from tourism overcapacity and destructive fishing, leading to severe erosion.¹² In the Global North (Japan), the destruction of seagrass beds spurred a significant increase in the perceived value (WTP) for their restoration, indicating that tangible loss can drive conservation valuation.⁴⁵

4.3. Theme 3: Ecosystem resilience and climate adaptation

MPAs are identified as a critical institutional measure for bolstering marine ecosystem resilience against global stressors, serving as Nature-based Solutions (NbS).^{4, 7, 54, 77, 105, 128}

Protection against hazards: Healthy coastal habitats, including but not limited to coral reefs, mangrove forests and seagrass meadows, provide crucial physical protection for coastal communities. Coral reefs act as submerged breakwaters, with examples reducing incoming wave energy by up to 97%.¹⁰⁵ A 500-metre-wide mangrove forest can reduce wave heights by 50–100%.¹⁰²

Scaling and networked MPAs to increase resilience:^{7, 16, 17, 133} Suitably scaled and networked MPAs can enhance resilience by protecting and maintaining large population sizes, maximising genetic diversity and preserving connectivity via larval dispersal. Successful protection and restoration efforts increase resilience to environmental change. Networking and coordination can also have operational and cost benefits.

Failure of protection against warming: Despite success in mitigating local threats, empirical evidence shows that MPAs can fail to achieve intended ecological outcomes by being overwhelmed by broad-scale and diffuse stressors encroaching into MPAs.¹⁵

Global South and Global North perspectives: Both regions use MPAs and restoration for climate adaptation. The Global South (Seychelles) Reef Rescuers Project successfully achieved a five-fold increase in coral cover in transplanted sites and demonstrated high resilience (90–100% survival) during the 2015 El Niño event.¹²⁰ In the Global North (Australia), well-managed MPAs help mitigate non-climate threats, boosting ecosystem resilience against climate-related impacts, though marine heatwaves have still led to multiple coral bleaching events since 2016.⁵³

A contrast between regions is the risk posed by the combination of climate threats, localised pollution and overexploitation causing severe negative outcomes, particularly in the Global South. In Southern India, the Gulf of Mannar faces severe coral bleaching due to thermal stress combined with mortality caused by hypoxia (following algal blooms) and plastic accumulation in mangroves.³¹ The Global North also faces climate-related habitat shifts, with negative change hotspots identified in the Northeast Atlantic shelf for fish habitat.⁵²

4.4. Theme 4: Effectiveness, conditionality and design principles

The ecological effectiveness of MPAs is highly conditional on the level of protection, size, enforcement and integration into broader spatial planning.^{46, 67}

Protection level matters: Full protection (no-take zones) consistently provides the strongest ecological benefits compared to partial protection.^{46, 81, 20, 55, 65} Fully protected areas

better restore fish stocks and prevent habitat damage.^{81, 46} Partially protected areas (PPAs) often yield ambiguous benefits and sometimes create an 'illusion of protection'.⁴⁶

Conditionality for success: Success is strongly linked to design features and management effort. For achieving high fish biomass, modelled metanalyses indicate that isolation of ecosystems from human pressures was overwhelmingly the most important condition, often combined with large area or effective enforcement.⁴⁶ Up to 70% of MPAs globally are estimated to partially or totally fail to meet their conservation goals, resulting in 'paper parks'.⁶⁹

Monitoring and data: The lack of consistent monitoring instruments and protocols is a critical obstacle to accurately measuring MPA contributions to biodiversity conservation globally.⁷⁶ The use of advanced technology, such as artificial intelligence (AI) in Integrated Marine Observing Systems (IMOS), is enhancing monitoring capabilities, including automated species identification and illegal fishing detection.¹⁰

Global South and Global North perspectives: Both the Global North and Global South struggle with making designated areas operational. In the Global South (Colombia), while 15.7% of marine territory is protected, only 3.8% is fully or highly protected.³⁸ Enforcement is a conditionality factor seen across both regions. In the Global South (Indonesia), private sector involvement (like the Misool Eco-Resort) has contributed to an 86% reduction in illegal fishing.¹²⁷ In the Global North (Europe), effective conservation led to the recovery of the Morro Bay harbour porpoise population following the permanent prohibition of set gillnet fishing.¹⁸ The use of traditional systems, such as *Sasi Laut* in Indonesia, which include closed areas and seasonal restrictions, provides a local model for effective resource management.¹¹⁷

4.5. Theme 5: Major ecological threats and negative outcomes

While MPAs are intended to mitigate conservation threats, pervasive negative ecological outcomes persist and can be observed across examples from the Global South and Global North due to pollution, climate change and management failures.

Pollution and habitat degradation: Major threats include plastics and microplastics accumulating globally,² land-based run-off introducing sediment, nutrients, and pesticides (degrading the Great Barrier Reef, Australia),⁶³ and oil spills, heavy metals, and persistent organic pollutants (POPs) (threatening Canadian indigenous communities).⁵⁰

Conditionality on climate change: While MPAs can successfully mitigate local stressors including fishing, there is evidence demonstrating that MPA benefits are overwhelmed by large-scale stressors, including thermal stress and bleaching.^{23, 53} In some studies, coral cover decline after disturbances was greater inside MPAs compared to unmanaged reefs, highlighting the limits of local protection against global warming.¹⁵

Tourism impacts: Tourism and recreation, while often critical to non-fisheries livelihoods in MPAs, can be a significant pathway for the spread of non-native species, with abundance and richness observed to be significantly higher in recreational sites compared to control sites globally.⁶¹ Poorly managed ecotourism can also lead to habitat destruction, pollution and disturbance to wildlife.^{35, 58}

Global South and Global North perspectives: While pollution is global, the context can differ across Global South and Global North examples. In the Global South, threats often involve destructive practices linked to poverty or lack of regulation (e.g., destructive fishing gear damaging coral reefs in Indonesia,²² or mining siltation decreasing coral cover in Philippines).¹¹⁹ In the Global North (Europe/Baltic), threats to species like the harbour porpoise stem from exceeding limits for anthropogenic mortality from bycatch, contaminants and noise, despite existing legal protections.¹⁸

As with monitoring and data challenges identified under Theme 4, both regions face challenges in accurately measuring and reporting outcomes.⁷⁶ Development intervention reports and project evaluation reports tended to provide more holistic and robust measurement across a range of indicators.



Photo: Marte Lid/Norad

5. Fisheries management outcomes

Fisheries could be included under the Economy and livelihoods section but have been treated as a distinct topic as MPAs are often presented as fisheries management measures and there is a fundamental relationship between fisheries and MPA outcomes. There was a wealth of evidence on interactions between MPAs and fisheries that spanned a diverse range of literature. The sources provide extensive references that, taken collectively, provide insight into the complex relationship between MPAs, spatial management and fisheries outcomes. Given that fisheries represent a primary provisioning ecosystem service, the summaries extracted from references frequently discussed both the direct biological impacts (stock recovery) and the indirect socioeconomic consequences (livelihoods, income, conflict) of marine protection.

There is clear overlap between ecological and conservation outcomes, with fisheries being both a key driver of environmental change and a major source of livelihoods. Research streams broadly fall into two categories: understanding how fisheries impact MPA outcomes (generally negatively), and how MPAs impact fisheries outcomes, which may be biological (generally positive) or social (both positive/negative). Development organisation reports tended to span both socioecological and ecological outcomes.

Spillover effects are not clear cut and there is limited evidence for conservation benefits from partially protected MPAs. The illusion of protection from partially protected MPAs has been associated with modelled and observed negative biological outcomes.^{11, 78, 109} Good-quality MPAs have been associated with substantial fisheries productivity gains, though the footprint of those gains is highly conditional. The role of scale in MPA effectiveness is important to socioeconomic and socioecological outcomes, as is the scale of external pressures impacting MPAs and fisheries concurrently.

The extracted summaries of MPA-fishery interactions frequently overlap with extracted summaries of ecological outcomes, unsurprisingly. Ecological outcomes of high relevance to fisheries (such as direct biological enhancement and stock sustainability) are discussed in Section 4. Emphasising fisheries management outcomes, three major and recurring themes were identified.

5.1. Theme 1: Fisheries governance and management frameworks

The success of MPAs in delivering fisheries outcomes relies on their integration into the wider fisheries management landscape and recognition that reductions in fishing effort are commonly required.

Improving fisheries beyond MPA boundaries is essential. The significance of spillover effects from MPAs continues to be debated, with most positive spillover effects observed in intensely fished small coastal areas. To sustain food production and fish populations,

fisheries need to be better managed beyond MPAs and in context of broader ecological resilience. Such frameworks exist, for example: The EAFM serves as the cornerstone approach for managing fisheries, linking ecological health with human welfare outcomes.¹⁰⁹ MSP uses zoning to manage sustainable fishing and reduce pressure on marine ecosystems across broad regions.¹⁰³

MPAs typically require reducing fishing effort.^{41, 42} Global MPA expansion targets will likely lead to a net reduction of fishing effort spanning small-scale and industrial fisheries.^{41, 42} Displacement of fishing effort to less managed adjacent areas is a known risk.^{39, 41, 42} Local approaches to fisheries (Traditional Resource Management (TRM) approaches) can be effective. The concept of 'right-sizing of fishing effort' is used in Philippines to set sustainable fishing limits based on ecosystem capacity and the balancing of harvesting needs.¹¹² In Indonesia, *Sasi* is one such TRM that has supported MPA outcomes.¹¹⁷

Implemented advanced data and technology shows promise. AI and environmental DNA (eDNA) metabarcoding offer improved capabilities for marine ecosystem and fisheries research and have been applied in the fisheries sector for stock assessment and catch prediction.⁹⁴ Improving the accuracy of fisheries catch and landings data is frequently identified as necessary for conservation and management objectives, including of endangered species.¹⁴

Dynamic and adaptive management is called for to address short-term and medium-term challenges. Dynamic management using near-real-time information (often collected by resource users) has been applied to achieve management goals, such as bycatch avoidance.³ Adaptive management to support EAFM is recommended, as is the flexibility of protected areas to adapt to climate change. This raises a significant implementation question which tends not to be discussed in those references.

Global South perspectives: In Global South-associated literature, there is more explicit discussion about the urgency of addressing fisheries management shortcomings and the need to reduce fishing pressure to address overexploitation.^{117, 113, 111} Major achievements include facilitating the nationwide adoption of registration systems to reduce fishing pressure and aid control in places like Philippines.^{117, 118} The legal protection of preferential use rights of small-scale fishers within nearshore waters is a key management feature.^{117, 118} Small, locally managed MPAs are often designed explicitly to enhance food security and manage data-poor fisheries,⁵ and may be the only practical fishery management tool for achieving stock recovery and securing seafood provision.^{80, 81}

5.2. Theme 2: Socioeconomic impacts and livelihood conflicts

While conservation outcomes are often positive under conditions of high protection and active management, MPAs impose restrictions that generate immediate negative socioeconomic effects for fishers accessing those grounds, leading to conflict and requiring compensatory measures.

Short-term income loss and displacement: Restrictions within MPAs may limit regional/local food security and cause critical short-term income loss for fishers.^{92, 101, 102} Fishers often oppose MPAs because closures require greater time and fuel to maintain catches.^{5, 68} This displacement of fishing effort can depress overall productivity if that effort is not removed from the system.⁴²

MPAs as a source of conflict: The introduction of MPAs reallocates resource rights and restructures fishing patterns, leading to conflict for resource appropriation.^{5, 40, 12, 36} In Australia, specific groups like the commercial and recreational fishing sectors have been targeted in public opinion research potentially leading to those interests' views being represented as public opinion.⁶⁷

Artisanal and small-scale fisher focus: MPAs are often viewed as fishery management tools aiming to increase harvests and revenues. Specifically, MPA-Fs (Fisheries MPAs) are designed to support artisanal fishing by promoting stock sustainability and spillover effects, requiring artisanal fishers to be the primary beneficiaries.^{98, 101}

Gender and inequality: The implementation of MPAs is associated with women being less likely to participate in governance, often leading to them seeking non-fishing sources of income.⁵⁴ Women are probably underrepresented in research, despite situations where women are fundamental to fisheries, such as in West Africa, requiring formalisation of use rights and co-management to move beyond informal codes of practice.¹³⁶ Section 7 provides detail about gender and social equity.

Global South perspectives: The food security and social networks associated with fisheries in LICs and LMICs is often fundamental. For example, in Senegal, fisheries provide 70% of the nation's animal protein and 17% of jobs, including a large share for women.⁹² Restrictions impose critical short-term income loss, requiring compensation/mitigation to ensure social acceptance. There are clear Global South examples of MPAs benefiting small-scale fisheries governance through improvements in access rules, resource use management, and formalising and strengthening use rights and tenure security.

5.3. Theme 3: External threats to fisheries outcomes

Even with effective MPAs, fisheries outcomes are continuously threatened by external, large-scale stressors that require management action outside of protected boundaries.

Illegal, unreported and unregulated (IUU) fishing: IUU fishing is identified as a major global and local challenge and threat. Deterrence of illegal fishing is a major benefit of MPAs.¹²⁷ In resource-dependent communities, illegal fishing is often motivated by financial need.^{76, 77} Strengthening policy and enforcement to combat IUU fishing enhances fisheries management.^{138, 140}

Climate change impacts: Climate change (e.g., marine heatwaves) has significantly affected fisheries, leading to rapid declines in fish stocks. Shifts in marine species distribution can limit access to critical protein sources, particularly affecting developing countries reliant on fish.⁴

Overexploitation and destructive practices: Overexploitation was ranked as a major driver of losses for fishes globally²⁴ and as contributing to fish population decline.¹⁴ Overfishing, along with capture-based aquaculture, contributes to the decline of wild populations. Destructive fishing practices are highlighted as drivers of marine habitat loss.

Contamination and pollution: Fish populations are threatened by environmental contamination, including heavy metals and oil spills, which affects coastal communities.⁵⁰ Microplastics are an emerging concern in commercial fish and shrimp production.³¹

Global South perspectives: The risk posed by combined threats of climate-driven shifts, resource depletion and pollution puts economically disadvantaged coastal communities reliant on fisheries at high risk.⁵¹ In the Global South, projects focused on improving fisheries management and reducing IUU fishing have yielded stock recovery results in short timescales.^{122, 138}

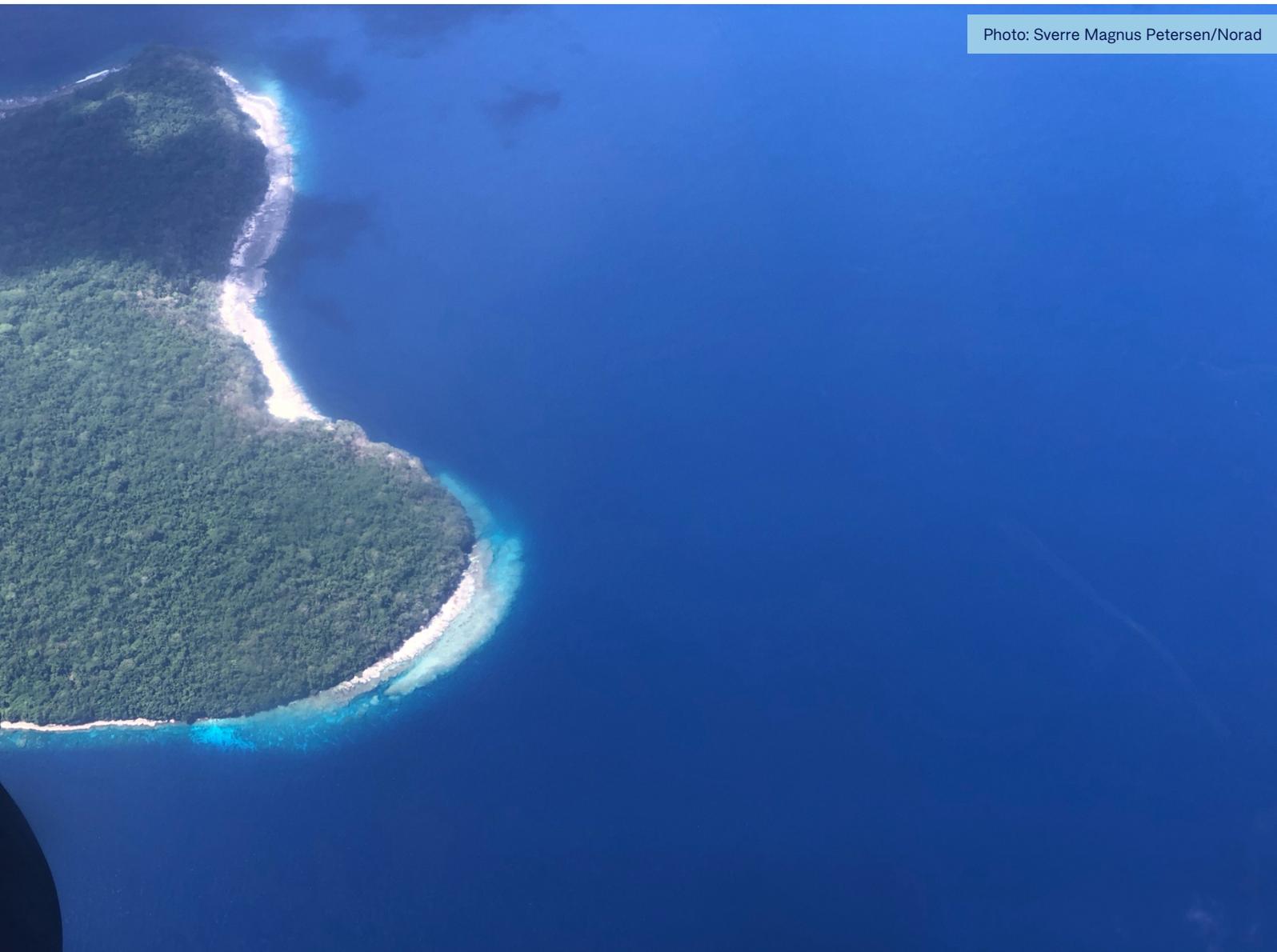


Photo: Sverre Magnus Petersen/Norad

6. Economy and livelihood outcomes

Economic projections are often cited, including eye-catching global estimates that expansion of the global protected area network should yield revenues between US\$64 billion and US\$454 billion greater than the cost of non-expansion. Such projections are highly conditional and there is more merit in focusing on smaller scale observed studies, though observed results can also be significant. For example, the USAID Sustainable Ecosystems Advanced Project in Indonesia achieved secure tenure or managed access for more than 28,000 people through LMMAs and TURF.¹³² Development organisation reports were a key source of evidence for measurable socioeconomic outcomes.

MPAs are widely advocated as a 'win-win strategy' for biodiversity conservation and poverty alleviation,⁷⁶ but the literature clearly points to nuance and the potential for negative impacts on local communities.⁷⁶ An important development strategy used in MPAs to improve employment, raise household income and lessen the short-term negative effects of resource restrictions is the promotion of alternative and supplemental livelihoods, such as ecotourism, aquaculture and value chain strengthening, particularly for vulnerable communities.

Tourism is shown to be the strongest lever for sustainable development connected to MPAs.¹⁰¹ Ecotourism represents one of the fastest-growing global sectors, being projected to generate between US\$330 billion and US\$484 billion annually in indirect expenditure by 2050. Ecotourism has demonstrated potential to provide alternative livelihoods, reducing dependence on fisheries and fostering poverty alleviation. Successful examples include community-based tourism in Raja Ampat and conservation-linked enterprises in Philippines, both improving household welfare and self-funding conservation efforts. The potential negative environmental consequences of tourism require consideration, as noted in sections 4.3 and 4.5.

There are also examples where conservation restrictions have displaced traditional livelihoods, creating equity and compensation tensions. There are examples of benefits from tourism and MPAs being unevenly distributed, with poorer and female workers marginalised. Overreliance on tourism can heighten vulnerability to shocks, as seen during the COVID-19 pandemic. The Global South bears disproportionate conservation costs and fewer asset protection benefits, pointing to development cooperation, inclusive governance and diversified, sustainable livelihoods as key to ensuring equitable MPA expansion.

6.1. Theme 1: Livelihoods, poverty alleviation and employment

Enhanced livelihoods and the creation of employment opportunities are frequently cited as positive development outcomes of MPAs.^{4, 7, 37, 76} However, the establishment of MPAs for conservation purposes has also been observed to interfere with existing livelihoods, including disrupting small-scale fisheries with a role in food security. As noted above, tourism, particularly ecotourism, has emerged as a key mechanism for livelihood diversification and sustainable development in coastal and rural communities.

Global and regional studies spanning protected areas including MPAs point to positive wealth and poverty alleviation outcomes.^{79, 85, 137} In a study evaluating the impacts of protected areas on human wellbeing across 34 developing countries, households near tourism-associated protected areas (terrestrial and coastal) were 17% wealthier and less likely to be in poverty than comparable households further away¹⁴⁷. Beyond economic and wellbeing returns, tourism-based livelihoods have been observed to contribute to social inclusion and empowerment. Homestay and craft-based initiatives often prioritise the participation of women and marginalised groups, promoting community resilience and poverty reduction.

Alternative livelihood examples identified included mariculture, aquaculture, craft-making, ecotourism, fisheries value chain strengthening and value addition, and beekeeping. A crucial function of development aid and MPA management has been to mitigate income loss caused by restrictions on fishing.^{41, 77, 100, 107} Through targeted livelihood grants and vocational training, communities have been able to mitigate short-term income losses and adapt to restrictions by shifting towards tourism-related services, such as providing transportation or guiding tourists.

Distributional inequities may accompany the introduction of alternative livelihoods.^{2, 5, 23, 36} The economic benefits of MPAs tend not to be uniformly shared. Non-poor or better-connected groups typically gain more, while fishers and resource-dependent households may bear disproportionate costs. The designation of MPAs can disrupt established livelihoods without adequate compensation, fuelling local conflicts and social discontent.

Power asymmetries can limit local agency and the willingness to address sustainability challenges.^{22, 27, 30, 65} Job quality concerns further complicate outcomes in situations where stable resource-based work is replaced with low-wage, seasonal employment, increasing household vulnerability and reliance on welfare support.⁶⁸

Global South and Global North perspectives: The economic and social impacts of sustainable tourism vary sharply between the Global North and Global South, reflecting contrasting dependencies, governance capacities and financial constraints. Developing nations rely heavily on reef ecosystems and nature-based tourism, with over half of the world's poorest countries situated in biodiversity hotspots. Such dependence points to both heightened exposure to crises and to the need for economic diversification.

The high cost of expanding protected areas in LICs and LMICs often necessitates development aid and external financing to capture livelihood benefits from natural assets.⁴¹ ⁸⁵ In these settings, local fishers can face exploitation by investors who control capital and production means, leading to persistent structural dependence.²² Community-based management, customary tenure and participatory governance have shown promise in improving equity and outcomes (see Sections 7 and 8).



Photo: Marte Lid/Norad

6.2. Theme 2: Tourism, financial stability and diversification

The blue economy concept revolves around tourism, especially ecotourism, which is recognised as a promising source of balancing sustainable development and conservation. Within the studies, nuance emerges, notably the environmental costs of tourism that can result in environmental objectives not being met, for example through habitat damage¹³, non-native species introduction⁶¹. Adequate planning, equity of local community needs and reconciliation of carrying capacity with environmental objectives are key to enabling tourism that is sustainable with MPA objectives.

Employment and economic gains: Significant economic activity is produced by protected area tourism, sustaining livelihoods and promoting regional economic growth.¹⁰¹ Locals can find work as tour guides, hotel employees, boat operators and park rangers linked to ecotourism, which is a major source of job creation. The most significant example is Australia's Great Barrier Reef, which contributes more than AU\$5.6 billion dollars to the national economy each year and which supports about 69,000 full-time positions.⁶³ Tourism alone accounts for about AU\$5.2 billion of the AU\$5.6 billion.⁶³ Protected area tourism can have strong economic multiplier effects, generating secondary income within local economies, estimated at 1.74 in Brazil and 1.83 in Fiji respectively through spending on goods, services and local enterprises.⁹⁰

Tourism-generated revenue can support conservation financing.^{44, 115, 116, 122, 123, 134}

Mechanisms such as visitor fees and public service agencies, like the BLUD system in Raja Ampat, enable MPAs to fund operational costs and reinvest in community welfare.¹³⁵ The Saba Marine Park became the world's first self-funding marine park through tourist income.⁸¹

Financial returns and community welfare: MPAs link to beneficial results, such as opportunities to increase earnings, especially via fishing and tourism. In households near protected areas in developing countries (terrestrial and coastal PAs), families located near tourism-associated protected areas tended to be wealthier compared to comparable households more than 10km away. In Brazil, financial yield from public investment in Abrolhos Marine National Park is 6.2 Reals for every Real spent by the government.⁹⁹ Marine ecosystems themselves provide critical protection that contributes to community welfare; for example, mangrove-associated flood mitigation services in Jamaica are valued at over US\$32.6 million annually.⁶⁰

The importance of diversification: In localised contexts such as Gili Matra, Indonesia, more than half the population is employed in tourism. Heavy dependence on tourism can create an economic monoculture, leaving communities highly vulnerable to crises.^{12, 123} The COVID-19 pandemic vividly exposed this fragility, as tourism shutdowns caused widespread job losses and income collapse, compelling coastal residents to revert to extractive livelihoods such as capture fisheries.^{12, 59}

Global South and Global North perspectives: Tourism linked to coral reefs and marine ecosystems plays a crucial role in the economies of many nations across the Global South. In 2006, reef tourism generated approximately US\$91.6 million for St Lucia and US\$43.5 million for Tobago.⁴⁴ The Bahamas' shark-diving industry contributes around US\$113.8 million annually, while the Great Barrier Reef World Heritage Area was highlighted earlier as sustaining substantial contributions to the national economy. To ensure sustainability, several regions have developed self-sustaining financial models for marine conservation, such as Saba and Raja Ampat.¹²²

Despite these successes, structural disparities remain.^{6, 85} The global economic benefits of protected area expansion are often captured disproportionately by high-income nations, while LICs and LMICs bear the opportunity costs of conservation. Development aid and equitable financing mechanisms are highlighted as essential to help nations benefit from their natural assets. Knowledge inequities, exemplified by 'parachute science', where external researchers fail to engage local communities, also hinder the translation of research into effective policy and local empowerment. Infrastructure strain, such as from waste management and freshwater supply, can compromise long-term sustainability if not addressed through integrated planning.

6.3. Theme 3: Food and nutrition security

Food and nutrition security in relation to MPAs chiefly depends on the sustained provision of seafood supporting the nutritional needs of local and interconnected communities. This theme is intrinsically linked to Sections 4 and 5, discussing ecological and fisheries management outcomes. It is worth expanding on those sections to make explicit that biological production and marine habitats are central to poverty alleviation, reversal of malnutrition and food insecurity in many developing countries. Globally, coral reef-associated production accounts for 10% of fish consumed by people around the globe⁶ and in regions of Africa, Asia and Latin America, fished resources can be the primary source of animal protein. Through increasing yields and catches, MPAs have been promoted as effective tools to improve fisheries sustainability and hence to contribute to food and nutrition security. In Indonesia, a number of projects focused on securing resource use rights to ensure long-term access to food and enhance food security through increased income and contributed to a poverty alleviation strategy¹¹⁷. A notable feature in such projects is the mandate to improve socioeconomic and ecological outcomes.

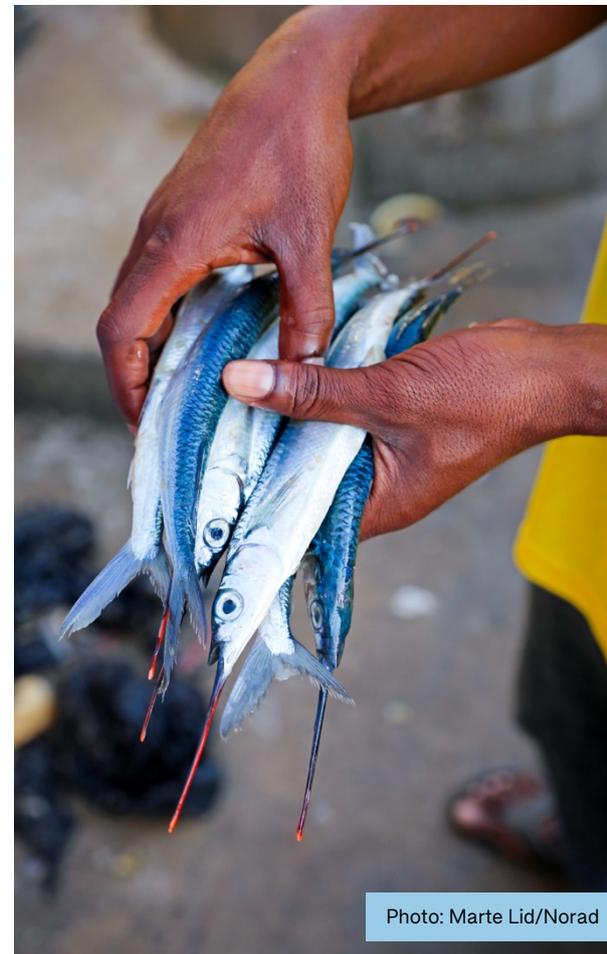


Photo: Marte Lid/Norad

7. Observed gender and social equity outcomes

A robust body of evidence that points to the role of women in achieving conservation success and sustainable development results in coastal communities. Women, often central in post-harvest processing and hospitality, have seen significant gains through targeted interventions, such as women's cooperatives that have doubled or tripled per-kilogram fish prices and improved household welfare.

Research points to the importance of understanding social structures and power dynamics in relation to MPAs. MPAs can perpetuate existing gender inequalities in leadership and authority. Such insights rely on monitoring and indicators being applied that provide understanding about how demographic traits, such as gender, interact with the distributional effects of marine conservation initiatives.

Despite women making up a significant portion of the fisheries workforce (representing 40% to 50% of the global small-scale fisheries workforce) their participation is recognised as interconnected but unequal, frequently putting them at a disadvantage. This inequality, entrenched in patriarchal standards, limits women's involvement in governance and their access to essential resources and assets like ownership of registered boats. In response, global development aid results increasingly emphasise projects designed to enhance gender equity, disability and social inclusion (GEDSI), acknowledging that empowering women economically serves as a direct means for alleviating poverty in coastal communities.

7.1. Theme 1: Gender roles and participation in marine resource use

Women play a significant and essential, yet often undervalued, role in the marine resource sector, with their participation characterised as integrated but unequal.² Roles are frequently rigidly traditional, where men fish and women handle post-harvest and domestic tasks. Women can be the primary beneficiaries of fished resources.¹⁰⁷ In West African shellfish fisheries, for example, women are the majority participants (79%) and dominate ownership throughout the whole value chain (harvesting, processing and marketing).¹³⁶ This critical role is often underreported and underrepresented.

Positive interventions include targeted improvements for women, exemplified by the Women Group in the GMMTP with specific roles created to deliver benefit from value-added processing,¹² and the 6 de Julio Cooperative Mangrove Custodia, an all-female group organised to sell processed crab and shellfish meat.⁵¹

Gender disaggregation of data is a fundamental approach for tracking individual-level indicators and grasping the complete extent of resource utilisation across different groups.^{112, 121, 137, 138} Examples of women's critical role in community-based conservation point to an understanding of nature and environmental consciousness that may vary from that of men.¹²⁵ For example, females offered notably greater assessments of historical biodiversity loss and its effects than males. Additionally, females exhibited a greater average willingness to pay (WTP) for entry to marine reserves (19.54) in comparison to males (16.31).⁴⁴

The positions women occupy are frequently intertwined but unequal, resulting in a disadvantage for them. For instance, the Women Group in the GMMTP, while overseeing an important processed seafood sector, was placed in the low relevance–low influence category in stakeholder prioritisation, due to their indirect impacts and restricted engagement in coral reef activities. Furthermore, domestic abuse is recognised as a significant barrier preventing women's involvement in various seascapes.

Global South and Global North perspectives: In both settings, the literature reveals a gap in understanding the involvement of women, indigenous peoples and youth in marine planning and management processes. In some contexts, the establishment of MPAs has led to negative consequences for women. For example, in South Africa, restrictions associated with MPAs have increased the burden on women to secure alternative food sources.³⁰ Conversely, positive outcomes have been documented in other regions. LMMAs in Fiji, for instance, have demonstrated benefits for women's health and wellbeing.⁸³ There are also examples of women gaining greater influence in decision-making processes due to factors such as higher education levels and more stable income sources.^{89, 91, 114}

7.2. Theme 2: Initiatives for women's empowerment

Efforts to address gender inequalities in marine contexts increasingly focus on women's economic empowerment, skills development and leadership integration.^{107, 121, 119, 108, 114} These initiatives aim to create more equitable opportunities for women and strengthen their role in marine resource management. To achieve this, programmes have promoted alternative and sustainable livelihood options to reduce dependence on vulnerable marine ecosystems. Alongside these economic strategies, targeted actions seek to enhance women's access to financial resources, such as credit, and to provide training that supports long-term empowerment and self-sufficiency.^{111, 113}

The economic empowerment of women is identified as a direct means for reducing poverty in coastal communities. Strengthening the role of women is recognised as a significant chance to improve their overall wellbeing.^{107, 138, 111} Certain initiatives aim to enhance the participation of marginalised groups, such as women and youth, in opportunities related to livelihoods reliant on renewable natural resources. Very limited literature was identified on

initiatives focused on tackling gender disparities and threats like gender-based violence and sexual exploitation and abuse.

Enhancing women's economic prospects is difficult because of the widespread influence of patriarchal systems and systemic discrimination that limit women's ability to access economic resources, credit and assets.^{107, 110, 54} The pandemic heightened pressures on women. To address these challenges, interventions may need particular institutional backing and targeted support, such as seen in Senegal (Box 1).

Box 1 – Economic Empowerment through Women's Fish Processing Groups in West Africa¹²¹

(Source : USAID/COMFISH Mid - Term Performance Evaluation)

A USAID project in West Africa strengthened women's economic opportunities through the creation of a revolving fund dedicated to *Groupements d'Intérêt Économique* (GIEs) in Cayar , Senegal . These organised groups have produced measurable positive economic outcomes for their members , demonstrating the value of collective action in women's economic empowerment . The revitalisation of the Network of Women in Artisanal Fisheries in Senegal (REFEPAS) increased recognition of women's roles in the fisheries sector .

The GIE 'Mantoulaye Guène' , a women's fish processing group in Cayar , achieved significant economic gains through this initiative . Members reported a two - to threefold increase in the price per kilogram of processed fish , resulting in comparable rises in net profits . The project's broader objective was to raise women's incomes from fish processing activities , supported by improvements in local infrastructure and enhanced hygiene and sanitation standards .

Initiatives for Women's Empowerment: Global South examples

Based on the literature collated, most targeted empowerment initiatives in marine and coastal governance are concentrated in the Global South, frequently supported by development partners and non-governmental organisations. These initiatives aim to strengthen women's roles in fisheries, enhance leadership and promote economic resilience through locally relevant approaches.

Across these regions, initiatives broadly fall into three interlinked areas.

Initiatives	Examples
<p>Livelihood diversification efforts provide training for rural artisans and support activities such as craft production, ecotourism, apiculture and conservation-based enterprises like mangrove crab fattening.</p>	<p>In West Africa, initiatives in Senegal and Cameroon demonstrate the beneficial effects of community and institutional assistance. Women's fish processing groups in Cayar have witnessed a twofold or threefold increase in net profits, thanks to enhanced organisation and infrastructure. In Cameroon, initiatives have concentrated on offering alternative livelihoods to alleviate mangrove degradation, while also implementing training programmes that improve women's welfare and financial independence.</p>
<p>Leadership and governance programmes promote women's participation in decision-making through national declarations, action plans and targeted training modules.</p>	<p>Across Asia, comparable trends arise. In Madagascar, the Fisherwomen Leadership Programme engaged close to 1,300 women, empowering them to take on leadership positions in LMMA initiatives. Capacity-building efforts involved training on environmentally friendly fish processing technologies, and small grants helped women's groups grow their businesses. In Philippines, similar efforts have promoted women's involvement in marine governance through training and organisational assistance.</p>
<p>Economic security initiatives (such as savings clubs, where women make up over 70% of members and hold 85% of leadership positions) enhance women's financial resilience. In some contexts, policies such as joint spousal registration of fishing vessels have further strengthened women's role in household decision-making and secured their economic right.</p>	<p>In Latin America and the Caribbean, women have gained from initiatives aimed at economic empowerment. In the Dominican Republic, the Women Artisans of Los Corozos obtained bank loans to create a craft workshop, while in the 6 de Julio Cooperative Mangrove Custodia, a women-only group was established to handle and market crab and shellfish meat, enhancing both local incomes and community unity.</p>

7.3. Theme 3: Marine tenure, use rights and community engagement

Secure marine tenure and robust community engagement are important components of effective marine management, serving as the foundational requirements for achieving social equity, sustainable resource investment and long-term compliance. Small-scale fishers, responsible for producing about two-thirds of the world's fish supply, show improved food security and nutrition by managing fisheries sustainably through secure access and tenure rights.¹ The governance of tenure is critical for advancing gender equity and ensures that communities have the assurance needed to invest in and manage fishery resources sustainably. Strong, organised community engagement is vital for generating legitimacy, minimising socioeconomic conflict and ensuring long-term compliance and adherence to protected area rules.

Respect for local rights, especially customary tenure and traditional practices, has yielded encouraging results in management outcomes and improves tenure security. The creation of MPAs essentially alters property rights, frequently imposing substantial opportunity and monetary costs on users engaged in extraction, like fishermen.^{23,51} A significant tension arises because MPAs often limit traditional fishing rights without providing automatic compensation for losses, resulting in conflict.⁶⁵ Limited local involvement in management, despite robust support, can restrict the perceived economic advantages of an MPA. For instance, local participation in the Anambas Island Regency Marine Protected Area remains very low, and communities report no significant increase in income resulting from the MPA; despite generally strong public support. Although involvement in MPA management is slowly improving, residents still do not perceive meaningful livelihood benefits or development aid tied directly to the MPA's establishment.³⁷

Global South and Global North perspectives: Both the Global South and Global North share common challenges regarding equity and conflict resolution.^{36, 20} In both contexts, the implementation of MPAs has been observed to generate tensions related to use rights, access and economic displacement, leading to social friction and financial burdens for affected communities. Restrictions imposed by conservation measures can displace traditional users, resulting in 'green grabbing', where land and resources are appropriated for environmental purposes, as seen in the establishment of Banff National Park in Canada.²⁵ Similar patterns emerge in the UK's Lyme Bay, where demersal trawling vessels experienced a decline in profitability and access, while recreational users such as divers and sea anglers benefited.⁴⁷ Comparable trade-offs have been observed in Australia, where the adoption of best management practices (BMPs) to protect adjacent catchments imposed high short-term costs and production losses on landholders.⁶³ Also in Australia, extractive users reported stress, fear and a sense of betrayal following MPA establishment,⁵⁵ underscoring the social dimensions of conservation conflict. Moreover, public support for MPAs in Australia often coexists with limited understanding of complex zoning schemes, raising questions about the legitimacy and equity of restricted-use regimes. Further tensions arise

¹ USAID Global PA00MVXZ.pdf (Marine Tenure and Small-Scale Fisheries Brief)

when conservation measures constrain sustainably managed fisheries or conflict with alternative economic activities such as farming and aquaculture, as illustrated by restoration projects in the Solway Firth wetlands in the UK.²⁸

Notwithstanding these obstacles, mitigation techniques in the Global North have assisted in minimising losses or producing access and tenure-related co-benefits.

Compensation plans have been used to counteract the financial effects on impacted industries, such as those related to the extension of no-take zones in Australia's Great Barrier Reef Marine Park, where payments totalled more than \$250 million.⁴¹

At the Georges Bank Reserve (USA), fishermen reported increased catch efficiency after area closures, with positive ecological spillovers increasing the value of retained fishing rights.⁸²

Multi-sectoral advisory committees in the UK's Lyme Bay MPA are one example of an inclusive governance approach that has encouraged more equitable outcomes across stakeholder groups.⁴⁷

Additionally, through businesses like fish farms and ecotourism, indigenous communities in British Columbia, Canada, have effectively combined sustainable practices with traditional means of subsistence, strengthening their cultural identity and economic claim to marine resources.⁵⁰

Several approaches have proven effective in securing tenure and enhancing engagement, including in the Global South. Participatory tools are increasingly employed to strengthen local food systems and ensure equitable access to marine resources.^{9, 91, 126, 133} These tools are explicitly designed to integrate women's priorities, aligning livelihood activities with gender-sensitive objectives. Community governance mechanisms, such as LMMAs and TURFs, have provided practical frameworks for managed access and tenure security, benefiting thousands of coastal residents through development programmes. A further example of inclusive engagement is found in the Misool Community Recycling Programme, where the empowerment of women and marginalised groups through the purchase of recyclable waste has created alternative income streams and strengthened social cohesion.¹¹⁷

8. Governance and institutional outcomes

As explored in Sections 4, 5 and 6, governance and management strongly influence MPA and associated socioeconomic outcomes. Strong governance provides the regulatory frameworks, institutional capacity and enforcement mechanisms necessary to guide sustainable marine resource use, integrate multiple stakeholders and support adaptive management in the face of environmental and social change. Effective governance depends on capacity building, institutional strengthening and inclusive decision-making to address equity concerns, integrate customary and scientific knowledge and overcome barriers such as fragmented policies or insufficient enforcement. Synthesis of the governance and institutional insights overlap with insights presented in preceding sections. Aggregating these insights relative to governance led to two key themes emerging.

8.1. Theme 1: Multi-stakeholder and co-management models

Effective and sustainable marine action depends on aligning diverse interests and perceptions across public and private sectors. Collaborative and multi-stakeholder approaches are essential for addressing complex marine challenges linked to the blue economy and climate change. Co-management, a hybrid strategy involving joint efforts among governments, communities and NGOs, has been associated with successful conservation and fisheries management outcomes. Scaling up fisheries co-management involving local communities is recognised as a key governance priority.

Governance models exist on a continuum from top-down state control to bottom-up community-led initiatives, with shared or co-management approaches representing a middle ground. Emerging evidence demonstrates that indigenous and community participation and leadership foster more inclusive and effective governance arrangements, such as co-governance and co-management systems.^{23, 53, 81, 118, 126} Successful governance relies on sustained stakeholder engagement and supportive policy environments. Effective management of protected areas, through legal or collaborative means, requires ongoing regional cooperation and participatory decision-making structures that reflect local social realities.^{25, 60, 65, 73}

Multi-sectoral and broader geographical scale management approaches, such as MSP, are recommended to strengthen governance by providing a transparent, participatory and multi-sectoral framework to minimise conflicts and encourage cross-sectoral coordination. Such tools are flagged as necessary and complementary to MPAs to help bridge competing interests while promoting balanced and sustainable marine resource use.

8.2. Theme 2: Capacity building and institutional strengthening

Institutional capacity gaps remain a significant constraint on MPA performance worldwide. Strengthening institutional and enforcement capacity is essential for implementing effective conservation and rehabilitation strategies. In Indonesia, the Ministry of Marine Affairs and Fisheries has enhanced its capacity through the introduction of standard competencies, ensuring that staff are adequately trained for sustainable management. The development of the Specific Competence Standards for Work (SK3) for MPA managers represents a systematic approach to long-term capacity building.¹⁴⁰

There are positive examples of capacity development supported by the rollout of bespoke assessment tools, such as the Ecosystem Approach to Fisheries Management Benchmarking System (EAFM BS) and the MPA Management Effectiveness Indicators (E-KKP3K).¹⁴⁰ More broadly, IUCN launched the Management Effectiveness Tracking Tool (METT) in 2002 to specifically support protected area management effectiveness, as is called for under the Kunming-Montreal target. These instruments provide standardised frameworks for evaluating management performance, establishing baselines and guiding resource allocation. Broader efforts include strengthening fisher associations, supporting collaborative schemes and improving intersectoral coordination to address environmental and social risks.

References point to the importance of strengthening local and national capacity to support MPAs. This requires equitable collaboration across the Global North and Global South, actively addressing 'parachute science' where externally led research fails to strengthen local capabilities. Building genuine capacity within national and local management agencies promotes sustainable knowledge transfer and empowers communities to manage their marine environments more effectively.^{93, 107, 132, 140}

8.3. Global South and Global North perspectives

The review reveals distinct priorities and challenges when discussing governance in the Global South versus the North, although the fundamental principles of effectiveness (through for example active enforcement) are universal.

Characteristic	Global South focus	Global North focus/implications
Capacity and institutions	Heavy focus on institutional strengthening of government agencies (e.g., MMAF, LGUs in Indonesia/Philippines). Need for systemic funding changes to support local researchers.	Governance structures exist through multiple legal frameworks (e.g., EU Habitats Directive), but effective protection is hindered by poor implementation and insufficient monitoring by Member States.
Local models & rights	Strong reliance on bottom-up models like LMMAs and integrating local wisdom (adat). Securing tenure and use rights (e.g., TURFs) is a key governance action for livelihoods and poverty alleviation.	Traditional governance has often been top-down and exclusionary. Social equity challenges remain and there are examples of successfully engaging Indigenous Nations in co-led planning processes (e.g., Canada).
Funding mechanisms	Development aid often supports financial mechanisms like the BLUD system in Indonesia, which collects visitor tariffs to cover management costs and community welfare. Governance is compromised by fee leakage and inflation.	Visitors demonstrate higher acceptance of user fees if managed by NGOs rather than government bodies. Market-based measures are explored to improve governance by aligning operator incentives with management objectives.

Governance remains the cornerstone of effective adaptation across both the Global North and South, particularly as emerging fields such as AI and climate change reshape environmental management. While governance priorities differ between regions, the need for transparent, equitable and adaptive systems is universal. In the Global South, the rapid integration of AI into marine science and conservation demands governance mechanisms that ensure ethical integrity, fair access to technology and protection of sensitive data, while also supporting capacity-building within local institutions.^{10, 131} In the Global North, governance reform must focus on translating established legal frameworks into practice through effective monitoring, accountability and climate-responsive policy.^{2, 20, 29, 105}

Both regions share a common need to modernise regulatory systems to manage shifting species distributions and to build a workforce capable of responding to the realities of a changing climate.¹⁰⁵

The lessons from the COVID-19 pandemic illustrate that traditional governance systems, whether in the North or South, are often ill-equipped to handle sudden, large-scale disruptions.^{1,59} This shared vulnerability leads to calls to adopt adaptive management as a common principle of effective governance. Adaptive management promotes learning, flexibility and proactive decision-making, enabling institutions to respond to uncertainty and evolving environmental conditions. While there is an open question about 'how', embedding the principle of adaptive approaches is key to enabling governance frameworks to respond to conservation, livelihoods and climate challenges with resilience and foresight.



Photo: Francesco Ungaro/Pexels

9. Conditions attached to MPA outcomes

9.1. Introduction

Across the literature, MPAs are universally recognised as crucial conservation tools, but their success is never guaranteed, is highly dependent on context, and is constrained primarily by socioeconomic, financial and governance factors rather than ecological design alone. Four themes emerged from the analysis of extracted summaries of MPA effectiveness and conditions influencing effectiveness.

The overarching analysis reveals three critical conclusions: (1) Effectiveness is conditional on robust finance and enforcement. (2) Effectiveness requires socio-political legitimacy and equity. (3) The failure to provide tangible socioeconomic benefits undermines conservation outcomes.

9.2. Theme 1: The implementation gap and defining effectiveness

The sources consistently highlight a severe discrepancy between the formal establishment of conservation areas and their functional operation, which limits their effectiveness globally. As noted earlier, there are tools to support management effectiveness (e.g. METT).

'Paper parks' are a global peality:⁷⁴ A recurring negative finding is that many designated MPAs worldwide lack the effective management, resources or enforcement capacity necessary to achieve their intended conservation and socioeconomic goals.

Defining success through protection level:³² Positive ecological outcomes are primarily observed in fully or highly protected areas, particularly strict 'no-take' marine reserves (see Section 4).

Qualitative shortfalls: MPA expansion often focuses heavily on area coverage (quantitative targets) but critically falls short on qualitative elements such as effective management, equity and connectivity.^{53,100} It is highly uncertain what benefits MPA expansion will yield without concomitant improvements in effectiveness.⁵³

9.3. Theme 2: Financial and enforcement conditionality

Financial sustainability and rigorous enforcement capacity are cited as key conditions for MPA success.

Funding is a primary predictor of effectiveness: Funding is identified as the most robust predictor of successful ecological outcomes in MPAs.¹⁰⁰ Globally, effectiveness is severely limited by chronic resource shortfalls, with a global study finding that 65% of MPAs had

insufficient budget for basic management needs, and 91% suffered from inadequate on-site staff capacity.^{79, 85}

Enforcement as a requirement: Adequate enforcement and compliance are critical requirements for MPA success.⁷⁴ Weak enforcement capacity, often resulting directly from inadequate funding and human resources, is a major constraint, particularly in developing nations.¹²²

Financial innovation: Collaborative Management Partnerships (CMPs), such as the delegated management model, are noted as effective financial mechanisms, capable of attracting and stabilising investment flows and yielding budgets up to 14.6 times greater than baseline state budgets in some cases.^{120, 122} The economic rate of return for MPA expansion can be high (up to 24%) with benefit-to-cost ratios ranging from 3:1 to 20:1, suggesting a robust economic justification for strict protection,^{104, 115} but noting that economic outcomes are often unequally distributed.

9.4. Theme 3: Socio-political conditions, equity and livelihoods

References point to effectiveness being conditional on social acceptance, participatory governance and the integration of equity concerns, particularly for resource-dependent communities.

Inclusion and legitimacy: Effectiveness requires inclusive decision-making and participatory management tailored to the local context. Success relies on normative legitimacy (inclusive decision-making) and perceived legitimacy (acceptance by those reliant on resources and the public).^{30, 69, 77} Top-down approaches that ignore rights and justice concerns are flagged as a risk to MPA outcomes.³⁰

Tenure security and rights, mitigating social costs, gender and social inequality, discussed in preceding sections, were also noted as important if not critical considerations for MPAs.

9.5. Theme 4: Design, planning and adaptive management

Effective MPAs must be scientifically sound, integrated into wider management frameworks, and capable of adapting to environmental change.

Design criteria and NEOLI: While highly effective MPAs are often 'no-take, enforced, old, large, and isolated' (NEOLI), modelled results indicate that none of these five individual conditions were found to be strictly necessary for achieving ecological success. However, ecological isolation emerged as the clearest determinant of positive performance relative to ecological outcomes.^{46, 67}

Longevity and scale: Effectiveness often requires a substantial long-term commitment, typically decades, for full benefits to materialise.^{82, 134} No-take MPAs may need to be large

(hundreds of square kilometres) to contribute significantly to biodiversity and spillover benefits.^{81, 63}

Climate-readiness and static boundaries: The effectiveness of MPAs is complicated by the fact that static protection boundaries are fundamentally unprepared to address climate-induced species range shifts and habitat alterations.^{53, 74} Effectiveness may be conditional on MPAs being 'climate-ready' by protecting critical areas such as 'climate refugia' and locations predicted to be more resilient.^{23, 72}

As discussed in preceding sections, wider regional management approaches such as MSP are advised to counter the risk of external pressures impacting MPA outcomes, and to support the identification of and early resolution of conflicts between resource users.^{98, 121}

9.6. Global South and Global North perspectives

The sources, drawn from both academic analysis (Global) and implementation reports (World Bank/USAID, primarily focused on the Global South), reveal distinct focuses shaped by socioeconomic realities.

In the Global South (e.g., Indonesia, Caribbean, Africa), conditionality is overwhelmingly centred on poverty alleviation, livelihood security and grassroots governance capacity.^{112, 134} Effectiveness here is often jeopardised by high debt bondage, dependency on middlemen, and the fundamental necessity for communities to rely on the environment for survival.^{114, 138} Success hinges on providing tangible, near-term benefits (e.g., tourism revenue, credit access) to incentivise compliance. Failures are frequently attributed to weak enforcement capacity and fragmentation resulting from inadequate budgets and human resources.^{23, 79}

In contrast, discussions related to the Global North (e.g., Australia, Canada, Europe) tend to focus on challenges related to policy alignment, scientific rigour and addressing external stressors like land-based pollution.^{63, 84, 85} While enforcement remains a key condition for effectiveness,³⁶ an important financial constraint can be ensuring the transparency and stability of fee mechanisms (visitor WTP) rather than the total absence of funds.⁶⁵

Shared connections across regions exist in the universal threat of climate change, which undermines static MPA boundaries globally, and the shared implementation problem where regardless of national income MPAs must define their objectives in measurable terms to assess success. There is the potential for widespread learning from implementation tools (such as METT and E-KKP3K) to track progress from poor baseline scores to functional management capacity.⁷⁶

10. MPA purpose and priorities

Reported MPAs are often established with overlapping purposes that influence their design, management and evaluation. The primary purpose tends to be biodiversity conservation, seeking to protect species, habitats and genetic diversity to support long-term ecosystem persistence and contribute to global conservation targets such as the 30x30 goal. A second, closely related purpose is fisheries restoration, where MPAs act as spatial management tools with the intention of rebuilding depleted stocks and sustaining food security through spillover benefits to adjacent fishing grounds in the case of no-take zones. Increasingly, MPAs are also promoted as NbS for climate adaptation and mitigation, providing coastal protection, carbon sequestration and ecological resilience under changing climatic conditions.

The contextual purpose of an MPA shapes management priorities. In areas where fisheries have collapsed, MPAs are implemented primarily as recovery zones with strict no-fishing regulations. In more stable fisheries, they serve to promote sustainable exploitation through habitat protection and spatial zoning. Within many developing regions, particularly in the Global South, MPAs are additionally framed as instruments for poverty alleviation and livelihood enhancement, linking conservation directly with employment, food security and local economic development. This has led to the adoption of MPA frameworks designed to ensure that artisanal fishers are principal beneficiaries.

Where MPAs are expected to deliver multiple benefits, ecological objectives tend to be institutionally prioritised over socioeconomic ones. Management assessments commonly emphasise biophysical indicators such as species abundance and habitat condition and favour full protection over partial measures to maximise ecological efficacy. Achieving ecological function is widely viewed as a prerequisite for long-term economic and social gains: healthy ecosystems underpin fisheries productivity, coastal protection and revenue generation. Nonetheless, evidence from development and community-based projects underscores that livelihood support and equity considerations are essential for conservation success. Effective implementation therefore requires a sequential and integrated approach – addressing immediate socioeconomic needs to enable compliance and community support, while ensuring that biological recovery ultimately sustains both ecological integrity and human wellbeing.

11. Strength of evidence assessment

11.1. Approach to evidence assessment

This section provides a qualitative assessment of the strength and distribution of evidence across key outcome areas synthesised in Sections 4–9. The assessment considers multiple dimensions of evidence quality: the number and diversity of sources, consistency of findings across contexts, methodological rigour, geographic breadth and whether outcomes are observed or modelled.

The review synthesised evidence from 140 documents comprising:

- **79 academic reviews and papers** (56%) – primarily systematic reviews, meta-analyses and narrative syntheses emphasising ecological and fisheries outcomes
- **55 development organisation reports and reviews** (39%) – evaluation reports, project documentation and policy guidance from USAID and World Bank providing implementation evidence on socioeconomic outcomes
- **6 NGO and institutional reports** (4%) – providing global perspectives, implementation guidance and case studies.

Where development-agency reports showed strong methodological clarity (for example, well-documented monitoring frameworks), transparent approaches and clear causal reasoning, these were treated as higher-confidence sources within the implementation and socioeconomic evidence base. Although not formally scored, their contribution is reflected in the thematic synthesis and in the moderate confidence ratings assigned to several socioeconomic findings.

The distribution of included literature reflects complementary strengths: academic literature provides more rigorous evidence on ecological outcomes with strong global coverage, while development agency reports offer essential but often methodologically less standardised evidence on socioeconomic outcomes, governance and implementation realities in specific project contexts.

11.2. Overall evidence landscape

Thematic distribution: Evidence is most abundant and robust for ecological outcomes, with academic reviews providing consistent, well-replicated findings across diverse contexts. Fisheries outcomes are moderately well covered, spanning both academic and development literature. Economic and livelihood outcomes, particularly tourism, are documented across both literature types but with variable methodological quality. Governance and institutional outcomes receive moderate attention, primarily in development reports. Gender equity, youth engagement and poverty alleviation as distinct analytical categories are less

extensively studied in academic literature, though development agency reports address these dimensions more systematically.

Geographic representation: In addition to global reviews, the evidence base spanned Southeast Asia with particularly Indonesia and Philippines most heavily represented, reflecting both biodiversity importance and concentration of development cooperation activities. Latin America and Caribbean, West Africa, East Africa and the Western Indian Ocean, and Pacific Island states were represented. Mediterranean and other Global North examples provide important comparators. South Asia appears underrepresented relative to the importance for marine resource-dependent communities.

Methodological considerations: Academic reviews generally employed more rigorous systematic methods including meta-analysis, though few primary studies were identified that applied experimental designs with robust counterfactuals. This is highly likely to reflect the 'review of reviews' search strategy. Development agency reports vary in methodological rigour, being project evaluations or completion reports rather than independent impact evaluations. Few studies across either literature type employ rigorous causal inference designs (RCTs, quasi-experimental methods with matched controls). Most evidence is therefore correlative rather than definitively causal, which restricts what claims can be made about MPA impacts.

Temporal coverage: Most evidence reflects outcomes measured over five- to 15-year timeframes. Long-term studies (>20 years) are rare but particularly valuable where they exist. Short-term evaluations (one to three years) are common in development reports but often insufficient to capture ultimate ecological or socioeconomic outcomes, particularly for slow-recovering species or livelihood transitions.

11.3. Strength of evidence by outcome theme

The following qualitative ratings are applied:

Strong: Consistent findings across numerous reliable sources spanning diverse contexts; reasonable confidence in extracted generalised insights

Moderate: Multiple sources showing general patterns but with some inconsistency, geographic clustering or methodological limitations

Limited: Few sources, inconsistent findings or heavily context dependent; conclusions tentative

Insufficient: Very limited evidence; outcomes plausible but not verified based on the evidence collated.

11.3.1. Ecological and biodiversity outcomes

Fish biomass and abundance within highly protected MPAs: STRONG

This is the most robustly evidenced outcome in the review. Numerous academic meta-analyses and systematic reviews, supported by development project monitoring data, consistently document substantial increases in fish biomass and density within fully protected, well-enforced MPAs. Observed effect sizes can be large and consistent across contexts in developed and developing countries. The pattern is consistent: high protection + effective enforcement = substantial biomass gains. Evidence spans decades and numerous locations.

Biodiversity conservation (species richness, threatened species): STRONG

Multiple academic reviews document positive biodiversity outcomes within effectively managed MPAs, including recovery of threatened species and increases in species richness. Evidence is strongest for habitat-associated species in coastal and reef systems. Outcomes are more uncertain for highly migratory species. The conditionality on enforcement and protection level is clear and consistent. Time lags vary by taxa, but patterns are well established across contexts.

Habitat protection and restoration (coral, mangrove, seagrass): MODERATE

Numerous sources document that MPAs can maintain habitat integrity relative to unprotected areas, particularly by preventing direct physical damage from destructive fishing or coastal development. Restoration examples show positive results. However, the evidence also clearly demonstrates that local protection cannot override large-scale stressors, particularly thermal stress from climate change. Coral MPAs show stability or slow recovery under normal conditions, but major bleaching events overwhelm local protection. Evidence is consistent but contextual dependence is high.

Fishery spillover to adjacent areas: MODERATE

This outcome shows variability in the evidence. Academic reviews indicate spillover effects are strongest and most consistent in small, heavily fished coastal areas where MPAs protect critical habitat and fishing pressure in surrounding areas is high. Effects diminish or become undetectable at larger scales, for highly mobile species,



Photo: Marte Lid/Norad

or where fishing pressure outside MPAs is low. Development reports from small-scale fisheries projects (Philippines, Indonesia, Pacific Islands) document positive spillover more consistently than broader academic assessments. The evidence suggests spillover occurs but is highly conditional on scale, species characteristics, fishing intensity and broader fisheries management context.

Coastal protection services: MODERATE

Multiple sources document that healthy coastal habitats (coral reefs, mangroves, seagrass) provide measurable wave attenuation and coastal protection services. The evidence for this ecological function is strong. What is more uncertain is the attribution to MPAs specifically: coastal protection depends on habitat presence and health, which MPAs may help maintain, but the relationship is complex and other factors (coastal development, pollution, climate change) may dominate. The logic chain is clear, but direct MPA-coastal protection attribution is often inferred rather than measured.

Climate resilience and adaptation: LIMITED

While MPAs are widely promoted as climate adaptation tools and the theoretical rationale is sound (protecting refugia, maintaining connectivity, reducing local stressors to enhance resilience), empirical evidence for climate resilience outcomes is limited. Most evidence comes from modelling studies or short-term observations insufficient to demonstrate resilience under climate stress. Multiple sources identify that MPAs can fail to protect corals from bleaching during thermal stress events, highlighting the limits of local protection against global stressors. Evidence for MPA networks enhancing regional resilience exists but is primarily theoretical.

Regional ecological resilience: INSUFFICIENT

Very few studies explicitly measure resilience at regional or network scales over time periods sufficient to assess resilience (decades). The concept is theoretically sound and frequently recommended, but empirical evidence demonstrating that MPA networks enhance regional ecological resilience to multiple stressors remains limited. This represents a significant knowledge gap.

11.3.2. Fisheries management outcomes

Integration with broader fisheries governance frameworks: MODERATE

Development agency reports and practitioner literature provide consistent evidence that MPAs function most effectively as fisheries tools when embedded in comprehensive EAFM or MSP frameworks. Academic reviews support this finding. Multiple examples from Philippines, Indonesia and Pacific Islands document positive outcomes when MPAs are coupled with fishing effort reduction, vessel registration, catch monitoring and co-management. However, rigorous comparative studies testing MPA-only versus integrated

approaches were not identified. Evidence is consistent but often based on case comparisons rather than controlled designs.

Reduction of IUU fishing within MPAs: MODERATE

Numerous sources identify IUU fishing as a major threat and enforcement as critical to MPA effectiveness. Development project reports document measurable reductions in IUU fishing when enforcement capacity is adequate. Evidence is consistent that enforcement works when adequately resourced, but the challenge is securing sustained enforcement capacity.

Food security and nutrition from sustainable fisheries: MODERATE

Development reports, particularly from USAID projects, provide consistent evidence that MPAs embedded in broader fisheries management can contribute to food security by maintaining fish stocks and catches. The logic chain is well supported: healthy stocks → sustained catches → food security. However, direct measurement of nutritional outcomes linked to MPAs is limited. Most evidence is based on intermediate outcomes (biomass, catch) with food security outcomes inferred. Context dependency is high – outcomes depend on whether fishing effort is truly reduced system-wide and whether benefits accrue to local communities versus external fishers.

Livelihood outcomes for artisanal fishers: MODERATE

This outcome shows high variability. Development reports document both positive outcomes (when MPAs are designed with artisanal fishers as primary beneficiaries, tenure rights are secured, and spillover benefits are realised) and negative outcomes (when displacement occurs without mitigation, compensation is inadequate or benefits are captured by industrial fishers or external operators). Academic literature included greater emphasis on negative distributional impacts and conflict. The evidence is clear that outcomes depend on design choices, tenure security, benefit-sharing mechanisms and complementary livelihood support. Generalised insights are difficult; context determines outcomes.

11.3.3. Economic and livelihood outcomes

Tourism revenue generation: STRONG

Multiple sources across academic literature, development reports and NGO documentation provide consistent evidence that well-managed MPAs in attractive locations can generate substantial tourism revenue. Examples span global contexts and effect sizes can be large. The pattern is clear: natural assets + accessibility + management = significant revenue potential. Caveats are also well documented: revenue generation does not automatically translate to local benefits, negative ecological impacts require planning, for example, carrying capacity must be managed, and tourism dependence creates vulnerability to shocks.

Local employment and income from tourism: MODERATE

Evidence that tourism creates employment is strong. What is less clear and more variable is how much employment and income flows to local communities versus external operators, and the quality of jobs created. Development reports emphasising pro-poor tourism design document positive local income effects. Academic literature raises concerns about benefit capture by elites or external operators and replacement of stable fishing livelihoods with precarious seasonal tourism work. The evidence suggests tourism can benefit local communities but requires deliberate design choices and monitoring to ensure equitable outcomes.

Alternative livelihood success (aquaculture, value-added processing, crafts): MODERATE

Development reports document numerous examples of successful alternative livelihoods supported through targeted interventions (seaweed farming, fish processing, ecotourism services, crafts). Success factors consistently include sustained technical and financial support, market access, access to credit, and business development over longer time frames (three/five years). However, success is highly variable and context dependent, as is scale of effect. Some alternative livelihood programmes show limited uptake or sustainability. The evidence suggests alternative livelihoods can work but require substantial sustained investment and careful matching to local capacities and market opportunities.

Poverty alleviation: LIMITED

While there are claims that MPAs can alleviate poverty, direct empirical evidence linking MPAs to poverty reduction is limited. One robust, global study of protected areas (including terrestrial and coastal) found households near tourism-associated protected areas in developing countries were wealthier and less poor than comparable distant households – this is the strongest evidence identified. Development reports document poverty-related indicators (income gains, asset accumulation, food security improvements) in specific project contexts but rarely employ rigorous poverty measurement or counterfactual designs. Poverty alleviation appears plausible as an outcome of well-designed MPAs with tourism revenue, secure fisheries and livelihood support, but evidence remains largely indirect and correlational. This represents a significant evidence gap given poverty alleviation is a core development objective.

Economic resilience and diversification: LIMITED

Some sources discuss livelihood diversification as a resilience strategy, and COVID-19's impact on tourism-dependent communities provided clear evidence of vulnerability from tourism over-dependence. However, systematic evidence on whether MPAs enhance or reduce economic resilience in coastal communities is limited. The theoretical argument for diversification is sound but empirical evidence is scarce.

11.3.4. Gender and social equity outcomes

Women's economic empowerment through targeted interventions: MODERATE

Development reports document compelling examples of women's economic gains through targeted interventions such as women's cooperatives, fish processing groups, savings clubs and value chain support. Effect sizes can be substantial (doubling/tripling prices/incomes in documented cases from Senegal, Indonesia, Philippines). The pattern is consistent: gender-specific programming with technical training, financial services and market support yields economic benefits for women. However, the evidence base is largely from project reports rather than independent evaluations. The strength of generalised insights beyond supported interventions is unclear, though it is clearer that without explicit gender-focused approaches, entrenched marginalisation continues.

Women's participation in governance: LIMITED

Multiple sources document that women's participation in MPA governance remains limited despite their significant role in fisheries. Some positive examples exist (Indonesia's Fisherwomen Leadership Programme, various co-management initiatives), but the evidence base on effective strategies for increasing women's governance participation is limited. Barriers are reasonably well documented (patriarchal norms, time constraints, gender-based violence, lack of recognition) but there is less evidence on what works to overcome them.

Secure tenure rights for indigenous peoples and local communities (IPLCs) and small-scale fishers: MODERATE

Multiple sources, particularly development agency reports, consistently document that formalising tenure rights (TURFs, LMMAs, customary rights recognition) is associated with improved management outcomes, compliance and livelihood security. Examples span Pacific Islands, Indonesia, Philippines and Latin America. The logic appears sound and examples are numerous. However, rigorous studies comparing formalised versus informal tenure with appropriate controls were not identified. The evidence is consistent and policy-relevant but relies on case comparisons rather than experimental designs.

Equitable benefit distribution: LIMITED

Inequitable distribution of MPA benefits is frequently documented as a problem, with benefits captured by elites, external operators or better-connected groups while marginalised communities and groups bear costs. What is less well documented is evidence on effective benefit-sharing mechanisms and their distributional impacts. Some positive examples exist (Raja Ampat's BLUD system, various community-benefit agreements) but systematic evidence on what governance structures and mechanisms ensure equitable distribution is limited. This represents a significant gap.

Youth engagement: INSUFFICIENT

Youth are rarely addressed as a distinct category in the MPA literature reviewed. A handful of sources mention youth in passing or include youth in capacity-building activities, but systematic attention to youth-specific needs, opportunities or outcomes is largely absent. This is a notable evidence gap.

11.3.5. Governance and institutional outcomes

Co-management effectiveness: STRONG

This is one of the most consistent findings across both academic and development literature. Multiple sources spanning diverse contexts document that participatory co-management approaches with authority devolution are associated with improved compliance, sustainability and social acceptance compared to top-down governance. Examples include Indonesia's *adat*-based systems, Pacific Island LMMAs, Philippines co-management frameworks and various community-based surveillance systems. The evidence is robust and consistent that inclusive governance matters, but there is variation in implementation.

Institutional capacity strengthening: MODERATE

Development reports consistently emphasise capacity building as essential and document improved management outcomes when systematic capacity building is provided. The evidence that capacity matters is strong. What is less clear is which capacity-building approaches are most effective and sustainable. Many projects provide training with limited evidence of lasting institutional change. The pattern suggests sustained, systematic approaches work better than short-term workshops, but rigorous comparative evidence is limited.

Enforcement effectiveness: STRONG

An almost universal finding in the review is that enforcement capacity is critical to MPA effectiveness. Sources across all types and contexts consistently identify adequate enforcement as a necessary (though not sufficient) condition for achieving conservation outcomes. Inadequate enforcement is flagged as a leading explanation for 'paper parks'. The relationship is clear, consistent, and well documented: no enforcement = no ecological outcomes. The challenge is not lack of evidence but lack of resources to operationalise enforcement globally. Also, relevant but not well represented in the sources is the role of voluntary compliance.

Integration into Marine Spatial Planning: MODERATE

Multiple sources recommend MSP as a framework for integrating MPAs with broader marine management. Examples from established MSP processes (e.g., Great Barrier Reef, some European contexts, emerging in Southeast Asia) document benefits of coordination, conflict reduction and addressing threats at appropriate scales. However, MSP implementation is still relatively recent in most contexts, and long-term evidence of effectiveness is emerging rather than established. The logic and early evidence are compelling, but evidence base is limited.

Adaptive management implementation: LIMITED

Adaptive management is frequently recommended but rarely rigorously implemented or evaluated. Few sources document systematic adaptive management processes with evidence of learning and course correction based on monitoring. This gap between recommendation and implementation is noted by multiple sources. The concept is sound and endorsed but empirical evidence of adaptive management in practice at scale is limited.

11.4. Cross-cutting observations

Conditionality is universal: The single most consistent finding across all outcome areas is that MPA effectiveness is highly conditional. Success depends on protection level, enforcement capacity, adequate financing, inclusive governance, secure tenure, livelihood support and integration with broader management. The evidence does not support simplistic claims that ‘MPAs work’ or ‘MPAs don’t work’ – outcomes depend on how MPAs are designed, implemented, resourced and governed.

Ecological evidence is stronger than socioeconomic: The evidence base for ecological outcomes is larger, more methodologically rigorous, more geographically diverse and more consistent than evidence for socioeconomic outcomes. This reflects research priorities and funding, but the smaller pool of socioeconomic evidence may reflect a burgeoning field of research rather than a prioritisation of nature over people. The imbalance is, though, problematic for development cooperation where socioeconomic outcomes are central objectives.

Development agency reports fill critical gaps: Academic literature emphasises biological outcomes and often treats socioeconomic factors as confounding variables rather than primary outcomes. Development agency reports, while methodologically variable, provide essential evidence on implementation realities, governance processes, livelihood impacts, gender dimensions and poverty-related outcomes that are more generally absent from academic literature. Both evidence types are necessary for comprehensive assessment.

Time lags complicate evidence: Many outcomes (ecological recovery, livelihood transitions, governance institutionalisation) require years to decades to fully materialise. Most studies are shorter-term, potentially missing ultimate outcomes. Long-term studies are rare but particularly valuable. This temporal complexity means that evidence often reflects intermediate outcomes with ultimate impacts inferred rather than measured.

Context dependency limits generalised insights: Evidence spans highly diverse contexts (ecological, social, economic, governance). The evidence provides guidance on conditions and principles but does not support mechanistic application of generic models. Each context requires local analysis and adaptation. Extracting and applying insights to unstudied contexts requires caution.

Measurement challenges persist: Lack of standardised indicators and monitoring protocols across studies makes comparison difficult. Ecological monitoring is more standardised than socioeconomic monitoring. Many studies measure outputs (areas designated, people trained) rather than outcomes (ecological change, livelihood improvement). Gender-disaggregated data and distributional impact data may be absent. These measurement challenges limit evidence quality and comparability.

11.5. Confidence in review findings

Despite limitations outlined in Section 12, the review team has **moderate to strong confidence** in the following overarching conclusions:

Strong confidence: Well-designed, adequately resourced and effectively enforced MPAs can deliver substantial ecological benefits including stock recovery and biodiversity conservation.

Strong confidence: MPA socioeconomic outcomes are highly variable and context dependent. There are examples of positive impacts and separate examples of negative impacts. Those examples that demonstrate positive impacts tend to reflect more comprehensive and holistic design and implementation that is sensitive to local circumstances.

Moderate to strong confidence: Success in achieving balanced conservation-development outcomes requires integrated approaches addressing governance, equity, livelihoods and enforcement simultaneously rather than prioritising conservation in isolation.

Moderate to strong confidence: The conditions for success are reasonably well understood even if not universally applied: high protection levels, adequate financing, inclusive governance, secure tenure, complementary livelihood support and integration with broader spatial and sectoral planning.

Moderate confidence: Development cooperation can substantially influence outcomes through attention to these conditions, though success is neither automatic nor guaranteed and depends on sustained commitment and context-appropriate implementation.

These conclusions rest on evidence from 140 sources spanning multiple outcome domains, geographies and methodological approaches. While individual studies vary in quality and no single study provides definitive answers, the convergence of findings across diverse sources and evidence types provides reasonable confidence in the content of this review. The explicit acknowledgement of evidence gaps, the conditional nature of outcomes and the need for context-specific adaptation appropriately calibrates this confidence.

12. Methodology

12.1. Approach and overview

This rapid review followed systematic review principles adapted from Cochrane guidance (<https://www.cochrane.org/authors/handbooks-and-manuals/handbook/current>), ensuring transparency, auditability and methodological rigour within a compressed timeframe. The review was conducted by two independent reviewers who maintained detailed logs of decisions and worked collaboratively throughout the process.

Review objectives: To synthesise evidence on interactions between MPAs and development-relevant outcomes, identify conditions for success and provide evidence-based recommendations for development cooperation organisations.

Eligibility criteria: English-language publications (2015–2025) addressing MPAs, marine reserves, no-take zones or similar designations, focusing on environmental and socioeconomic outcomes. Academic searches prioritised review-type publications; development agency searches included evaluation reports and project documentation.

Quality considerations: Quality was addressed through the inclusion criteria (requiring clear methods, documented outcomes including modelled outcomes, and relevance to MPAs), dual independent screening, source-type weighting, and triangulation between sources. This approach ensured proportionate quality assurance while maintaining feasibility within the rapid-review timeframe. Given the rapid-review design, the heterogeneity of sources and the inclusion of non-primary studies, a risk-of-bias tool was not applied, in line with COCHRANE recommendations.

Timeline: The review was conducted between late September and late October 2025, with database searches and screening in September to early October, extraction completed by 28 October, and thematic synthesis commenced 24 October.

12.2. Search strategy

Academic databases:

Lens: Boolean search using ('marine protected area' OR 'marine protected areas' OR MPA OR MPAs OR 'marine reserve*' OR 'no-take' OR 'no take' OR NTZ OR NTZs OR 'marine sanctuary'), filtered to reviews (2015–2025), full text available, open access. Initial 6,400 records refined through marine-keyword filtering and title screening to 75 records, then abstract screening to **12 included studies**.

OpenAlex: Title/abstract search: (marine OR coastal) AND (protect* OR 'no take' OR 'no-take' OR reserve OR sanctuary) AND (result OR evaluat* OR outcome OR impact), filtered to reviews (2015–2025), open access. Initial 344 records screened through title and abstract review to 104, then full-text review to **62 included studies**.

Development agency repositories:

USAID Development Experience Clearinghouse: Targeted searches for MPA-related evaluations and reports: **36 documents included**

World Bank Open Knowledge Repository: Targeted searches for MPA-related reports: **20 documents included**

Snowball referencing: Forward and backward citation chasing from key papers: **18 additional studies included**

Total included in synthesis: 140 documents

All searches were restricted to English-language, open-access publications to ensure reproducibility. Search strings, filters, dates and results were logged at each stage.

12.3. Screening and selection

Screening occurred in three sequential phases conducted independently by both reviewers:

Title screening: Identified marine/ocean-relevant studies and excluded obviously irrelevant records

Abstract screening: Assessed relevance to MPA outcomes and inclusion criteria; unclear cases flagged for full-text review

Quality-related inclusion criteria: During screening we assessed whether documents demonstrated minimum methodological transparency i.e., clear objectives, described methods, identifiable data sources, and traceable findings. Records lacking these features were excluded. For development-agency reports, evaluation documents, project completion reports, and analytical reports where methodological steps, data sources, and monitoring evidence were explicitly presented were considered of higher quality. This enabled consistent treatment of a diverse set of documents to inform the review while recognising the greater weight of higher quality records.

Rapid full-text scan: Final eligibility determination and to aid data extraction QA

Duplicate records were removed at each stage. Exclusion reasons were systematically logged. Discrepancies between reviewers were resolved through discussion until consensus was reached. Approximately 20% of records underwent dual screening for consistency verification.

12.4. Data extraction

Data extraction captured:

Bibliometrics: ID, DOI, title, publication year, open access link

Context: Geography, development context (LIC/LMIC/SIDS where applicable), source type

Outcomes: Categories aligned with thematic sections (ecological, fisheries, economic, social equity, governance), noting that most documents addressed multiple outcomes

Evidence: Key results, recommendations, knowledge gaps, monitoring observations

Extraction was managed in Microsoft Excel using standardised templates. Both reviewers extracted data independently with regular calibration to ensure consistency.

12.5. Analysis and synthesis

Thematic framework: Following calibration, reviewers agreed on six primary analytical themes:

- Ecological and biodiversity outcomes
- Fisheries management outcomes
- Economic and livelihood outcomes
- Gender and social equity outcomes
- Governance and institutional outcomes
- Conditions for effectiveness (cross-cutting).

AI-assisted synthesis: Google NotebookLM was employed to enhance efficiency in handling the large volume of records. Both reviewers used a standardised prompt to instruct the tool. The prompt is available below *'Analyse the document given to extract key insights and summarise them theme-wise, keeping [sub-theme] (in the context of Marine Protected*

Areas and nature-based solutions) as the main theme. Identify major and recurring themes, draw summaries under each theme, and use direct evidence from the notes as the evidence base for your analysis. Highlight essential points visually or conceptually, particularly emphasising contrasts and connections between the Global South and Global North perspectives.'

AI outputs were manually reviewed, verified, refined and expanded upon by both reviewers through multiple iterative rounds to ensure fidelity to source material, accuracy of interpretation and appropriate contextualisation. This 'humanising of AI' approach maintained rigorous human oversight while benefiting from computational efficiency in pattern recognition and initial summarisation. Quality assurance checks were conducted regularly throughout the synthesis process.

Evidence mapping: Thematic summaries were traced directly to source documents in Excel. Frequency analysis and cluster mapping identified recurring patterns, dominant narratives and underrepresented areas. Contrasts between Global South and Global North contexts were systematically documented where meaningful.

Analytical lens: Context was recognised as critical to interpretation. The synthesis focused on understanding MPA effectiveness within diverse socioecological settings, examining how different MPA purposes and objectives (biodiversity conservation, fisheries management, poverty alleviation) were prioritised and achieved. Equal weight was given to varying contexts rather than imposing uniform evaluative standards.

12.6. Quality assessment

Quality considerations were integrated through a proportionate, transparent approach consistent with rapid-review guidance:

Quality considerations embedded in screening and inclusion: Minimum methodological transparency requirements were built into screening criteria (clarity of methods, identifiable data sources, clear causal reasoning, coherence between data and findings). Dual independent review of a subset of records at screening and extraction reduced subjectivity and error.

Quality considerations for analysis and synthesis: While no formal scoring was used, quality was considered through source-type weighting, transparency checks, and triangulation. Academic systematic reviews and meta-analyses were treated as higher-rigour sources for ecological and fisheries outcomes. Development-agency reports were important for understanding implementation and socioeconomic themes but were treated as context-specific evidence unless supported by multiple sources. Sources with clear methodological approaches and analysis were treated as higher-rigour sources. Patterns identified across

multiple sources (triangulation) were treated as higher-confidence findings. Lower quality sources contributed to context but not to support broad findings. Development agency evaluation reports demonstrated a sufficient standard of methodological documentation, transparency and clear causal reasoning to warrant inclusion. These were treated as higher-rigour implementation evidence within the narrative synthesis. These cases are highlighted in the relevant thematic discussions where they contribute materially to findings.

Informing the strength of evidence assessment: Based on the analysis and synthesis considerations above, the strength of evidence assessments (Section 11) explicitly identify where evidence is strong, moderate, limited or insufficient, allowing readers to calibrate confidence in each theme.

Quality considerations informing limitations: Several limitations identified in Section 12.8 directly stem from quality variability in the included sources, including:

- the predominance of correlational rather than causal evidence for socioeconomic outcomes;
- uneven reporting and limited methodological detail in some development-agency reports;
- uneven geographic coverage, with clusters of higher-quality evidence from Southeast Asia and fewer robust sources from other regions; and
- limited long-term monitoring data to support conclusions on sustained livelihood or equity outcomes.

These limitations reflect the authors' assessment of where source quality constrained the ability to make stronger generalisations.

Implications of quality limitations and source heterogeneity for findings and conclusions:

Taking into account the quality check approach described in this section, readers can calibrate the confidence and weighting behind the findings of this review. The implications are as follows:

- Ecological findings retain high confidence, being grounded primarily in multiple high-quality systematic reviews and meta-analyses with strong global consistency.
- Socioeconomic, governance and equity findings are presented with calibrated caution, reflecting the more variable quality of the underlying evidence.
- Conclusions emphasise conditionality and context and explicitly caution against universalised outcomes.
- Recommendations focus on principles and enabling conditions, not guaranteed impacts, which is methodologically appropriate given the mixed evidence base.
- Strength-of-evidence labels throughout Section 11 signal where limited quality constrains certainty, aiding transparency for readers.

In addition to the above, the report underwent external peer review prior to submission to Norad as an additional quality check.

12.7. Evidence synthesis approach

The review synthesised evidence from five complementary 'pools of information', each contributing distinct insights:

Empirical and technical data: Measured outcomes from monitoring, modelling and technical systems providing strongest evidence on biological performance and operational effectiveness

Systematic reviews and academic frameworks: Aggregated analyses establishing global patterns, clarifying mechanisms and identifying consistent relationships

Development aid and programmatic evidence: Applied case studies linking conservation with development outcomes, demonstrating implementation realities and context-specific adaptations

Local and experiential knowledge: Traditional management systems, community observations and fisher experience contextualising global principles and highlighting importance of participatory approaches

Policy frameworks and global commitments: Institutional documents positioning MPAs within broader biodiversity, climate and development agendas

Integration across these pools enabled balanced interpretation spanning ecological, social and economic dimensions while respecting contextual specificity.

12.8. Strengths and limitations

Strengths:

- **Systematic and transparent:** Cochrane-aligned methodology with comprehensive documentation
- **Dual independent review:** Reduced bias and error throughout all stages
- **Diverse evidence base:** Combined academic reviews emphasising ecological outcomes with development agency reports emphasising socioeconomic outcomes, providing complementary perspectives
- **Broad geographic coverage:** Evidence from all major marine regions with good representation of LICs and LMICs, particularly through development agency documentation
- **Efficient AI integration:** Enhanced processing capacity while maintaining rigorous human oversight and quality control.

Limitations:

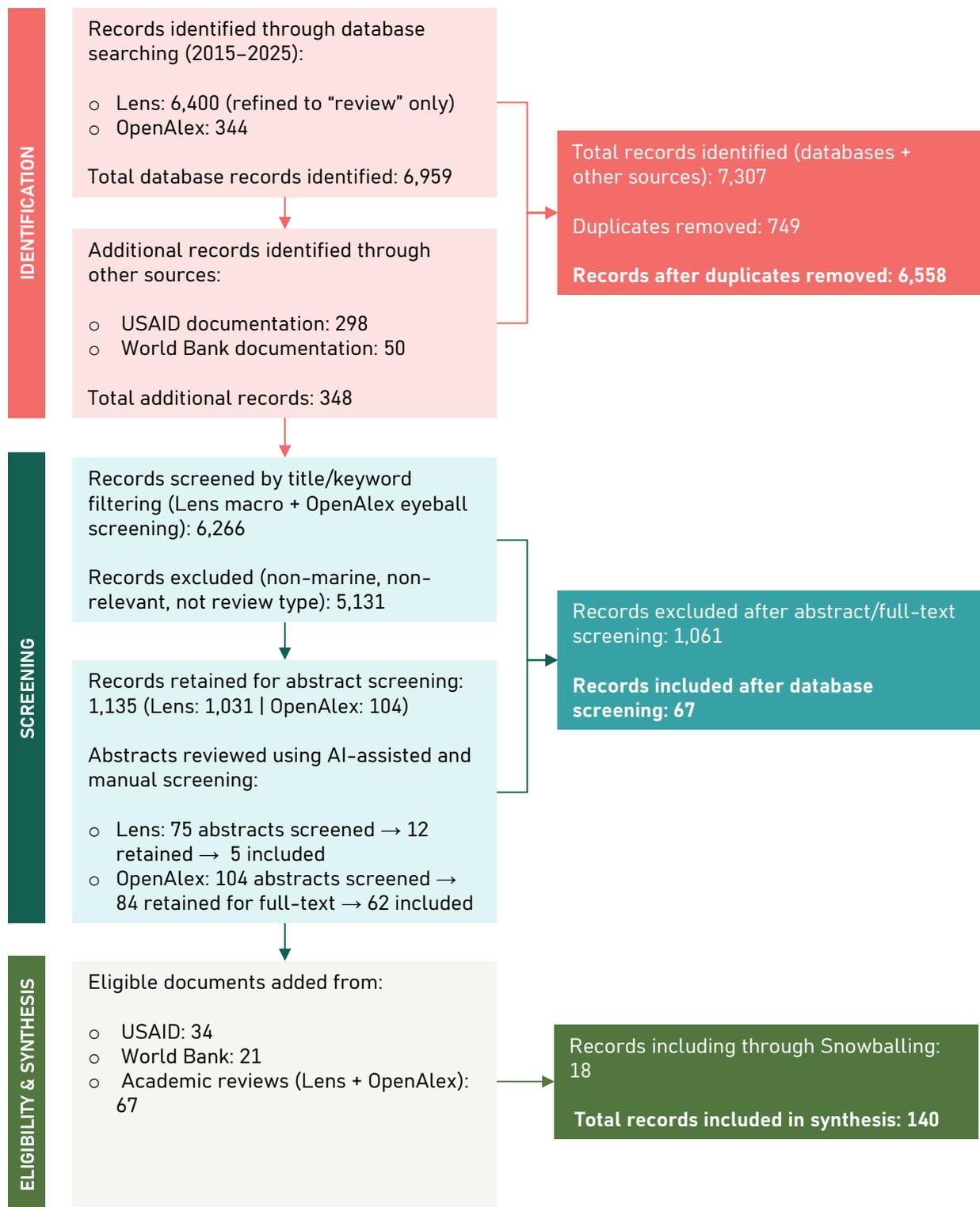
- **Database and language restrictions:** Limited to two academic databases and English-language, open-access publications; potentially excluded relevant non-English sources and paywalled research
- **Publication type emphasis:** Prioritising reviews over primary studies enabled efficient synthesis but may have introduced lag in capturing most recent primary research findings
- **Time constraints:** Compressed timeline (one month, 50% effort) necessitated trade-offs between comprehensiveness and depth
- **Heterogeneity:** Evidence base spans diverse geographies, methodologies and outcome types; findings represent broad patterns rather than universal laws applicable to all contexts
- **Limited causal inference:** Most reviewed literature reports associations rather than experimental causal evidence, limiting definitive claims about MPA impacts
- **Uneven evidence distribution:** Strong evidence on ecological outcomes; moderate on fisheries, tourism, governance; limited on gender, poverty, distributional impacts and long-term socioeconomic outcomes
- **Geographic clustering:** Evidence concentrates around accessible research sites and development projects. Generalizability to unstudied contexts requires caution and local adaptation
- **AI tool considerations:** While enhancing efficiency, AI-assisted synthesis required iterative calibration and continuous human oversight to address occasional inaccuracies or oversimplifications. Extensive quality assurance checks ensured outputs accurately reflected source material.

Despite these limitations, the breadth of sources, systematic approach, dual independent review, and integration of academic and practitioner evidence provide reasonable confidence that findings reflect genuine patterns and offer meaningful guidance for development cooperation decision-making. The explicit acknowledgement of limitations, transparent methodology and systematic strength of evidence assessment (Section 11) enable readers to appropriately calibrate confidence in specific findings.

12.9. Reporting

This review is reported following adapted PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidance. A PRISMA flow diagram documenting the search and screening process follows. All search logs, exclusion reasons and extraction templates are archived and available upon request to support reproducibility and transparency.

12.10. PRISMA diagram



Bibliography

1. Papathanassis, A. (2023) Author comment: A decade of 'blue tourism' sustainability research: Exploring the impact of cruise tourism on coastal areas – RO/PR1 [Preprint]. doi:10.1017/cft.2023.2.pr1.
2. Quan, Y. and Jin, J. (2024). A bibliometric review on marine ecological environment governance: Development and prospects (1990–2022). *Environmental and Sustainability Indicators*, 22, p.100406. doi: 10.1016/j.indic.2024.100406.
3. Oestreich, W.K., Chapman, M.S. and Crowder, L.B. (2020). A comparative analysis of dynamic management in marine and terrestrial systems. *Frontiers in Ecology and the Environment*. doi: 10.1002/fee.2243.
4. Dube, K. (2024). A comprehensive review of climatic threats and adaptation of marine biodiversity. *Journal of Marine Science and Engineering*, 12(2), 344. <https://doi.org/10.3390/jmse12020344>.
5. Mascia, M.B., Fox, H.E., Glew, L., Ahmadi, G.N., Agrawal, A., Barnes, M., Basurto, X., Craigie, I., Darling, E., Geldmann, J. and Gill, D. (2017). A novel framework for analyzing conservation impacts: evaluation, theory, and marine protected areas. *Annals of the New York Academy of Sciences*. doi: 10.1111/nyas.13428.
6. Ford-Learner, M.A., Addison, J. and Cumming, G.S. (2024). A review of ecosystem service supply in tropical marine ecosystems and its relationship to habitats in the Great Barrier Reef. *Ecosystems and People*, 21(1). <https://doi.org/10.1080/26395916.2024.2425816>.
7. Albright, R. and Cooley, S. (2019). A review of interventions proposed to abate impacts of ocean acidification on coral reefs. *Regional Studies in Marine Science*, 29, p.100612. doi: 10.1016/j.rsma.2019.100612.
8. Baco, A.R., Etter, R.J., Ribeiro, P.A., von der Heyden, S., Beerli, P. and Kinlan, B.P. (2016). A synthesis of genetic connectivity in deep-sea fauna and implications for marine reserve design. *Molecular Ecology*. doi: 10.1111/mec.13689.
9. Wu, X., Lü, Y., Zhang, J., Lu, N., Jiang, W. and Fu, B. (2023). Adapting ecosystem restoration for sustainable development in a changing world. *The Innovation*, 4(1), p.100375.
10. Adiyono, S., Arifin, M., Latifah, N. and Darmanto, E. (2025). Artificial intelligence in integrated marine observing systems: a comprehensive review. *International Journal of Marine Engineering Innovation and Research*, 10(1), pp. 155–164. doi: 10.12962/j25481479.v10i1.4754.
11. Phillips, G.A.C., Krueck, N., Ogier, E., Barrett, N., Dutton, I. and Hartmann, K. (2023). Assessing the multiple benefits of partially protected marine protected areas in Australia: A systematic review protocol. *PLOS ONE*. doi: 10.1371/journal.pone.0284711.
12. Rahmadyani, R.F., Dargusch, P. and Adrianto, L. (2023). Assessment of stakeholder's perceptions of the value of coral reef ecosystem services: the case of Gili Matra Marine Tourism Park. *International Journal of Environmental Research and Public Health*, 20(1), 89. <https://doi.org/10.3390/ijerph20010089>.

13. Herrera-Silveira, J.A., Pech-Cardenas, M.A., Morales-Ojeda, S.M., Cinco-Castro, S., Camacho-Rico, A., Caamal Sosa, J.P., Mendoza-Martinez, J.E., Pech-Poot, E.Y., Montero, J. and Teutli-Hernandez, C. (2020). Blue carbon of Mexico, carbon stocks and fluxes: a systematic review. *PeerJ*.
14. Ybanez Jr., C.O. and Gonzales, R.C. (2023). Challenges and progress of grouper aquaculture in Asia: A review. *Davao Research Journal*, 14(2), 6–29. <https://doi.org/10.59120/drj.v14i2.109>.
15. Bruno, J.F., Côté, I.M. and Toth, L.T. (2019). Climate change, coral loss, and the curious case of the parrotfish paradigm: Why don't marine protected areas improve reef resilience? *Annual Review of Marine Science*, 11, pp.307–334. doi: 10.1146/annurev-marine-010318-095300.
16. Henriksson, S., Jorde, P.E., Berkström, C., Søvik, G., De Wit, P., Knutsen, H., Moland, E., André, C. and Jahnke, M. (2024). Connectivity and population structure in a marginal sea – a review. *Diversity and Distributions*. doi: 10.1111/ddi.70056.
17. van Woesik, R., Shlesinger, T., Grottoli, A.G., Toonen, R.J., Vega Thurber, R., Warner, M.E., Hulver, A.M., Chapron, L. and McLachlan, R.H. (2022). Coral-bleaching responses to climate change across biological scales. *Global Change Biology*. doi: 10.1111/gcb.16192.
18. Koschinski, S., Owen, K., Lehnert, K. and Kamińska, K. (2024). Current species protection does not serve its porpoise – Knowledge gaps on the impact of pressures on the Critically Endangered Baltic Proper harbour porpoise population, and future recommendations for its protection. *Ecology and Evolution*. doi: 10.1002/ece3.70156.
19. Beger, M., Metaxas, A., Balbar, A.C., Kuempel, C.D., Treml, E.A. and Possingham, H.P. (2022). Demystifying ecological connectivity for actionable spatial conservation planning. *Trends in Ecology & Evolution*, 37(12), pp.1079–1091.
20. Giakoumi, S., Scianna, C., Plass-Johnson, J., Micheli, F., Grorud-Colvert, K., Thiriet, P., Claudet, J., Di Carlo, G., Di Franco, A., Gaines, S.D., García-Charton, J.A., Lubchenco, J., Reimer, J., Sala, E. and Guidetti, P. (2017). Ecological effects of full and partial protection in the crowded Mediterranean Sea: a regional meta-analysis. *Scientific Reports*, 7, Article number: 8940. doi: 10.1038/s41598-017-08850-w.
21. Ginzburg, A.I., Kostianoy, A.G., Gholamalifard, M., Koibakova, S.E. and Syrlybekkyzy, S. (2024). Ecologically and biologically significant marine protected areas in the Caspian Sea: a review. *Ecologica Montenegrina*, 76, pp.85–115. <https://doi.org/10.37828/em.2024.76.6>.
22. Nirzalin, Chalid, I. and Febriandi, Y. (2018). Economic development and access to fish resources: A review sociology on fisherman's production access in Kuala Langsa, Aceh. *Proceedings of MICoMS 2017*.
23. Harvey, B.J., Nash, K.L., Blanchard, J.L. and Edwards, D.P. (2018). Ecosystem-based management of coral reefs under climate change. *Ecology and Evolution*. doi: 10.1002/ece3.4146.
24. Isbell, F., Balvanera, P., Mori, A.S., He, J.-S., Bullock, J.M., Regmi, G.R., Seabloom, E.W., Ferrier, S., Sala, O.E. and Guerrero-Ramirez, N.R. (2022). Expert perspectives on global biodiversity loss and its drivers and impacts on people. *Frontiers in Ecology and the Environment*, 21(2), pp.94–103. doi: 10.1002/fee.2536.

25. Cobb, G., Nalau, J. and Chauvenet, A.L.M. (2024). Global trends in geospatial conservation planning: a review of priorities and missing dimensions. *Frontiers in Ecology and Evolution*, 11, Article 1209620. doi: 10.3389/fevo.2023.1209620.
26. Meehan, M.C., Ban, N.C., Devillers, R., Singh, G.G. and Claudet, J. (2020). How far have we come? A review of MPA network performance indicators in reaching qualitative elements of Aichi Target 11. *Conservation Letters*, 13(6), e12746. doi: 10.1111/conl.12746.
27. Lloret, J., García-de-Vinuesa, A. and Demestre, M. (2024). How human health and well-being depends on healthy marine habitats in the Mediterranean: A review. *Conservation Biology*, 10(2), e24329. doi: 10.1111/cobi.24329.
28. Guo, X., Liu, Y., Xie, T., Li, Y., Liu, H. and Wang, Q. (2025). Impact of ecological restoration on carbon sink function in coastal wetlands: a review. *Water*, 17(4), p.488. <https://doi.org/10.3390/w17040488>.
29. Miatta, M., Bates, A.E. and Snelgrove, P.V.R. (2021). Incorporating biological traits into conservation strategies. *Annual Review of Marine Science*, 13, pp.421–443. doi: 10.1146/annurev-marine-032320-094121.
30. Parsons, M., Taylor, L. and Crease, R. (2021). Indigenous environmental justice within marine ecosystems: A systematic review of the literature on Indigenous Peoples' involvement in marine governance and management. *Sustainability*, 13(8), p.4217. doi: 10.3390/su13084217.
31. Lincoln, S., Chowdhury, P., Posen, P.E., Robin, R.S., Ramachandran, P., Ajith, N., Harrod, O., Hoehn, D., Harrod, R. and Townhill, B.L. (2023). Interaction of climate change and marine pollution in Southern India: Implications for coastal zone management practices and policies. *Science of The Total Environment*, 902, p.166061. doi: 10.1016/j.scitotenv.2023.166061.
32. Arneth, A., Leadley, P., Claudet, J., Coll, M., Rondinini, C., Rounsevell, M.D.A., Shin, Y.-J., Alexander, P. and Fuchs, R. (2023). Making protected areas effective for biodiversity, climate and food. *Global Change Biology*. doi: 10.1111/gcb.16664.
33. Kennish, M.J. (2022). Management strategies to mitigate anthropogenic impacts in estuarine and coastal marine environments: A review. *Open Journal of Ecology*, 12(10), pp.338–355. doi: 10.4236/oje.2022.1210038.
34. Utami, W., Sugiyanto, C. and Rahardjo, N. (2024). Mangrove area degradation and management strategies in Indonesia: A review. *Journal of Degraded and Mining Lands Management (Malang, Indonesia)*, 11(3), pp. 6037–6047. doi: 10.15243/jdmlm.2024.113.6037.
35. Moussa, L.G., Mohan, M., Burmeister, N., King, S.A.L., Burt, J.A., Rog, S.M., Watt, M.S., Udagedara, S., Sujud, L. and Montenegro, J.F. (2024). Mangrove ecotourism along the coasts of the Gulf Cooperation Council countries: A systematic review. *Land*, 13(9), p.1351. <https://doi.org/10.3390/land13091351>.
36. Grip, K. and Blomqvist, S. (2020). Marine nature conservation and conflicts with fisheries. *Ambio*, 49, pp.1328–1340. doi: 10.1007/s13280-019-01279-7.
37. Taufiqurrahman, E., Prayitno, H.B., Ibrahim, P.S., Ratnawati, H.I. and Maslukah, L. (2023). Marine protected area management under the impacts of climate change and increased human

- activities in marine ecosystems: A review for Anambas Islands MPA. IOP Conference Series: *Earth and Environmental Science*, p.1163, 012022. doi: 10.1088/1755-1315/1163/1/012022.
38. Hernández Guzmán, D., Lastra Mier, R., Vergara, A. and Milanés, C.B. (2023). Marine protected areas in Colombia: A historical review of legal marine protection since the late 1960s to 2023. *Marine Policy*, 155, p.105726. doi: 10.1016/j.marpol.2023.105726.
 39. Schmidt, D.N., Pieraccini, M. and Evans, L. (2022). Marine protected areas in the context of climate change: key challenges for coastal social-ecological systems. *Philosophical Transactions of the Royal Society B: Biological Sciences*. doi: 10.1098/rstb.2021.0131.
 40. Duggan, J., Cvitanovic, C. and van Putten, I. (2023). Measuring sense of place in social-ecological systems: a review of literature and future research needs. *Social-Ecological Systems*. doi: 10.1080/26395916.2022.2162968.
 41. Innes, J., Pascoe, S., Wilcox, C., Jennings, S. and Paredes, S. (2015). Mitigating undesirable impacts in the marine environment: A review of market-based management measures. *Frontiers in Marine Science*, 2, Article 76. <https://doi.org/10.3389/fmars.2015.00076>.
 42. Fulton, E.A., Bax, N.J., Bustamante, R.H., Dambacher, J.M., Dichmont, C., Dunstan, P.K., Hayes, K.R., Hobday, A.J., Pitcher, R., Plagányi, É.E., Punt, A.E., Savina-Rolland, M., Smith, A.D.M. and Smith, D.C. (2015). Modelling marine protected areas: insights and hurdles. *Philosophical Transactions of the Royal Society B: Biological Sciences*, published 5 November. doi: 10.1098/rstb.2014.0278.
 43. Frisch, A.J. and Rizzari, J.R. (2019). Parks for sharks: human exclusion areas outperform no-take marine reserves. *Frontiers in Ecology and the Environment*, first published 31 January. doi: 10.1002/fee.2003.
 44. Teneva, L. (2016). Peer Review #1 of 'Artificial reefs and marine protected areas: a study in willingness to pay to access Folkestone Marine Reserve, Barbados, West Indies (v0.1)'. *PeerJ*. doi: 10.7287/peerj.2175v0.1/reviews/1.
 45. Anonymous Reviewer (2018). Peer Review #1 of 'Long-term evolution of preferences for conservation projects in the Seto Inland Sea, Japan: a comprehensive analytic framework (v0.1)'. *PeerJ*. doi: 10.7287/peerj.5366v0.1/reviews/1.
 46. White, J.W. (2015). Peer Review #1 of 'Pathways from marine protected area design and management to ecological success (v0.2)'. *PeerJ*. doi: 10.7287/peerj.1424v0.2/reviews/1.
 47. Anonymous Reviewer (2020). Peer Review #1 of 'The Aichi Biodiversity Targets: achievements for marine conservation and priorities beyond 2020 (v0.1)'. *PeerJ*. doi: 10.7287/peerj.9743v0.1/reviews/1.
 48. O'Connor, R.J., Spalding, A.K., Bowers, A.W. and Ardoin, N.M. (2024). Power and participation: A systematic review of marine protected area engagement through participatory science methods. *Marine Policy*, 163, 106133. doi: 10.1016/j.marpol.2024.106133.
 49. Valente Monteiro, C., Dal Cin, F., Lage, L. and Barreiros Proença, S. (2025). Preserving coastal heritage: A review of climate adaptation strategies on Ilha de Moçambique (Mozambique). *Land*, 14(9), 1917. <https://doi.org/10.3390/land14091917>.

50. Irvani, R., Biagi, M., Laforest, S., Lee, K., Isaacman, L., Chen, Z. and An, C. (2025). Protecting shorelines in Canadian Indigenous communities: Environmental challenges, policy interventions, and mitigation technologies. *Marine Pollution Bulletin*, 219, 118310. doi: 10.1016/j.marpolbul.2025.118310.
51. Cinti, A., Ramirez, L., Castrejón, M., Aburto, J.A., Loto, L., Fulton, S., Rueda, M., Schiavetti, A., Fernández-Rivera Melo, F.J., Bravo, M., Trigueirinho Alarcon, D., Penchel Araújo, V. and Parma, A.M. (2024). Small-scale fisheries in ecologically sensitive areas in Latin America and the Caribbean: Do marine protected areas benefit fisheries governance? *Ambio*, vol. 54, pp.20–42. doi: 10.1007/s13280-024-01987-3.
52. Queirós, A.M., Huebert, K.B., Keyl, F., Fernandes, J.A., Stolte, W., Maar, M., Kay, S., Jones, M.C., Hamon, K.G., Hendriksen, G. and Vermard, Y. (2016). Solutions for ecosystem-level protection of ocean systems under climate change. *Global Change Biology*, first published 11 July. doi: 10.1111/gcb.13423.
53. Tan, J.S.D. and Fischer, A.M. (2022). Suggestions for marine protected area management in Australia: a review of temperature trends and management plans. *Regional Environmental Change*, 22, article number 92. doi: 10.1007/s10113-022-01992-6.
54. Roy, J., Prakash, A., Some, S., Singh, C., Bezner Kerr, R., Caretta, M.A., Conde, C., Rivera Ferre, M., Schuster-Wallace, C., Tirado-von der Pahlen, M.C., Totin, E., Vij, S., Baker, E., Dean, G., Hillenbrand, E., Irvine, A., Islam, F., McGlade, K., Nyantakyi-Frimpong, H., Ravera, F., Segnon, A., Solomon, D. and Tandon, I. (2022). Synergies and trade-offs between climate change adaptation options and gender equality: a review of the global literature. *Humanities and Social Sciences Communications*, 9, article number 251. doi: 10.1057/s41599-022-01251-6.
55. Phillips, G.A.C., Ogier, E., Dutton, I., Barrett, N., Krueck, N.C. and Hartmann, K. (2025). The ambiguous role of partially protected marine protected areas in Australia: Results from a systematic literature review. *PLOS ONE*, published 7 January. doi: 10.1371/journal.pone.0307324.
56. Prihantoro, A.N., Anggoro, S. and Muhammad, F. (2019). The changes of mangrove area in Pati Regency of the Year 2011–2015 and their impact analysis: A literature review. *E3S Web of Conferences*, vol. 125, article 01018. doi: 10.1051/e3sconf/201912501018.
57. Fleming, E., Noel-Storr, A., Macura, B., Gartlehner, G., Thomas, J., Meerpohl, J.J., Jordan, Z., Minx, J., Eisele-Metzger, A., Hamel, C., Jemifó, P., Porritt, K. and Grainger, M. (2025). Position statement on artificial intelligence (AI) use in evidence synthesis across Cochrane, the Campbell Collaboration, JBI and the Collaboration for Environmental Evidence 2025. *Environmental Evidence*, 14, article 20. Published 31 October.
58. Wishanesta, I.K.D., Saskara, I.A.N., Purbadharmaja, I.B.P. and Suasih, N.N.R. (2024). The development of potential blue economy activities in the marine protected area: A literature review'. *Technium Sustainability*, 5. doi: 10.47577/sustainability.v5i.10956.
59. Molteni, C. (2021). Una revisión sistemática sobre el impacto del COVID-19 en áreas protegidas. *Revista Kawsaypacha: Sociedad y Medio Ambiente*, (8), pp.81–100. doi: 10.18800/kawsaypacha.202102.004.

60. Lee, S., Hall, G. and Trench, C. (2022). The role of Nature-based Solutions in disaster resilience in coastal Jamaica: current and potential applications for 'building back better'. *Disasters*, first published 3 May. doi: 10.1111/disa.12539.
61. Anderson, L.G., Roccliffe, S., Haddaway, N.R. and Dunn, A.M. (2015). The role of tourism and recreation in the spread of non-native species: A systematic review and meta-analysis. *PLOS ONE*, published 20 October. doi: 10.1371/journal.pone.0140833.
62. Appolloni, L., Buonocore, E., Russo, G.F. and Franzese, P.P. (2020). The use of remote sensing for monitoring *Posidonia oceanica* and Marine Protected Areas: A systemic review. *Ecological Questions*, 31(2), pp.7-17. doi: 10.12775/EQ.2020.009.
63. Kroon, F.J., Thorburn, P., Schaffelke, B. and Whitten, S. (2016). Towards protecting the Great Barrier Reef from land-based pollution. *Global Change Biology*, first published 29 February. doi: 10.1111/gcb.13262.
64. Cameron, R.P. (2022). Twenty years of ecological research in Nova Scotia wilderness areas and nature reserves: A review of studies, 2002 to 2022. *Proceedings of the Nova Scotian Institute of Science*, 52(2). doi: 10.15273/pnsis.v52i2.11497.
65. Marty-Gastaldi, J., Lazaric, N. and Dérijard, B. (2025). Urban Marine Protected Areas (MPAs): A systematic review of governance, management and human impact. *Ocean & Coastal Management*, 269, article 107811. doi: 10.1016/j.ocecoaman.2025.107811.
66. McLeod, E., Shaver, E.C., Beger, M., Koss, J. and Grimsditch, G. (2021). Using resilience assessments to inform the management and conservation of coral reef ecosystems. *Journal of Environmental Management*, p.277, article 111384. doi: 10.1016/j.jenvman.2020.111384.
67. Raabe, N.L., King, T.J., Cardilini, A.P.A., Miller, K.K. and Borrie, W.T. (2024). Who asked you? A systematic review exploring the origin of primary research into attitudes to marine protected areas in Australia. *Marine Policy*, p.165, article 106215. doi: 10.1016/j.marpol.2024.106215.
68. Fox, H.K. and Swearingen, T.C. (2021). Using a difference-in-differences and synthetic control approach to investigate the socioeconomic impacts of Oregon's marine reserves. *Ocean & Coastal Management*, p.215, article 105965. doi: 10.1016/j.ocecoaman.2021.105965.
69. Di Cintio, A., Fernandes-Salvador, J.A., Puntilla-Dodd, R., Granado, I., Niccolini, F. and Bulleri, F. (2024). Socio-economic factors boosting the effectiveness of marine protected areas: A Bayesian network analysis. *Ecological Informatics*, 84, 102879.
70. IUCN, GIZ, GRID-Arendal and UNEP (2017). *Blue solutions from Latin America and the Wider Caribbean: Regional forum on solutions for oceans, coasts and human well-being in Latin America and the Wider Caribbean* (Call no. IUCN-2015-042, 2nd ed.). [Online]. Available at: <https://portals.iucn.org/library/sites/library/files/documents/2015-042-2nd%20ed.pdf>.
71. IUCN, GIZ, GRID-Arendal and UNEP (2016). *Blue Solutions from Africa: Regional Forum on Solutions for Oceans, Coasts and Human Well-Being in Africa* (Call no. IUCN-2016-075). [Online]. Available at: <https://portals.iucn.org/library/sites/library/files/documents/2016-075.pdf>.
72. Costello, M.J. (2024). Evidence of economic benefits from marine protected areas. *Scientia Marina*, 88(1), e080. doi: 10.3989/scimar.05417.080.

73. Rodwell, L.D., Gallacher, J., Simmonds, N., Fellowes, H., Brown, N., Gill, N., Clark, W. and Biggs, C. (2016). Evaluating the success of a marine protected area: a systematic review approach. *Journal of Environmental Management*, 183, pp.280–293. doi: 10.1016/j.jenvman.2016.08.029.
74. Di Cintio, A., Niccolini, F., Scipioni, S. and Bulleri, F. (2023). Avoiding 'Paper Parks': A Global Literature Review on Socioeconomic Factors Underpinning the Effectiveness of Marine Protected Areas'. *Sustainability*, 15(5), 4464. doi: 10.3390/su15054464.
75. MacKeracher, T., Diedrich, A. and Simpfendorfer, C.A. (2018). Sharks, rays and marine protected areas: a critical evaluation of current perspectives. *Fish and Fisheries*, 20(2), pp.255–267. doi: 10.1111/faf.12337.
76. Fox, H.E., Holtzman, J.L., Haisfield, K.M., McNally, C.G., Cid, G.A., Mascia, M.B., Parks, J.E. and Pomeroy, R.S. (2014). How are our MPAs Doing? Challenges in assessing global patterns in Marine Protected Area performance. *Coastal Management*, 42(3), pp.207–226. doi: 10.1080/08920753.2014.904178.
77. 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; WWF.
78. Albers, H.J. and Ashworth, M.F. (2022). Economics of marine protected areas: Assessing the literature for marine protected area network expansions. *Annual Review of Resource Economics*, 14(1), pp.533–554. doi: 10.1146/annurev-resource-111820-024652.
79. Maxwell, S.L., Cazalis, V., Dudley, N., Hoffmann, M., Rodrigues, A.S.L., Stolton, S., Visconti, P., Woodley, S., Kingston, N., Lewis, E., Maron, M., Strassburg, B.B.N., Wenger, A., Jonas, H.D., Venter, O. and Watson, J.E.M. (2020). Area-based conservation in the twenty-first century. *Nature*, 586(7828), pp.217–227. doi: 10.1038/s41586-020-2773-z.
80. United Nations Development Programme (UNDP), Secretariat of the Convention on Biological Diversity (SCBD) and UN Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC) (2021). *Creating a Nature-Positive Future: The contribution of protected areas and other effective area-based conservation measures*. UNDP, New York.
81. Roberts, C.M. and Hawkins, J.P. (2000). *Fully-protected marine reserves: a guide*. WWF Endangered Seas Campaign, Washington, DC, USA & Environment Department, University of York, UK.
82. Department for Environment and Water (South Australia) (2024). *Science shows marine park benefits: Scientific studies of ecological improvements* [PDF]. Adelaide. Available at: <https://cdn.environment.sa.gov.au/marineparks/docs/mp-fact-scienceshowsmplibenefits.pdf>.
83. Reuchlin-Hughenoltz, E. and McKenzie, E. (2015). *Marine protected areas: Smart investments in Ocean Health*. WWF – World Wide Fund for Nature, Gland, Switzerland. ISBN 978-2-940529-21-6.
84. McDonald, G.J., Bone, J., Costello, C., Englander, G. and Raynor, J. (2024). Global expansion of marine protected areas and the redistribution of fishing effort. *Proceedings of the National*

Academy of Sciences of the United States of America, 121(29), e2400592121. doi: 10.1073/pnas.2400592121.

85. Waldron, A., Adams, V., Allan, J., Arnell, A., Asner, G., Atkinson, S., ... Woodley, S. (2020). *Protecting 30% of the planet for nature: Costs, benefits and economic implications*. Campaign for Nature / University of Cambridge.
86. Gratcheva, E.M., Gurhy, B., Emery, T., Wang, D., Oganés, L., Linzie, J.K., Harvey, L., Marney, K., Murray, J. and Rink, R. (2021). *A New Dawn: Rethinking Sovereign ESG*. Equitable Growth, Finance & Institutions Insight; The World Bank, Washington, DC.
87. Department of Agriculture – Bureau of Fisheries and Aquatic Resources & The World Bank (2021). *Appraisal Environmental and Social Review Summary (ESRS) – Fisheries and Coastal Resiliency Project (P174137)*. The World Bank, Washington, DC. Available at: <https://documents1.worldbank.org/curated/en/457661634092504214/pdf/Appraisal-Environmental-and-Social-Review-Summary-ESRS-Fisheries-and-Coastal-Resiliency-Project-P174137.pdf>.
88. The World Bank (2021). *Appraisal Environmental and Social Review Summary (ESRS) – Madagascar Economic Transformation for Inclusive Growth (P174684)*. The World Bank, Washington, DC. Available at: <https://documents1.worldbank.org/curated/en/379851619974292452/pdf/Appraisal-Environmental-and-Social-Review-Summary-ESRS-Madagascar-Economic-Transformation-for-Inclusive-Growth-P174684.pdf>.
89. The World Bank (2021). *Appraisal Environmental and Social Review Summary (ESRS) – Northern Mozambique Rural Resilience Project (P174635)*. The World Bank, Washington, DC. Available at: <https://documents1.worldbank.org/curated/en/856301620913930236/pdf/Appraisal-Environmental-and-Social-Review-Summary-ESRS-Northern-Mozambique-Rural-Resilience-Project-P174635.pdf>.
90. World Bank (2021). *Banking on Protected Areas: Promoting Sustainable Protected Area Tourism to Benefit Local Economies*. Washington, DC: World Bank.
91. The World Bank (2021). *Concept Environmental and Social Review Summary (ESRS) – Indonesia Inclusive Livelihoods for Poor Rural Communities in Eastern Indonesia Project (P174902)*. Washington, DC: World Bank. Available at: <https://documents1.worldbank.org/curated/en/726621618855655397/pdf/Concept-Environmental-and-Social-Review-Summary-ESRS-Indonesia-Inclusive-Livelihoods-for-Poor-Rural-Communities-in-Eastern-Indonesia-Project-P174902.pdf>.
92. The World Bank (2021). *Concept Environmental and Social Review Summary (ESRS) – Senegal: Natural Resources Management Project (P175915)*. The World Bank, Washington, DC.
93. The World Bank (2021). *Enhancing the Resilience of the Wildlife Sector through Collaborative Management Partnerships (CMPs) in Kenya's Protected Areas: Policy Brief*. Washington, DC: World Bank. Available at: <https://documents.worldbank.org/curated/en/681531625820426858/pdf/Enhancing-the-Resilience-of-the-Wildlife-Sector-through-Collaborative-Management-Partnerships-CMPs-in-Kenya's-Protected-Areas-Policy-Brief.pdf>.

94. WWF, Global Canopy and The World Bank (2022). *Geospatial ESG: The emerging application of geospatial data for gaining 'environmental' insights on the asset, corporate and sovereign level*. WWF-UK, Cambridge, UK; Global Canopy; The World Bank, Washington, DC.
95. Dasgupta, S., Blankespoor, B. and Wheeler, D. (2025). *Implementing 30x30: Lessons from Country Case Studies*. World Bank Policy Research Working Paper 11045. Washington, DC: The World Bank.
96. McDonald, G.J., Bone, J., Costello, C., Englander, G. and Raynor, J. (2024). Global expansion of marine protected areas and the redistribution of fishing effort. *Proceedings of the National Academy of Sciences of the United States of America*, 121(29), e2400592121. doi: 10.1073/pnas.2400592121.
97. Department of Blue Economy, Ministry of Fisheries and Blue Economy, Republic of Seychelles (2024). *Social Impact Assessment of the Sustainable-Use Marine Protected Areas: Third South West Indian Ocean Fisheries Governance and Shared Growth Project (SWIOFish3) – P1556642*. Victoria, Seychelles: Department of Blue Economy. Available at: https://mofbe.gov.sc/wp-content/uploads/2024/10/Social-Impact-Assessment-of-the-Sustainable-Use-MPAs_Final-report.pdf.
98. World Bank (2023). *Pioneering Marine Spatial Planning in Morocco: An Opportunity to Articulate Conservation and Development*. Washington, DC: The World Bank. Available at: <https://documents1.worldbank.org/curated/en/099050923180032112/pdf/P1705960f6f7330c20989b048129a56d95d.pdf>.
99. Zhu, H., Gupta, A., Earley, E., Narain, U., Diez, S.M., Lange, B., Bhammar, H., Spencer, P., Young, C.E.F., Batista, A.K., Freitas, C.R., Whitney, E., and Taylor, J.E. (2021). *Assessing the Economic Impact of Protected Area Tourism on Local Economies in Brazil* (Report No. P1710440f20d2d082084d000647b3726049). Washington, DC: The World Bank. Available at: <https://documents.worldbank.org/curated/en/099130106152239807/pdf/>.
100. World Bank (2022). *Marine Protected Areas: Development Aid Impacts and Governance (Synthesis 1)*. Washington, DC: World Bank.
101. World Bank (2022). *Marine Protected Areas: Effectiveness, Livelihoods, and Governance (Synthesis 2)*. Washington, DC: World Bank.
102. The World Bank (2024). *The Changing Wealth of Nations 2021: Building Coastal Resilience with Mangroves – The Contribution of Natural Flood Defenses to the Changing Wealth of Nations* (Technical Report). Washington, DC: International Bank for Reconstruction and Development / The World Bank.
103. World Bank (2025). *Developing a National Marine Spatial Planning Framework for Thailand's Sustainable and Resilient Blue Economy: Summary Report* (Report No. P179593-3e76d6b9-4d12-4947-a78c-853a7d4a6ebb). Washington, DC: World Bank.
104. The World Bank (2024). *Blue Carbon in the Middle East and North Africa (MENA)* (Technical Report No. P1807561e6026405818328119895ebffc74). Washington, DC: The World Bank.
105. The World Bank (2021). *PROBLUE – Climate-Informed Marine Spatial Planning: Supporting Mitigation and Resilience*. Knowledge Factsheet Series #2, Integrated Seascape Management.

- Washington, DC. Available at:
<https://documents1.worldbank.org/curated/en/448511636704037044/pdf/PROBLUE-Climate-Informed-Marine-Spatial-Planning-Supporting-Mitigation-and-Resilience.pdf>.
106. Global Wildlife Program (2021). *The Global Wildlife Program Knowledge Platform 2020*. Washington, DC: World Bank. Available at:
<https://thedocs.worldbank.org/en/doc/24805f3c02de835dcd8bc642f95952b5-0320072021/original/GWP-Annual-Report-2020-low-res.pdf>.
 107. Siegel, P., Diop, M., Tall, A., Fox, A. and Jolley, J. (2015). *Mid-Term Performance Evaluation of the Collaborative Management of a Sustainable Fisheries Future in Senegal (USAID/COMFISH)*. USAID/Senegal & The Cadmus Group, Inc., March. Available at:
<https://www.climatelinks.org/sites/default/files/asset/document/Senegal%20-%20Mid-term%20Performance%20Evaluation%20of%20COMFISH%202015.pdf>.
 108. USAID/Indonesia (2023). *Final Performance Evaluation of the Marine Resources Program (MRP) – Enhancing Management Capacity* (Report No. PA00KXPG). Washington, DC: United States Agency for International Development.
 109. USAID/Philippines (2016). *Mid-term Performance Evaluation of the Ecosystem Improved for Sustainable Fisheries (ECOFISH) Project* (Report No. PA00MFG2). Washington, DC: United States Agency for International Development.
 110. United States Agency for International Development (USAID) (2021). *Marine Tenure and Small-Scale Fisheries: A Priority for Development Programming* (Report No. PA00MVXZ). Washington, DC: USAID.
 111. United States Agency for International Development (USAID) (2017). *Caribbean Marine Biodiversity Program: Gender Assessment & Action Plan* (Report No. PA00SSJP). Washington, DC: USAID.
 112. United States Agency for International Development (USAID) (2023). *Final Performance Evaluation of the Ecosystem Improved for Sustainable Fisheries (ECOFISH) Project – Philippines* (Report No. PA00N2DS). Washington, DC: USAID.
 113. United States Agency for International Development (USAID) (2017). *Caribbean Marine Biodiversity Program: Gender Assessment & Action Plan* (Report No. PA00SSJP). Washington, DC: USAID.
 114. United States Agency for International Development (USAID) (n.d.). *Consolidated Socio-economic Assessment* (Report No. PA00SSJQ). Washington, DC: USAID.
 115. United States Agency for International Development (USAID) (2024). *User Fees and the Sustainable Use of Marine Resources: Saint Vincent and the Grenadines* (Report No. PA00SSJV). Washington, DC: USAID.
 116. United States Agency for International Development (USAID) (2024). *User Fees and the Sustainable Use of Marine Resources: Grenada* (Report No. PA00SSJX). Washington, DC: USAID.
 117. Courtney, C.A., Pomeroy, R., De Alessi, M., Adhuri, D., Yuni, C. and Halim, A. (2017). *Marine tenure and small-scale fisheries: Learning from the Indonesia experience*. Tenure and Global

- Climate Change Program & USAID Indonesia Sustainable Ecosystems Advanced Project.
Washington, DC: USAID.
118. Courtney, C.A., Jhaveri, N.J., Pomeroy, R. and Brooks, S.H. (2017). *Marine tenure and small-scale fisheries: Learning from the Philippines experience*. Washington, DC: United States Agency for International Development.
 119. United States Agency for International Development (USAID) (2024). *Harnessing Markets to Secure a Future for Nearshore Fishers* (Report No. PA00T5T6). Washington, DC: USAID.
 120. United States Agency for International Development (USAID) (2013). *Restoring Coral Reefs in the Face of Climate Change in the Seychelles: An Ecosystem-based Adaptation Approach* (Case Study No. PA00TD3Z). Washington, DC: USAID.
 121. University of Rhode Island (Coastal Resources Center) / United States Agency for International Development (USAID) (2016). *USAID/COMFISH Project Final Performance Report – Senegal (February 11, 2011 to September 30, 2016)* (Report No. PA00TGTJ). Washington, DC: USAID.
 122. Tarrant, J.J. (lead author) (2019). *A Retrospective of the USAID/Indonesia Environment and Natural Resources Management Program: Reflections on 30 Years of Experience and Prospects for the Future* (Report No. PA00TSQ9). Washington, DC: United States Agency for International Development.
 123. United States Agency for International Development (USAID) (2023). *Simple Carrying Capacity Analysis of the P. Rao – Tanjung Dehegila Proposed Marine Protected Area* (Report No. PA00WHVJ). Washington, DC: USAID.
 124. United States Agency for International Development (USAID) (2020). *West Africa Biodiversity and Climate Change (WA BiCC) Program Final Report* (Report No. PA00WJMX). Washington, DC: USAID.
 125. United States Agency for International Development (USAID) (2023). *USAID Sustainable Ecosystems Advanced (USAID SEA) Project: Gender Assessment Report* (Report No. PA00WQ97). Washington, DC: USAID.
 126. Courtney, C.A., Pomeroy, R., De Alessi, M., Adhuri, D., Yuni, C. and Halim, A. (2017). *Evaluation Tool for Marine Protected Areas and Marine Protected Area Network Design in Indonesia* (Report No. PA00WQ9C). Washington, DC: United States Agency for International Development.
 127. United States Agency for International Development (USAID) (2024). *Private Sector Contribution to Marine Protected Areas in Indonesia* (Report No. PA00WQ9J). Washington, DC: USAID.
 128. United States Agency for International Development (USAID) (2021). *The Blue Guide to Coastal Resilience: Protecting coastal communities through nature-based solutions* (Report No. PA00X87M). Washington, DC: USAID.
 129. United States Agency for International Development (USAID) (2024). *Workshop on Monitoring & Evaluation in Marine Protected Areas: Indonesia Experience* (Report No. PA00X8S2). Washington, DC: USAID.

130. United States Agency for International Development (USAID) (n.d.). *Establishing an MPA Network and Advancing Sustainable Fisheries in North Maluku* (Report No. PA00X9RS). Washington, DC: USAID.
131. United States Agency for International Development (USAID) (2024). *Economic Rate of Return Analysis as an Economic Planning Tool for Marine Protected Areas in Indonesia* (Report No. PA00XBR7). Washington, DC: USAID.
132. Ministry of Marine Affairs and Fisheries (MMAF), Republic of Indonesia & United States Agency for International Development (USAID) Sustainable Ecosystems Advanced (SEA) Project (2021). *Sustaining Indonesia's Marine Environment: Lessons Learned from the USAID Sustainable Ecosystems Advanced Project* (Report No. PA00XBS5). Jakarta: MMAF & USAID SEA Project.
133. Green, A.L., Fajariyanto, Y., Lionata, H., Ramadyan, F., Tighe, S., White, A., Gunawan, T., Rudyanto and Minarputi, N. (2020). *A Guide, Framework and Example: Designing Marine Protected Areas and Marine Protected Area Networks to Benefit People and Nature in Indonesia*. Jakarta: The Nature Conservancy / USAID Sustainable Ecosystems Advanced Project.
134. Courtney, C.A., Pomeroy, R., De Alessi, M., Adhuri, D., Yuni, C. and Halim, A. (2017). *Socio-Economic Status of 16 Marine Protected Areas in Indonesia* (Report No. PA00XCNX). Washington, DC: United States Agency for International Development.
135. United States Agency for International Development (USAID) (2020). *Misool Marine Reserve, Raja Ampat: Conservation and Socio-Economic Assessment* (Report No. PA00XXGT). Washington, DC: USAID.
136. United States Agency for International Development (USAID) (2022). *Shellfisheries in West Africa: Spotlighting Women-Led Fisheries Livelihoods* (Report No. PA00Z67C). Washington, DC: USAID.
137. United States Agency for International Development (USAID) (2022). *Indo-Pacific Strategy (IPS) Natural Resources and Sustainable Services (NRSS) FY 2021 Annual Report* (Report No. PA00ZK4J). Washington, DC: USAID.
138. United States Agency for International Development (USAID) (2022). *HAY TAO Activity Final Report, Madagascar* (Report No. PA0211VT). Washington, DC: USAID.
139. United States Agency for International Development (USAID) (2022). *Integrated Marine Ecosystem Management (IMEM) Learning Evaluation* (Report No. PA021C41). Washington, DC: USAID.
140. United States Agency for International Development (USAID) (2021). *Marine Protected Areas Governance Program (MPAG) Final Report, Indonesia*. Washington, DC: USAID.
141. Horta e Costa, B., de Benito-Abelló, C., Pike, E., Turnbull, J., MacCarthy, J., Harasta, N., Fragkopoulou, E., Roessger, J., Sullivan-Stack, J., Gorraud-Colvert, K., Gill, D., Morgan, L., Gonçalves, E., Zupan, M., Gonçalves, J.M.S. and Claudet, J. (2025). Marine protected areas stage of establishment and level of protection are good predictors of their conservation outcomes. *Current Research in Sustainability*, 2(4), 100345. <https://doi.org/10.1016/j.crsus.2025.100345>.

142. Quan, Y. and Jin, J. (2024). A bibliometric review on marine ecological environment governance: Development and prospects (1990–2022). *Environmental and Sustainability Indicators*, 22, 100406. <https://doi.org/10.1016/j.indic.2024.100406>.
143. Fulton, E.A., Bax, N.J., Bustamante, R.H., Dambacher, J.M., Dichmont, C., Dunstan, P.K., Hayes, K.R., Hobday, A.J., Pitcher, R., Plagányi, É.E., Punt, A.E., Savina-Rolland, M., Smith, A.D.M. and Smith, D.C. (2015). Modelling marine protected areas: insights and hurdles. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 370(1681), 20140278. <https://doi.org/10.1098/rstb.2014.0278>.
144. Convention on Biological Diversity (CBD). (n.d.). Target 3. Kunming-Montreal Global Biodiversity Framework. Available at: <https://www.cbd.int/gbf/targets/3>.
145. Naidoo, R., Gerkey, D., Hole, D., Pfaff, A., Ellis, A.M., Golden, C.D., Herrera, D., Johnson, K., Mulligan, M., Ricketts, T.H. and Fisher, B. (2019). Evaluating the impacts of protected areas on human well-being across the developing world. *Science Advances*, 5(4), eaav3006. <https://doi.org/10.1126/sciadv.aav3006>.
146. Hilborn, R., Fitchett, M., Hampton, J. and Ovando, D. (2024). When does spillover from marine protected areas indicate benefits to fish abundance and catch? *Theoretical Ecology*, 18(1), Article 1. <https://doi.org/10.1007/s12080-024-00567-3>.
147. Medoff, S., Lynham, J. and Raynor, J. (2022). Spillover benefits from the world's largest fully protected MPA. *Science*, 378(6617), pp.313–316. <https://doi.org/10.1126/science.abn0098>.
148. Ovando, D., Caselle, J.E., Costello, C., Deschenes, O., Gaines, S.D., Hilborn, R. and Liu, O. (2021). Assessing the population-level conservation effects of marine protected areas. *Conservation Biology*, 35(4), pp.1284–1294. <https://doi.org/10.1111/cobi.13782>.
149. Hampton, J., Lehodey, P., Senina, I., Nicol, S., Scutt Phillips, J. and Tiamere, K. (2023). Limited conservation efficacy of large-scale marine protected areas for Pacific skipjack and bigeye tunas. *Frontiers in Marine Science*, 9, 1060943. <https://doi.org/10.3389/fmars.2022.1060943>.
150. Cavole, L.M., Gragnolati, M., Matoso Silva, R.V.M., Lopes, P.F.M., Giarrizzo, T. and Reis-Filho, J.A. (2025). Unveiling gender disparities: The role of women in transforming small-scale fisheries. *Fish and Fisheries*. <https://doi.org/10.1111/faf.70023>.
151. Golo, H.K. and Erinasho, B. (2023). Tackling the challenges confronting women in the Elmina fishing community of Ghana: A human rights framework. *Marine Policy*, 147, 105349. <https://doi.org/10.1016/j.marpol.2022.105349>.



Norad