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Management of Marine Protected Areas in Indonesia: Status and Challenges

2020

Management of Marine Protected Areas in Indonesia: Status and Challenges

In Collaboration with Yayasan WWF Indonesia

Management of Marine Protected Areas in Indonesia: Status and Challenges

(***Pengelolaan Kawasan Konservasi Perairan di Indonesia: Status dan Tantangan***)

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Many of the policies and regulations referenced in this report are author translations from Bahasa Indonesia to English when official translations have not been issued by the Government of Indonesia. The authors have attempted to maintain precise meaning during translation which are provided for convenience. Original policies and regulations in Bahasa Indonesia remain the official versions. To simplify the names of Marine Protected Areas in this report, a common name of each MPA is used throughout. The full official name of each MPA, alongside its common name, is listed in Annex 1. The authors are responsible for the choice and the presentation materials in this report and for the opinions expressed therein, which are not necessarily those of Kementerian Kelautan dan Perikanan and Yayasan WWF Indonesia (WWF-Indonesia).

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Foreword

Indonesia's marine protected areas management policy focuses on two main themes, which are, to carry out and ensure sustainable management as well as utilization of conservation areas for the community, especially in coastal and small islands. The latter theme includes sustainable fisheries, ecotourism, and other community-based environmental services aside from its function as a source of germplasm for development of marine and fisheries research. Indonesia's target of 32.5 million ha by 2030 is in accordance with Aichi Target 11, of committing 10% of its national water area to be designated as protected areas, and our government's commitment to SDG 14. Along with its target increase of marine protected areas area extent, one other target in achieving operational and/or sustainable marine protected areas management is expected to provide some significant benefits to the biodiversity in waters surrounding MPAs and adjacent coastal communities.

Preparation of "Management of Marine Protected Areas in Indonesia: Status and Challenges" might be referred to as a reflection upon related activities on management in Indonesia and is expected to provide some answers on MPA management challenges and opportunities in the future. The RPJMN (Rencana Pembangunan Jangka Menengah Nasional/National Medium-Term Development Plan) 2020-2024 has emphasized the importance of sustainable management in MPAs, encouraged global achievement of SDG 14 goals, and Improved food security at the national level. It is hoped that the new MPA area extent will provide a balanced outlook for activities amongst MPA managers in central government, provincial government, and society- especially communities surrounding the marine protected areas.

Based on the status and challenges that have been described in this document, the synergy of activities in achieving these targets, to increase the extent of marine protected areas and operational and sustainable marine protected areas management by the end of 2030, may be optimistically achieved by optimizing marine protected areas management capacity. This needs to be supported by scientific studies, lessons learned, and current experiences that focus on the functions of marine protected areas. By doing these, they can benefit the communities. These will be reflected in policies for marine protected areas management to encourage the sustainable management of marine protected areas.

Finally, I would like to express my appreciation to all those who have contributed to the preparation of this report. I really hope that it can be used as an overview of the existing marine protected areas in Indonesia.

TB Haeru Rahayu

Acting Director General for Marine Spatial Management
Ministry of Marine Affairs and Fisheries
Republic of Indonesia

Foreword

Indonesia's commitments to Aichi Target 11 and Sustainable Development Goal (SDG) 14 are outlined in the management strategy of Indonesia's marine protected areas with a focus on two main activities, which are, to increase the extent of marine protected areas and improve marine protected areas management. The former activity is mainly focused on increasing marine protected areas extent coverage to 32.5 million ha, or 10% of Indonesian waters, by 2030. The latter activity is simultaneously projected to be achieved this year.

The Ministry of Marine Affairs and Fisheries has been delivering various efforts to accomplish these, such as developing and implementing laws and regulations supporting marine protected areas management or providing reward to those regions that implement marine protected areas management and integrate RPJMN (Rencana Pembangunan Jangka Menengah Nasional/National Medium-Term Development Plan) into their regional planning documents. Has established strategies to increase the extent of MPA area and improve MPA management effectiveness. Those strategies are: (a) sharing plans, as an effort to strengthen the planning process in operationalizing marine protected areas management; (b) sharing investments, to reduce the funding gap in management; and (c) sharing responsibilities, to reduce the gap in human resources for marine protected areas implementation. So that, by 2030, 32.5 million ha of marine protected areas do not only exist in the waters, but also they are sustainably managed.

Marine Protected Areas Management in Indonesia: Status and Challenges report is a part of *the MPA Vision framework for 2030*, initiated by MMAF along with a consortium of NGOs (WWF-Indonesia, CTC, WCS-IP, YKAN, CII, RARE). It is intended to review the status and trends of marine protected areas in Indonesia. The document uses a knowledge-based approach in describing the condition of marine protected areas in Indonesia, with four main topics, namely: (1) marine protected areas Governance in Indonesia; (2) marine protected areas Implementation in Indonesia – Progress Towards National and Global Targets; (3) Balancing Biodiversity Conservation and Sustainable Use in marine protected areas; and (4) Building the marine protected areas Network – New Threats and Approaches to Improve marine protected areas Outcomes.

The report provides up-to-date conditions on the achievement of marine protected areas management targets in Indonesia. Furthermore, it encourages marine protected areas management practitioners in Indonesia with a reliable and focused view for achieving Indonesia's targets.

Andi Rusandi

Director for Marine Conservation and Biodiversity
Directorate General of Marine Spatial Management
Ministry of Marine Affairs and Fisheries
Republic of Indonesia

Foreword

The management of coastal and marine habitats through the establishment of marine protected areas is not a new endeavor. In fact, the Government of Indonesia (GoI) has been establishing MPAs for decades, with a current target of 32.5 million ha of MPAs to be established by 2030. This target is to ensure the health of marine ecosystems is well-maintained and the marine resources are sustainably utilized. In addition to the increase in marine protected areas area extent, effective management of marine protected areas is also a necessary goal, for positive impacts on both the marine ecosystems and the communities in these areas.

Yayasan WWF Indonesia, as one of the Ministry of Marine Affairs and Fisheries's partners, commits to supporting the government's efforts towards achieving these targets. As part of this commitment, Yayasan WWF Indonesia along with a consortium of NGOs (CTC, WCS-IP, YKAN, CII, RARE) welcomed Ministry of Marine Affairs and Fisheries's encouragement, particularly by the Directorate for Marine Conservation and Biodiversity, to produce a report of Management of Marine Protected Areas in Indonesia: Status and Challenges as a shared road map for better future marine protected areas management in Indonesia.

This report consists of four thematic areas, arranged in eleven chapters, each equipped with appropriate case studies. The chapters discuss topics such as governance, conditions of marine protected areas, enabling conditions, as well as the importance of building partnerships with local communities through community-led marine conservation (e.g. LMMAs, ICCAs, customary areas, sasi, etc).

This report provides the scientific basis for determining strategies, road maps, or other initiatives to support the implementation of marine protected areas and other coastal and marine conservation efforts in Indonesia in the future. Moreover, it is expected to provide opportunities to increase the efficacy of marine and coastal conservation efforts that are currently being initiated and implemented.

Imam Musthofa Zainudin

Head of Marine and Fisheries Program
Yayasan WWF Indonesia

Preface

My Ancestors
"My ancestors are sailors
happy to wade through the ocean
crashing the waves are not afraid
taking a storm is normal
the wind blew, the sail expanded
waves crashing on the shore
brave youths rose now
to the sea we are abuzz
my ancestors were sailors."

"Nenek Moyangku" by Saridjah Niung, 1940;
English translation from Adhuri (2018)

This Indonesian children's folk song, though eight decades old, is still hugely popular today. Its lyrics carry a message of identity: Indonesia is a nation with a strong maritime history and culture, with vast natural marine resources and capacity to explore and discover what lies around and beneath its waters.

Which, as it so happens, is a sea full of treasures.

Indonesia, which consists of approximately 17,000 islands and is the largest archipelagic country globally, is located in the Coral Triangle Region, the well-known hotspot of the world's marine biodiversity. Indonesia contains 52% (>2,000) of the world's coral fish species[1], more than two thirds (>500) of the world's coral species[2], and includes migratory corridors for megafauna such as sharks, cetaceans, and rays. Two-thirds of the nation's area consists of marine waters; 140 million people live in coastal areas (total population: 250 million), with more than half of the cities and districts also located on the coasts[3]. Thus, marine resources are of the utmost importance for the country's economic and social well-being.

Coastal communities are highly dependent on marine resources for food, livelihoods, transportation, and leisure. Indonesian coral reef fisheries are worth 1.5 billion USD annually and the value of coastal protection provided by reefs has been estimated at 387 million USD annually[4]. Indonesia also has many vibrant customary and cultural marine spiritual and governance traditions. Many practices have been influenced by traders, cultures, and religious and spiritual practices from the Far East, Melanesia, the Middle East, and other South Asia nations over centuries.

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[1] Allen, G. R. (2008). Conservation hotspots of biodiversity and endemism for Indo-Pacific coral reef fishes. Aquatic Conservation: Marine and Freshwater Ecosystems, 18(5), 541–556. https://doi.org/10.1002/aqc.880
[2] Veron, J. E. N., Devantier, L. M., Turak, E., Green, A. L., Kininmonth, S., Stafford-Smith, M., & Peterson, N. (2009). Delineating the Coral Triangle. Galaxea, Journal of Coral Reef Studies, 11(2), 91–100. https://doi.org/10.3755/galaxea.11.91
[3] Adhuri, D. S. (2018). The State and Empowerment of Indonesian Maritime Culture: The Case of Traditional Marine Resource Management. Journal of Ocean & Culture, 1, 18–34. https://doi.org/10.33522/joc.2018.1.18
[4] Burke, L., Reytar, K., Spalding, M., & Perry, A. (2012). Reefs at risk revisited in the coral triangle. World Resources Institute

The use of marine resources is an integral aspect of most coastal communities' daily lives. With population growth predicted to grow 240% by 2060[5] and the rapid expansion and development of large cities in the coastlines in recent decades[6], the use of marine resources has been intensified. As a result, 95% of marine ecosystems in Indonesia are threatened by destructive fishing and overfishing, watershed-based pollution, coastal development, and climate change[7].

It is all Indonesian people's shared responsibility to protect and sustainably use the coastal and marine resources, so future generations will be able to enjoy and benefit from them. Conservation can be a mutually beneficial solution for balancing equitable human resource needs with the protection of natural resources. Conservation protects biodiversity and maintains the function of ecosystems, which will provide economic, social, and cultural benefits for all Indonesian people[8]. In the face of growing populations and rapid global change, conservation is not an option, but a necessity.

Coastal and marine conservation have a broad meaning in this report, encompassing many approaches, including those governed and managed by governments, communities, or stakeholders, either formally or informally. While many activities have conservation as a primary objective—for example, the protection of areas, ecosystems, and species—many other activities provide biodiversity benefits as a secondary objective. Coastal and marine resource governance in Indonesia has existed for centuries, in the form of customary practices to use or protect an area or species sustainably, and these have been passed through generations. Formal conservation practices that are managed by the governments were introduced roughly a hundred years ago during the Dutch East Indies colonial period with a focus on wildlife protection. Formal conservation of coastal and marine areas in the form of Marine Protected Areas (MPAs), known officially as Marine Conservation Areas (*Kawasan Konservasi Perairan*), have been implemented by the Government of Indonesia (GoI) since the 1970s, with the first established in Laut Banda in 1977. Since their introduction, MPAs have become a primary coastal and marine conservation tool that is widely implemented.

To encourage conservation efforts at the global and national levels, the GoI and its partners, including communities, actively carry out coastal and marine conservation initiatives across the archipelago. At the *global* level, the GoI is a signatory of the Convention on Biological Diversity (CBD) and committed to supporting CBD—Aichi Target 11 to conserve 10% of the world's coastal and marine areas by 2020. At the *regional* level, the GoI is a member of the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF), a consortium of six countries located in the Coral Triangle region, including Indonesia, Malaysia, Philippines, Timor Leste, Papua New Guinea, and the Solomon Islands. The CTI-CFF was initiated in 2009 with the aim of protecting coastal and marine biological resources in the Coral Triangle Region (http://www.coraltriangleinitiative.org/). At the national level, the GoI set a target to establish 23.4 million ha of MPAs by 2020 (Perpres No. 18/2020). Besides implementing MPAs, following CBD guidance[9], the GoI will soon implement another tool that supports area-based conservation, i.e. recognition of "Other Effective Area-Based Conservation Measures" (OECMs).

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[5]Neumann, B., Vafeidis, A. T., Zimmermann, J., & Nicholls, R. J. (2015). Future coastal population growth and exposure to sea-level rise and coastal flooding-a global assessment. PloS One, 10(3), e0118571.

[6]Yeung, Y.-M. (2001). Coastal mega-cities in Asia: transformation, sustainability and management. Ocean & Coastal Management, 44, 319–333

[7]Burke, L., Reytar, K., Spalding, M., & Perry, A. (2012). Reefs at risk revisited in the coral triangle. World Resources Institute

[8]Roff, J., & Zacharias, M. (2011). Marine Conservation Ecology. Earthscan.

[9]IUCN-WCPA Task Force on OECMs. (2019). Recognising and reporting other effective area-based conservation measures. In Recognising and reporting other effective area-based conservation measures (Issue 3). IUCN. https://doi.org/10.2305/iucn.ch.2019.patrs.3.en

The year 2020 is known as a “super year” for coastal and marine conservation, due to multiple deadlines for global and national targets, e.g. (1) CBD Aichi Target 11: to protect 10% of marine areas and (2) Indonesia’s national target to establish 23.4 million hectares of MPAs. It is, therefore, an opportune time to evaluate the progress and achievement towards these targets as well as to reflect on past strategies and approaches, which can be useful to strengthen and improve future coastal and marine conservation efforts.

This report “Management of Marine Protected Areas in Indonesia: Status and Challenges” examines the status, progress, and achievements of MPA implementation and other coastal and marine conservation efforts in Indonesia, as well as gathers various lessons learned, key successes, and case studies. The report also reflects on Indonesia's MPAs in the context of best practices, challenges, and opportunities identified from studies within Indonesia, regionally within the Coral Triangle, as well as globally. It was developed as a joint partnership amongst the Ministry of Marine Affairs and Fisheries (MMAF) in collaboration with Yayasan WWF Indonesia, supported by a consortium of non-governmental organization partners: Coral Triangle Center, Wildlife Conservation Society Indonesia Program, Yayasan Konservasi Alam Nusantara, Conservation International, and RARE. We have also had additional input from multiple organizations, universities, and individual. Publisher produced this report in two language versions, i.e. Bahasa Indonesia and English.

Report Structure

The report is divided into four sections with a total of eleven chapters. Several themes and topics intersect and overlap, organized in scope by sections.

Section I explores the various aspects of MPA governance in Indonesia including the governing bodies, types of MPAs, the organizational structure within MPAs, and the MPA establishment process, as well as monitoring and evaluation of MPA implementation (Chapter 1). Besides these, Section I also discusses the topic of community participation and involvement to support MPA implementation (Chapter 2).

Section II examines the achievements of MPA implementation in Indonesia towards the national and global targets. This section explores the status and trends of coastal and marine ecosystem protection within MPAs and PAs (Chapter 3) and the ecological and social conditions across 33 MPAs (Chapter 4). Furthermore, it reviews the trends of MPA management effectiveness over time (Chapter 5). Some case studies presented in this highlight various lessons learned from MPA management in Indonesia.

Section III sketches several aspects to balance biodiversity conservation and sustainable use. Chapter 6 explores zoning system implementation and its effectiveness in supporting sustainable fisheries. Chapter 7 investigates how fisheries management areas (FMAs) can support the implementation of MPAs, and in contrast, how the implementation of MPAs can support fisheries management in the region. Furthermore, the section also outlines the role and benefits of responsible marine tourism to support MPA implementation (Chapter 8). Several case studies are also shared by key partners highlighting experiences, challenges, and successes in the efforts to balance the sustainable use and conservation.

Section IV covers a wide range of topics and key considerations to establish a network of MPAs in Indonesia and place this network in the global context. The section explores various threats and new potential approaches that can support MPA outputs. Chapter 9 reviews the potential impacts of climate change on marine ecosystems and the role and function of MPAs in increasing the resilience and resistance of ecosystems to climate change. In addition, this section also outlines a new approach that is being introduced worldwide, Other Effective Area-

Based Conservation Measures (OECMs) – that has potential to be implemented in Indonesia as another form of coastal and marine conservation tool, besides MPAs (Chapter 10). Last, Chapter 11 evaluates the stage of establishment and level of protection of MPAs in Indonesia using *The MPA Guide* global standards.

This report is the first component of the "MPA Vision" project, a collaborative project led by MMAF with support from Yayasan WWF Indonesia, Coral Triangle Center, and a consortium of non-government organization partners, other government ministries, and universities to evaluate past MPA implementation and develop a roadmap for MPAs for 2020-2030. In the midst of rapid ecological and economic change, policy development should be carefully developed based on scientific evidence and recommendations to facilitate effective decision-making and adaptive management. By presenting current MPA status and trends, and lessons learned, this report provides a scientific foundation to determine strategies, roadmaps, or other initiatives to support MPA implementation and other coastal and marine conservation in Indonesia in the future. This report is expected to provide a window of opportunity to improve and escalate the coastal and marine conservation efforts that are currently being implemented or will be initiated in Indonesia.

Editorial Team

Jakarta, December 2020

Acknowledgements

This report is a joint partnership product of the Kementerian Kelautan dan Perikanan (Ministry of Marine Affairs and Fisheries/MMAF) in collaboration with Yayasan WWF Indonesia, supported by a consortium of non-governmental organization partners. It was developed as one of the *MPA Vision 2030* project objectives, a collaborative project led by MMAF with support from non-government organization partners, other government ministries, and universities to evaluate past MPA implementation and develop a roadmap for MPA implementation for 2020-2030. It benefited greatly from the partnership with Yayasan WWF Indonesia, Coral Triangle Center, Wildlife Conservation Society Indonesia Program, Yayasan Konservasi Alam Nusantara, Conservation International Indonesia, and RARE. The vision, direction, and content of the report were initially developed by this MPA vision consortium and refined by an editorial board consisting of Andi Rusandi (MMAF) as Editor in Chief, Amehr Hakim (MMAF) as Managing Editor and a team of editors: Estradivari (Yayasan WWF Indonesia), Muhammad Erdi Lazuardi (Yayasan WWF Indonesia), Dedy Eka Saputra (MMAF), Agus Sapari (MMAF), and Dominic A. Andradi Brown (WWF-US). These editors also made significant contributions to the report as co-authors. The report development is also under the coordination and guidance from key persons at MMAF: Aryo Hanggono (former Director General for Marine Spatial Management) and Agus Dermawan (Secretary of Directorate General for Marine Spatial Management). We also thank Imam Musthofa Zainudin (Yayasan WWF Indonesia), Gabby N. Ahmadia (WWF-US), and Rili Djohani (Coral Triangle Center) for their leadership and guidance on the development of this report. We are grateful to Margaret A. Cargill Philanthropies and Walton Family Foundation for funding support.

We are deeply saddened by the loss of Mr. Aryo Hanggono, the former Director General for Marine Spatial Management, MMAF, during this report development. This report cannot be separated from his direction and guidance. We are honored to have known and worked with Mr. Aryo Hanggono and thankful for his dedication to promoting sustainable marine conservation and management in Indonesia.

This report reflects an enormous group effort. Each chapter was developed through collaboration with experts and practitioners working in the field of marine protected area management, marine management, and the natural and social sciences. We would like to acknowledge the authors for their substantial support and contribution to chapter or case study development. These authors are affiliated with numerous organizations, universities, and community groups, which indirectly have contributed to the development of this report. We would like to extend our appreciation for the support from these **government institutions**: Badan Riset dan SDM Kelautan dan Perikanan – Kementerian Kelautan dan Perikanan (KemenKP), Balai Kawasan Konservasi Perairan Nasional Kupang, Balai Kawasan Konservasi Perairan Nasional Wilayah Kerja Taman Wisata Perairan Gili Matra, Cabang Dinas Kelautan dan Perikanan Provinsi Nusa Tenggara Barat, Direktorat Konservasi dan Keanekaragaman Hayati Laut - KemenKP, SubDirektorat Konvensi dan Jejaring Kawasan Konservasi - KemenKP, Direktorat Jenderal Pengelolaan Ruang Laut – KemenKP; **Non-Government Organizations**: World Wildlife Fund – US, Yayasan Reef Check Indonesia, Yayasan TAKA, Yayasan Terumbu Karang Indonesia, The Nature Conservancy; **universities**: Universitas Pelita Bangsa, Bandung Ocean Technology Research and Management, Universitas Padjajaran, Universitas Pattimura, Universitas Papua, University of the South Pacific, University of Queensland, University of Tasmania, University of Exeter, University of Leeds, Florida International University, Duke University, University of Oregon, University of Washington; and **community groups**: *Masyarakat Hukum Adat* (Customary Law Community/Indigenous People) *Panglima Laôt Lhôk* Anoi Itam, *Panglima Laôt Lhôk* Iboih, and *Sarano Wali*.

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Executive Summary

Formal Protected Areas (PAs) were introduced in Indonesia in the early 20th century during the era of Dutch East Indies colonialism, with the first "Nature Monument" (*Monumen Alam*) established in 1916 to conserve biodiversity. The first marine PA that protects coastal ecosystems, Taman Laut Banda, Maluku, was established in 1977 by the Ministry of Forestry (now the Ministry of Environment and Forestry/MoEF).

PAs that have a primary objective of protection and conservation of coastal and marine ecosystems are commonly named "Marine Conservation Areas" (*Kawasan Konservasi Perairan*), hereafter referred to as Marine Protected Areas (MPAs). Indonesian MPAs are defined as: "*marine areas that are protected and managed by a zoning system, to achieve sustainable management of fish resources and the environment*" (PP No. 60/2007). MPAs in Indonesia are managed by governments and adopt a multi-use system that can balance biodiversity conservation and sustainable use. The Ministry of Marine Affairs and Fisheries (MMAF) and MoEF are responsible for managing MPAs in Indonesia (Chapter 1). There are five categories of MPAs in Indonesia: three are under the management of MMAF and two are under the management of MoEF; under these categories, there are fifteen types of MPAs (Chapter 1 and Chapter 6).

The number and extent of MPAs in Indonesia have grown rapidly since the 2000s, as the Government of Indonesia (GoI) set several targets to meet the Convention on Biological Diversity's (CBD) Aichi Target 11 that calls for protecting 10% of national waters. These targets are to establish 10 million ha of MPAs by 2010 and 23.4 million ha of MPAs by 2020 (Perpres No. 18/2020). As of December 2019, Indonesia has 196 MPAs (including 166 MMAF MPAs and 30 MoEF MPAs) with a total area of 23.1 million ha or approximately 7% of the nation's waters. Overall, these MPAs include 3% of mangrove forests, 36% of seagrass beds, and 43% of coral reefs in Indonesia (Chapter 3). Of the MPAs with zoning, 11% of the total MPA area can be categorized as "non-extractive zones" – areas where extractive activities such as fishing are prohibited (Chapter 6). The majority of MPA areas are allocated for sustainable use. To minimize the impacts on the environment and society beyond MPA boundaries, conservation must also include other efforts and approaches, such as Other Effective Area-Based Conservation Measures (OECMs); Indonesia is currently developing a framework and guidelines, and this report identifies potential candidate sites and OECMs in the Indonesian context (Chapter 10).

The effectiveness of MPAs in achieving their conservation goals, namely biodiversity protection and sustainable use, is a prerogative. The average hard coral cover in MPAs reaches 37% ± 2% and is relatively stable in most provinces in Indonesia over time. The abundance of key fisheries families varies significantly between MPAs, provinces, and time, with a mean of 612 ± 157 ind/ha. Meanwhile, the abundance of herbivorous fish families, although quite diverse between MPAs and provinces, tends to increase over time, with an average abundance reaching 1,361 ± 208 ind/ha (Chapter 4). Changes in human welfare were observed in the MPAs in four provinces: in general, health parameters (food security) increased, marine tenure parameters decreased, and economic welfare parameters (material assets) and education (school participation) varied over time. Many factors affect these changes besides the implementation of the MPA itself, including environmental changes such as climate change, fisheries, or other resource use, as well as social changes such as community characteristics, access to markets, economic and social status, etc.

These are not the only indicators to measure MPA efficacy; effectiveness of management is also required. The GoI applies two tools to evaluate this: (1) Management Effectiveness of Marine, Coastal and Small Islands Conservation Areas (*Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*; E-KKP3K) for MPAs managed by MMAF and (2) Management Effectiveness Tracking Tool (METT) for MPAs managed by MoEF (Chapter 5). Although management effectiveness is improving over time, two-thirds of MPAs are still within the initiation stage (Red level) and do not have adequate management tools yet. Inadequate financial and staffing capacity, complex governance, and low compliance are some of the challenges to improve MPA management effectiveness, not only in Indonesia, but also globally.

Management must also consider the fisheries and tourism sectors. Nationally, fisheries (96% small-scale) contributed USD 16.8 billion to the GDP in 2017, provided employment for 45 million people, and supplied 60% of domestic animal protein. To manage fisheries across the archipelago, MMAF divided the nation's marine areas into eleven Fisheries Management Areas (FMAs). MPAs are located and widely distributed within each FMA and protect between 0.2% to 7.7% of FMA waters (Chapter 7). In 2018, tourism in Indonesia grew 7.8% or almost double the global average of 3.9%, as well as contributes 5% to the GDP and provides employment for 12 million people. Interest in nature-based tourism has been increasing, as shown by an increasing number of tourist visits to the national parks. While marine tourism activities can be implemented in all types of MPAs, in Indonesia, 32 out of 196 MPAs have a specific primary objective to promote marine tourism (Chapter 8).

Community involvement in conservation can foster or legitimize ownership of marine resources. The GoI strongly encourages the involvement of all elements of society in managing MPAs through co-management, which has been formally regulated. Partnerships to support MPA management have been implemented in several MPAs in Indonesia (Chapter 2) and many showed positive results.

Looking forward

MPA implementation has rapidly expanded in the past few decades and will hopefully continue in a positive direction. At present, Indonesia has attained significant achievement in the number and extent of MPAs, while the MPA management effectiveness and MPA effectiveness showed mixed results. Moving forward, in the addition to the establishment of new MPAs in areas that have limited existing coverage, it is important to also focus on building management effectiveness and conservation outcomes from the existing MPA network. MPAs are a long-term investment for coastal and marine conservation and must therefore be monitored for adaptive management. With a positive trajectory towards national MPA targets, in 2019, MMAF increased its national MPA target to 32.5 million ha and aims to increase the effectiveness of MPA management by 2030. MPAs and other marine conservation efforts will be further considered as a critical component to achieving global goals on sustainable development (SDGs). Therefore, they cannot be seen only as tools that can contribute to the number and extent of protection, but also as tools to manage areas and marine resources that can balance the needs of biodiversity protection and human well-being.

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Acronyms

APBD	:	*Anggaran Pendapatan dan Belanja Daerah*/Provincial Income and Expenditure Budget
APBN	:	*Anggaran Pendapatan dan Belanja Nasional*/National Income and Expenditure Budget
APEI	:	Areas of Particular Environmental Interest
BAF	:	Blue Abadi Fund
Bappenas	:	*Badan Perencanaan Pembangunan Nasional*/National Development Planning Agency
BBKSDA	:	*Balai Besar Konservasi Sumber Daya Alam*/Nature Resource Conservation Big Office
BBTN	:	*Balai Besar Taman Nasional*/National Park Big Office
BCU	:	Bioclimatic Unit
BHS	:	Bird's Head Seascape
BIG	:	*Badan Informasi Geospasial*/Geospatial Information Bureau
BKKPN	:	*Balai Kawasan Konservasi Perairan Nasional*/National Aquatic Conservation Area Office
BKSDA	:	*Balai Konservasi Sumber Daya Alam*/Nature Resources Conservation Office
BLUD	:	*Badan Layanan Umum Daerah*/Regional Public Service Agency
BPPT	:	*Badan Pengkajian dan Penerapan Teknologi*/Indonesia Agency for Assessment and Application of Technology
BRIN	:	*Badan Riset dan Inovasi Nasional*/National Agency of Research and Innovation
BTN	:	*Balai Taman Nasional*/National Park Office
BTNW	:	*Balai Taman Nasional Wakatobi*/Wakatobi National Park Office
CA	:	*Cagar Alam*/Nature Reserve
CARE	:	Connected, Adequate, Representative, Efficient
CBD	:	Convention on Biological Diversity
CBD COP	:	Convention on Biological Diversity - Conference Of the Parties
CBT	:	Community-Based Tourism
CFA	:	Customary Fishery Area
CI	:	Conservation International
CII	:	Conservation International Indonesia

COREMAP-CTI	:	Coral Reef Rehabilitation and Management Program - Coral Triangle Initiative
CPR	:	Common Pool Resource
CTC	:	Coral Triangle Center
CTI-CFF	:	Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security
CTI-RPOA	:	Coral Triangle Initiative Regional Plan of Action
CTMPAS	:	Coral Triangle Marine Protected Area System
Dirjen PRL	:	*Direktur Jenderal Pengelolaan Ruang Laut*/Director General for Marine Spatial Management
Ditjen KSDAE	:	*Direktorat Jenderal Konservasi Sumber Daya Alam Ekosistem*/ Directorate General of Conservation on Natural Resources and Ecosystem
Ditjen PHKA	:	*Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam*/ Directorate General of Forest Protection and Nature Conservation
DKP	:	*Dinas Kelautan dan Perikanan*/Marine and Fisheries Office
DPL	:	*Daerah Perlindungan Laut*/Community Marine Reserve
EAFM	:	Ecosystem Approach to Fisheries Management
E-KKP3K	:	*Evaluasi Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*/Management Effectiveness of Aquatic, Coasts, and Small Islands Conservation Areas
ENSO	:	El Niño-Southern Oscillation
ERC	:	Ecosystem Restoration Concession
FAO	:	Food and Agriculture Organization
FGD	:	Focus Group Discussion/*Diskusi Kelompok Terarah*
FKTA-PB	:	*Forum Komunikasi Tokoh Adat Peduli Budaya*/Communication Forum for Indigenous People Culture
FMA	:	Fisheries Management Area/*Wilayah Pengelolaan Perikanan* (WPP)
GBRMP	:	Great Barrier Reef Marine Park
GDP	:	Gross Domestic Product
GEF	:	Global Environment Facility
GFSI	:	Global Food Security Index
GLPCA	:	Green List of Protected and Conserved Areas
GoI	:	Government of Indonesia
GSTC	:	Global Sustainable Tourism Council
GT	:	Gross Ton

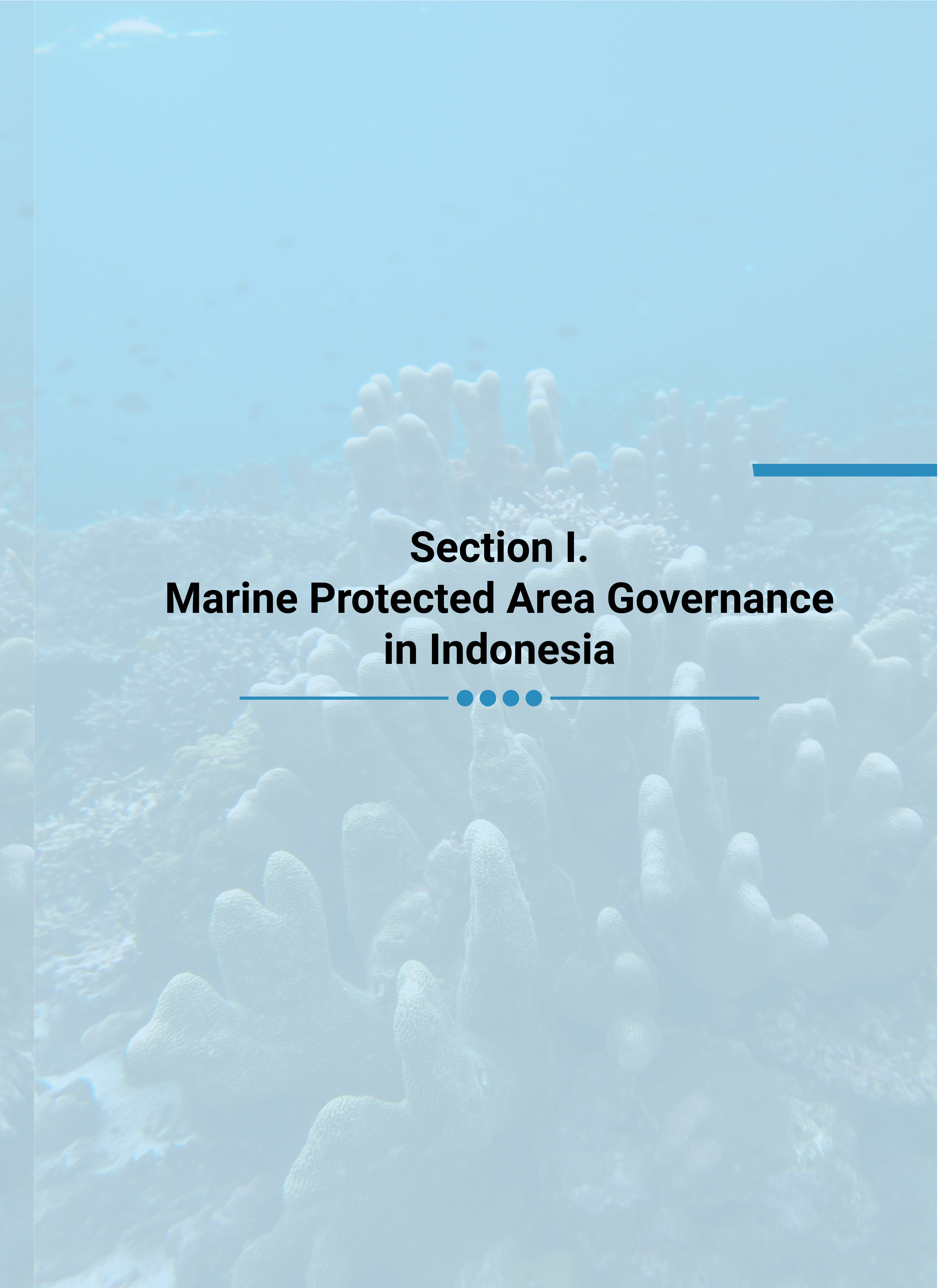
HP-3	:	*Hak Pengusahaan Perairan Pesisir*/Coastal Waters Commercial Use Right
I-LMMA	:	Indonesian Locally Managed Marine Area
ICCA	:	Indigenous and Community Conserved Area
ICZM	:	Integrated Coastal Zone Management
IDR	:	Indonesian Rupiah
IMAS	:	Institute for Marine and Antartic Studies
IPCC	:	Intergovernmental Panel on Climate Change
IUCN	:	International Union for the Conservation of Nature
KBA	:	Key Biodiversity Area
KCD	:	*Kantor Cabang Dinas/*Marine and Fisheries Provincial Branch Office
KemenKP	:	*Kementerian Kelautan dan Perikanan*/Ministry of Marine Affairs and Fisheries
KLHK	:	*Kementerian Lingkungan Hidup dan Kehutanan*/Ministry of Environment and Forestry
Kemenparekraf	:	*Kementerian Pariwisata dan Ekonomi Kreatif*/Ministry of Tourism and Creative Economy
Kepmen KP	:	*Keputusan Menteri Kelautan dan Perikanan*/Decree of the Minister of Marine Affairs and Fisheries
Kepmen LHK	:	*Keputusan Menteri Lingkungan Hidup dan Kehutanan*/Decree of the Minister of Environment and Forestry
Kemenristek	:	*Kementerian Riset dan Teknologi*/Ministry of Research and Technology
KKHL	:	*Konservasi dan Keanekaragaman Hayati Laut*/Conservation and Marine Biodiversity
KKM	:	*Kawasan Konservasi Maritim*/Maritime Conservation Area
KKP	:	*Kawasan Konservasi Perairan*/Marine Conservation Area
KKP3K	:	*Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*/Marine, Coasts, and Small Islands Conservation Area
KKPD	:	*Kawasan Konservasi Perairan Daerah*/Provincial Marine Protected Area
KKPN	:	*Kawasan Konservasi Perairan Nasional*/National Marine Protected Area
KPA	:	*Kawasan Pelestarian Alam*/Nature Conservation Area
KSA	:	*Kawasan Suaka Alam*/Nature Reserve Area
KSDA	:	*Konservasi Sumber Daya Alam*/Nature Resource Conservation

LIPI	:	*Lembaga Ilmu Pengetahuan Indonesia*/Indonesian Institute of Science
LKKPN	:	*Loka Kawasan Konservasi Perairan Nasional*/National Aquatic Conservation Area Office
LMMA	:	Locally Managed Marine Area
MACP	:	Margaret A. Cargill Philanthropies
MEL	:	*Monitoring, Evaluasi, dan Pembelajaran*/Monitoring, Evaluation, and Learning
MER	:	Misool Eco Resort
METT	:	Management Effectiveness Tracking Tool
MHA	:	*Masyarakat Hukum Adat*/Customary Law Community
MMAF	:	Ministry of Marine Affairs and Fisheries/*Kementerian Kelautan dan Perikanan*
MMP	:	*Masyarakat Mitra Polhut*/Community of Forest Police Partner
MoEF	:	Ministry of Environment and Forestry/*Kementerian Lingkungan Hidup dan Kehutanan*
MPA	:	Marine Protected Area
MSY	:	Maximum Sustainable Yield/*Tangkapan Maksimum Lestari*
MT	:	Metric Ton
NDC	:	Nationally Determined Contribution
NGO	:	Non-Governmental Organization
NOAA	:	National Oceanic and Atmospheric Administration
NPOA	:	National Plan of Action
NTB	:	Nusa Tenggara Barat
NTT	:	Nusa Tenggara Timur
NTZ	:	No-Take Zone
OECM	:	Other Effective Area-Based Conservation Measures/*Tindakan Efektif Lainnya untuk Konservasi Berbasis Kawasan*
PA	:	Protected Area
PAAP	:	*Pengelolaan Akses Area Perikanan* /Territorial Use Rights in Fisheries
PAME	:	Protected Area Management Effectiveness
Perdirjen PRL	:	*Peraturan Direktur Jenderal Pengelolaan Ruang Laut*
Perdirjen PT	:	*Peraturan Direktorat Perikanan Tangkap*
Permen KP	:	*Peraturan Menteri Kelautan dan Perikanan*/Ministry of Marine Affair and Fisheries Regulation

Permen LHK	:	*Peraturan Menteri Lingkungan Hidup dan Kehutanan*/Ministry of Environment and Forestry Regulation
Perpres RI	:	*Peraturan Presiden Republik Indonesia/*President of Republic Indonesia's Regulation
PES	:	Payment for Ecosystem Services
PIT	:	Point Intercept Transect
PKS	:	*Perjanjian Kerjasama/*Cooperation Agreement
PNBP	:	*Pendapatan Negara Bukan Pajak*/Non-Tax State Income
Pokja	:	*Kelompok Kerja/*Working Group
POKWASMAS	:	*Kelompok Masyarakat Pengawas/*Community-based Surveillance Group
PP RI	:	*Peraturan Pemerintah Republik Indonesia/*Government of Indonesia's Regulation
PSSA	:	Particularly Sensitive Sea Area
PUD	:	*Perairan Umum Daratan*/Mainland Public Water
RAN	:	*Rencana Aksi Nasional*/National Plan of Action
RAN-API	:	*Rencana Aksi National - Adaptasi Perubahan Iklim/*National Action Plan for Climate Change Adaptation
REAP-CCA	:	Region-wide Early Action Plan for Climate Change Adaptation
REDD+	:	Reducing Emission by Deforestation and Forest Degradation, Carbon Stock Enhancement and Forest Conservation
Ripparnas	:	*Rencana Induk Pariwisata Nasional*/Masterplan for National Tourism Development
RKT	:	*Rencana Kerja Tahunan*/Annual Work Plan
RPJP	:	*Rencana Pembangunan Jangka Panjang*/Long-Term National Development Plan
RPJMN	:	*Rencana Pembangunan Jangka Menengah Nasional/*National Medium Term Development Plan
RPP	:	*Rencana Pelaksanaan Program*/Program Implementation Plan
RZ	:	*Rencana Zonasi*/Zoning Plan
RZ-KSN	:	*Rencana Zonasi Kawasan Strategis Nasional/*Zoning Plan for National Strategic Areas
RZ-KSNT	:	*Rencana Zonasi Kawasan Strategis Nasional Tertentu/*Zoning Plan for Special National Strategic Areas
RZWP3K	:	*Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil*/Zoning Plan for Coastal Areas and Small Islands
SAP	:	*Suaka Alam Perairan*/Aquatic Nature Reserve
Satker	:	*Satuan Kerja*/Work Unit

Satgas	:	*Satuan Tugas*/Youth Task Force
SBS	:	Sunda Banda Seascape
SDG	:	Sustainable Development Goal
SDM	:	*Sumber Daya Manusia*/Human Resources
SE	:	Standard Error
SEA	:	Sustainable Ecosystems Advanced
SIDA	:	Swedish International Development cooperation Agency
SINAP	:	*Sistema Nacional de Áreas Protegidas*/National System for Protected Areas
SK Dirjen PHKA	:	*Surat Keputusan Direktur Jenderal Perlindungan Hutan dan Konservasi Alam*
SK Dirjen KSDAE	:	*Surat Keputusan Direktur Jenderal Konservasi Sumber Daya Alam dan Ekosistem*
SK Menhutbun	:	*Surat Keputusan Menteri Kehutanan dan Perkebunan*
SK Mentan	:	*Surat Keputusan Menteri Pertanian*
SKPD	:	*Satuan Kerja Perangkat Daerah*/Regional Apparatus Working Unit
SM	:	*Suaka Margasatwa*/Wildlife Reserve
SOP	:	Standard Operating Procedure
SP	:	*Suaka Perikanan*/Fisheries Reserve
SPKP	:	*Sentra Penyuluhan Kehutanan Pedesaan*/Village Forest Counseling Center
SSIC	:	Sustainable Solutions International Consulting
SST	:	Sea Surface Temperature
TAHURA	:	*Taman Hutan Raya*/Grand Forest Park
TCBFM	:	Traditional Community-Based Fisheries Management
TL	:	*Taman Laut*/Aquatic Park
TN	:	*Taman Nasional*/National Park
TNC	:	The Nature Conservancy
TNKJ	:	*Taman Nasional Karimun Jawa*
TNKpS	:	*Taman Nasional Kepulauan Seribu*
TNL	:	*Taman Nasional Laut*/Marine National Park
TNP	:	*Taman Nasional Perairan*/Aquatic National Park
TP	:	*Taman Pesisir*/Coastal Park
TPK	:	*Taman Pulau Kecil*/Small Islands Park
TURF	:	Territorial Use Rights in Fisheries/*Pengelolaan Akses Area Perikanan*

TW	:	*Taman Wisata*/Recreational Park
TWA	:	*Taman Wisata Alam*/Nature Recreation Park
TWAL	:	*Taman Wisata Alam Laut*/Marine Tourism Park
TWP	:	*Taman Wisata Perairan*/Aquatic Tourism Park
TWL	:	*Taman Wisata Laut*/Marine Recreation Park
UN	:	United Nations
UNDP/GEF	:	United Nations Development - Global Environmental Finance
UNEP	:	United Nations Environment Programme
UNEP-WCMC	:	United Nations Environment Programme World Conservation Monitoring Centre
UPT	:	*Unit Pelaksana Teknis*/Technical Implementation Unit
UPTD	:	*Unit Pelaksana Teknis Daerah*/Regional Technical Implementation Unit
USAID	:	United States Agency for International Development
USD	:	United States Dollar
UU RI	:	*Undang-Undang Republik Indonesia*
UUD RI	:	*Undang-Undang Dasar Republik Indonesia*
UVC	:	Underwater Visual Census
VME	:	Vulnerable Marine Ecosystem
WCPA	:	World Commission on Protected Areas
WCS-IP	:	Wildlife Conservation Society Indonesia Program
WFF	:	Walton Family Foundation
WPP	:	*Wilayah Pengelolaan Perikanan*/Fisheries Management Area
WRI	:	World Resources Institute
WWF	:	World Wide Fund for Nature (Indonesia)/World Wildlife Fund (US)
YKAN	:	Yayasan Konservasi Alam Nusantara



Section I.
Marine Protected Area Governance in Indonesia

Chapter 1. Formal Marine Protected Area Governance Structure

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Abstract

Good governance is one of the principles to ensure the effectiveness of Marine Protected Areas (MPA) management. Governance refers to the formal and informal structures and processes, agencies, and institutions, technical expertise, and traditions that shape management. This could refer to the national and local legislative and regulatory frameworks, the roles and responsibilities of different agencies and individuals, and the processes and relationships through which these are carried out. Management on the other hand, comprises the different tools available to the management authority. This chapter discusses the formal governance – which is governance by government – of MPAs in Indonesia in term of institutional framework and the current challenges. Global MPA governance will be provided as a sharing experience.

Abstrak

Tata kelola yang baik merupakan salah satu pilar yang harus tersedia untuk memastikan efektivitas pengelolaan Kawasan Konservasi Perairan (KKP). Tata kelola mengacu pada struktur kelembagaan baik formal maupun informal, keahlian teknis, dan proses kerja yang membentuk sebuah pengelolaan. Hal ini bisa mengacu pada kerangka kerja legislasi dan peraturan baik nasional maupun lokal, serta peran dan tanggung jawab lembaga maupun individu dan interaksinya. Pengelolaan di sisi lain terdiri dari berbagai perangkat pengelolaan yang tersedia bagi lembaga pengelola. Bab ini akan membahas tata kelola KKP dilihat dari kelembagaan formal – tipe pengelolaan oleh pemerintah – kerangka kelembagaan dan tantangannya saat ini. Informasi mengenai tata kelola KKP di tingkat global disajikan sebagai sebuah pembelajaran

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1.1 Introduction to Governance

Governance is a crucial but frequently overlooked or misunderstood mechanism that is fundamental to the success of protected area management. The technical rationale of the Convention on Biological Diversity (CBD) — Aichi Target 11 states "*well-governed and effectively managed protected areas are a proven method for safeguarding both habitats and populations of species and for delivering important ecosystem services*" (Convention on Biological Diversity 2012).

It is important to clarify what governance entails in this context. Researchers and practitioners continue to debate this, with its definition and use often dictated by different schools of thought. For the purpose of this chapter, the following definition of governance will be used:

> *"Governance is the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say. Fundamentally, it is about power, relationships and accountability: who has influence, who decides, and how decision-makers are held accountable."* (Graham, Amos, and Plumptre 2003.

In relation to natural resource management, governance can be defined as:

> *"The formal and informal arrangements and institutions which determine how resources or an environment are utilized; how problems and opportunities are evaluated and analyzed, what behavior is deemed acceptable or forbidden, and what rules and sanctions are applied to affect the pattern of resource and environmental use."* (Juda 1999 cited in Christie and White 2007.

Governance deals with varied and complex interactions between and across different scales, from the simplest word-of-mouth agreements to the most complex of international legal frameworks. It is this complexity that can make governance challenging to define, let alone to successfully enact. A common mistake in policy and practice is the interchanging of the terms "governance" and "management". While the two are undoubtedly interlinked, they are in many ways distinct from each other, and failure to recognize the differences can result in ineffective management and poor governance. Bennett and Dearden (2014b) argue that:

> *"...subsuming governance [...] under the auspices of management does not do justice to the full complexity of governance. [...] Governance is an umbrella term which refers to the institutions, structures and processes which determine how and whether management can function effectively to address societal or environmental issues whereas management is the "resources, plans and actions that are a product of applied governance."*

In simple terms, **management** is about **what is done** in pursuit of given objectives. **Governance** is about **who decides** about what is to be done, and **how** those decisions are taken. It is about who holds **power, authority, and responsibility**, and who is, or should be, held accountable (Borrini-Feyerabend et al. 2014).

In the context of Marine Protected Area (MPA) development and implementation, governance refers to the formal and informal structures and processes, agencies, institutions, technical expertise, and traditions that shape management. This could refer to the national and local legislative and regulatory frameworks, the roles and responsibilities of different agencies and individuals, and the processes and relationships through which these are carried out. Management on the other hand, comprises the different tools available to managers. Regarding the marine environment, an MPA could be seen as a management approach alongside a broader suite of tools such as sustainable fisheries management under an umbrella of Integrated Coastal Zone Management (ICZM). Within an MPA, management refers to inputs such as a management plan, or actions such as zonation, designation of non-extractive zone, or allowance for customary and indigenous resource harvest.

Quality or effectiveness of governance is strongly tied to what have been agreed by institutional bodies such as the CBD and International Union for the Conservation of Nature (IUCN) as the "good governance principles", categorized as: legitimacy and voice, direction, performance, accountability, fairness, and rights (Borrini et al. 2013; Borrini-Feyerabend et al. 2014).

1.2 Governance Typologies

The IUCN and CBD distinguish four broad governance types for protected and conserved areas, based on the actors who take or took the fundamental decisions for establishment, purpose, and management of these areas (Table 1.1).

This chapter discusses the formal governance (Type A) of MPAs in Indonesia in terms of institutional framework and the current challenges.

While useful as a framework to inform governance tracking, it is important to note that typologies such as (Table 1.1) simplify much of the complexity of governance. What works in one MPA might not work in another based on social, cultural, economic, political, financial, legislative, and geographical factors. For example, what could be characterized as shared governance (or co-management) in one MPA could be dramatically different elsewhere. These factors are not static, so adaptability is crucial for an effective approach. Communication, transparency, and accountability of and between stakeholders throughout all stages of the process (design and implementation) is key. As highlighted in the United Nations Environment Program (UNEP) report titled "Enabling Effective and Equitable Marine Protected Areas: Guidance on Combining Governance Approaches" (UN Environment 2019):

> *"The practical reality is that there is a need for an integrated approach combining the roles of the state, markets, and people. The most effective combination of these three approaches will differ for each MPA and will depend on several associated factors, including political will, community involvement, financial status, legislation and the capacity for enforcement. There should be input from all three approaches to generate the most effective and equitable form of governance."*

Table 1.1. Governance types recognized by IUCN. Governance type A (in bold) is the primary focus of this chapter.

Governance Type (Letter)	Governance Type
A	**Governance by government (at various levels and possibly combining various agencies).**
B	Governance by various rights holders and stakeholders together (shared governance).
C	Governance by private individuals and organizations (usually the landholders).
D	Governance by indigenous peoples and/or local communities (sometimes referred to as ICCAs).

Source: (Borrini-Feyerabend et al. 2014)

1.3 Global MPA Governance: History and Challenges

The history of state-led or "top-down" MPA governance is often a response to protect biodiversity from resource extraction in colonial and post-colonial societies throughout the world (Christie and White 2007). Experience, however, suggests that an exclusive focus on implementing state-led or "top-down" governance models for MPAs without considering local context — including the rights and needs of local communities — contribute to poor biodiversity and social outcomes (Gaymer et al. 2014). Without local inputs into institutional development, state-led governance frequently leads to rigid, inflexible management that fails to account for local priorities and needs (Glaser et al. 2010). Poor performance of MPAs can frequently be traced to the lack of inclusion of local communities in the design and implementation stages of MPA development (Ferse et al. 2010). In contrast, community involvement in governance can lead to systems that are more adaptable and flexible, in turn leading to more resilient socio-ecological systems (Olsson, Folke, and Berkes 2004).

State-led governance, however, can play a pivotal role in successful MPA outcomes. For example, high-level national and federal legislation allowed the Great Barrier Reef Marine Park Authority (GBRMPA) to enact policies for zoning in Australia. Here, state capacity also ensured wide stakeholder participation could be carried out with the general public (Fernandes et al. 2005). It must be noted, however, that this example reflects an atypical socio-ecological scenario, especially compared with most coral reef nations, with mostly untenured marine areas managed by a limited number of authorities. This contrasts with a more typical coral reef nation scenario of overlapping legislation and management jurisdictions, with local communities dependent on marine resources for subsistence and small cash economies (Ban et al. 2011). An example of these contrasts is the decline in support for Apo Island MPA in the Philippines when it shifted from a long-standing, highly respected community-based model to a state-led one (Hind, Hiponia, and Gray 2010). Often past MPA decision-making has reflected that the initial evidence-base for the design, implementation, and effectiveness of MPAs predominantly came from high-income countries using state-governed approaches, though more recent research has shown that these models frequently do not translate well to low and middle-income countries (Ban et al. 2011).

In a study on state-led MPA governance on the Andaman coast of Thailand, local community support for MPAs was severely hindered by mistrust of marine park authorities (Bennett and Dearden 2014a). Park authorities were viewed by local communities as outsiders — with limited understanding and regard for the local context and needs of the community (Bennett and Dearden 2014a). A study on effectiveness of two MPAs in Malaysia indicated that the use of "top-down" approaches resulted in few incentives for fishers to participate in management, in turn limiting support for management (Islam et al. 2017). Research in the Philippines has revealed trade-offs between the costs and benefits associated with MPA development and implementation, with local fishers being disproportionately affected compared to tourism operators (Oracion, Miller, and Christie 2005). Similarly, in the Florida Keys, USA, among local stakeholders, fishers felt alienated and excluded by zoning measures, in particular when compared with tourism and conservation stakeholders (Suman, Shivlani, and Milon 1999). Recent research argues against the framing of MPAs as win-win conservation and development interventions, where even initial acceptance by local communities may not lead to prolonged acceptance (Chaigneau and Brown 2016). Local community outcomes, in particular for food security and sustainable livelihoods, must be integrated in order to achieve conservation outcomes.

UNEP's best practices for MPA governance highlights the crucial role of a broad range of incentives that support behavior change to achieve conservation objectives, sustainable use, and the promotion of equity (UN Environment 2019). An incentive is defined as a particular governance approach that is designed to encourage people to behave in a way that supports the achievement of certain strategic policy outcomes such as biodiversity conservation (UN Environment 2019 see Chapter 2 for types of incentives). This is particularly relevant for legal incentives, of which the most commonly used in MPAs are: commitment to hierarchical obligation (e.g. CBD Aichi Targets); capacity for enforcement; penalties for deterrence, and clear and consistent legal definitions. Strong state input is crucial for achieving these core incentives for effective MPA governance. Clear and robust state-led legal incentives that recognize the role of local actors and institutions as partners in management can present an opportunity for good governance of MPAs in Indonesia.

1.4 MPA Governance Institution in Indonesia

MPAs in Indonesia — known formally as Marine Conservation Areas (*Kawasan Konservasi Perairan*) — can be broadly defined as *"spatially defined, marine, coastal, or small island areas that are protected and managed by a zoning system to achieve sustainable management of fisheries resources and environmental outcomes"* (PP RI No. 60/2007). MPAs are regulated by the Ministry of Marine Affairs and Fisheries (MMAF) and the Ministry of Environment and Forestry (MoEF). MoEF, which has jurisdiction across terrestrial and aquatic environments, manages both terrestrial protected areas (PAs) and MPAs. Both ministries have their own set of classifications for MPAs depending on the objectives and scope of conservation.

MMAF has three main categories of MPAs: (1) Marine, Coasts and Small Islands Conservation Areas (*Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil/* KKP3K*)*, (2) Maritime Conservation Areas *(Kawasan Konservasi Maritim/*KKM*)*, and (3) Marine Conservation Areas *(Kawasan Konservasi Perairan/*KKP*)*. There are in total ten types of MPAs under these three MMAF MPA categories, of which each has its own set of criteria and targets for conservation (Figure 1.1). In contrast, MoEF classifies its protected areas into two main categories: (1) Nature Reserve Areas (*Kawasan Suaka Alam*/KSA) and (2) Nature Conservation Areas (*Kawasan Pelestarian Alam*/KPA), with a total of five types of PAs (Figure 1.2). Despite these nuanced MPA categories and types, all align within the IUCN global definition of MPAs—though only represent a subset of areas that IUCN recognizes as MPAs, as the IUCN MPA definition is broader.

With high dependency of coastal communities on marine resources, MPAs in Indonesia are managed under a zoning system to balance biodiversity conservation and multiple use to support human well-being. This means restricted activities can still be carried out within specific areas within the MPA boundaries. The MPA zoning systems (or block systems) in Indonesia vary depending on the categories/types of MPAs (Figure 1.3 and Figure 1.4). Despite this, zones within MPAs can be broadly categorized as non-extractive zones (zones where extractive activities are prohibited, such as Core Zone, Wilderness Zone, Rehabilitation Zone, and Tourism Zone) and Use Zones (zones where limited and restricted extractive activities are allowed such as Limited Use Zone, Sustainable Fisheries Zone, etc.) (Chapter 6). For MMAF MPA categories, each MPA should have at least 2% of its total area allocated as Core Zone based on regulation Permen KP No. PER.30/MEN/2010.

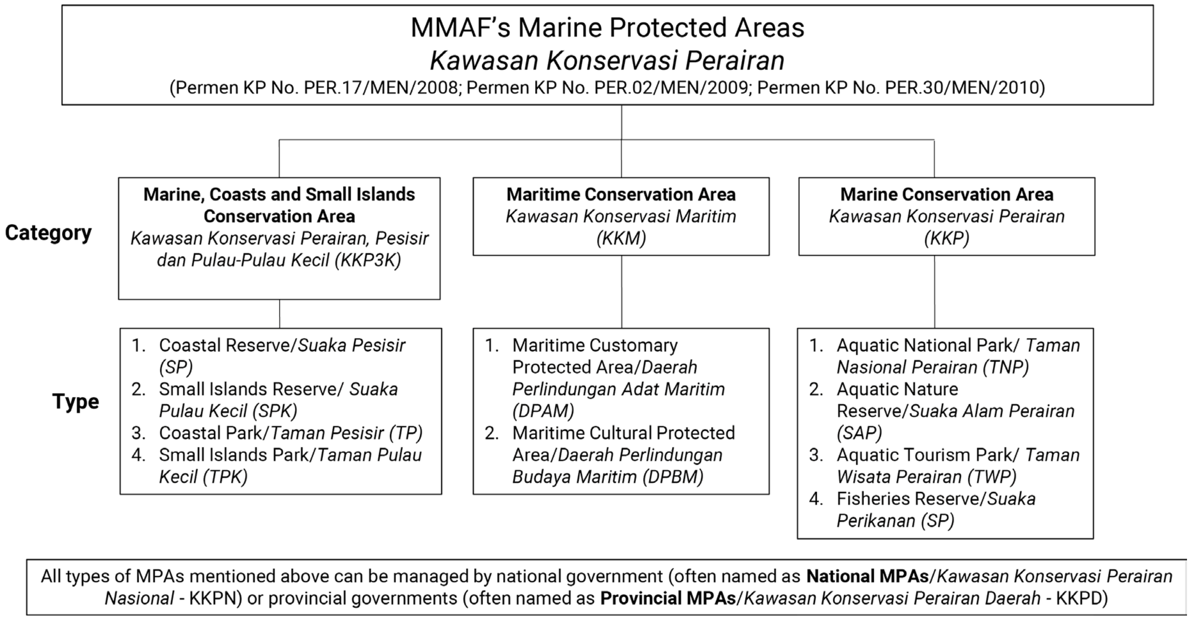

Figure 1.1. MMAF's categories and types of Marine Protected Areas.

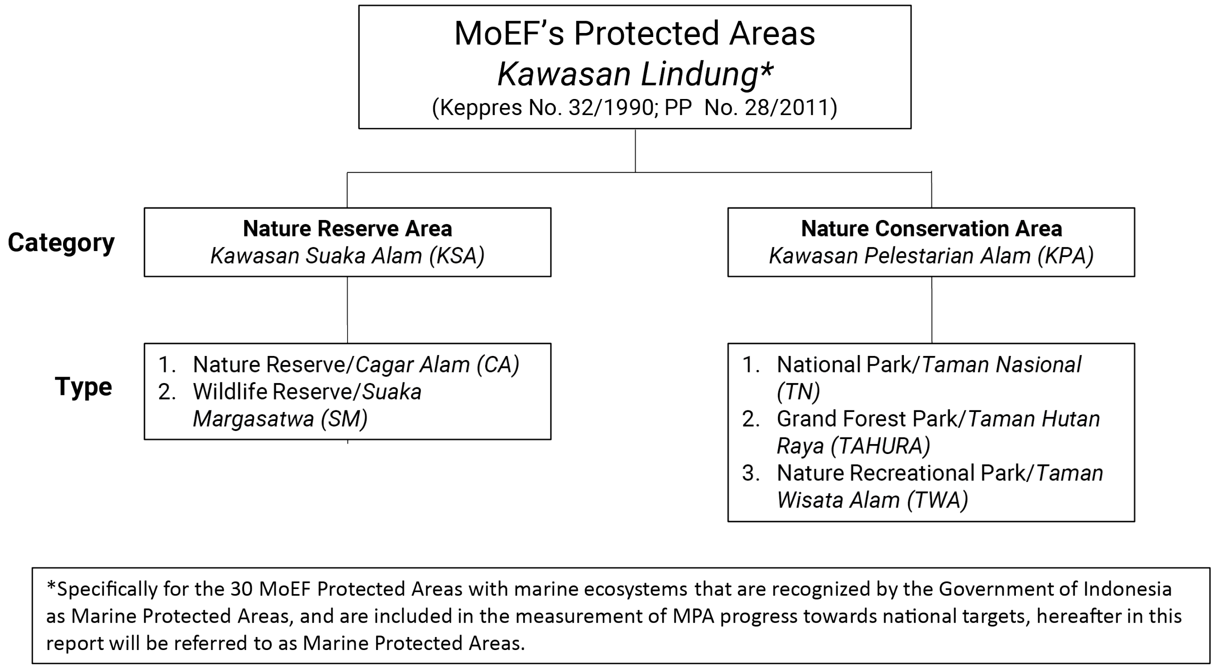

Figure 1.2. MoEF's categories and types of PAs apply to both terrestrial and Marine Protected Areas.

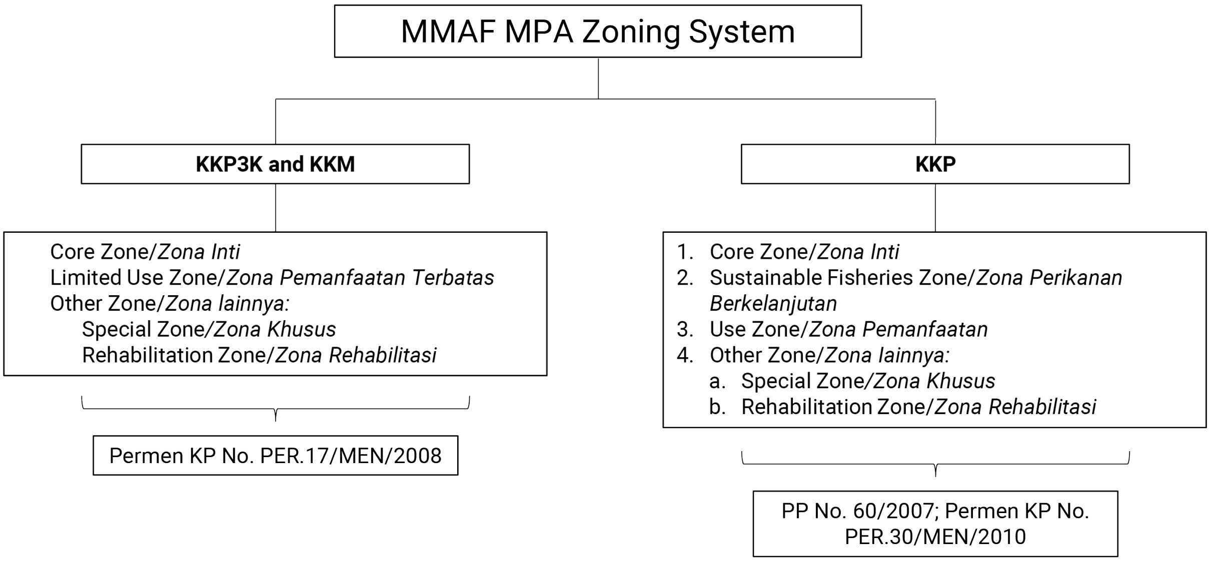

Figure 1.3. MMAF zone classification based on categories of MMAF MPAs. KKP3K: *Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil* (Marine, Coasts and Small Islands Conservation Area); KKM: *Kawasan Konservasi Maritim* (Maritime Conservation Area); KKP: *Kawasan Konservasi Perairan* (Marine Conservation Area).

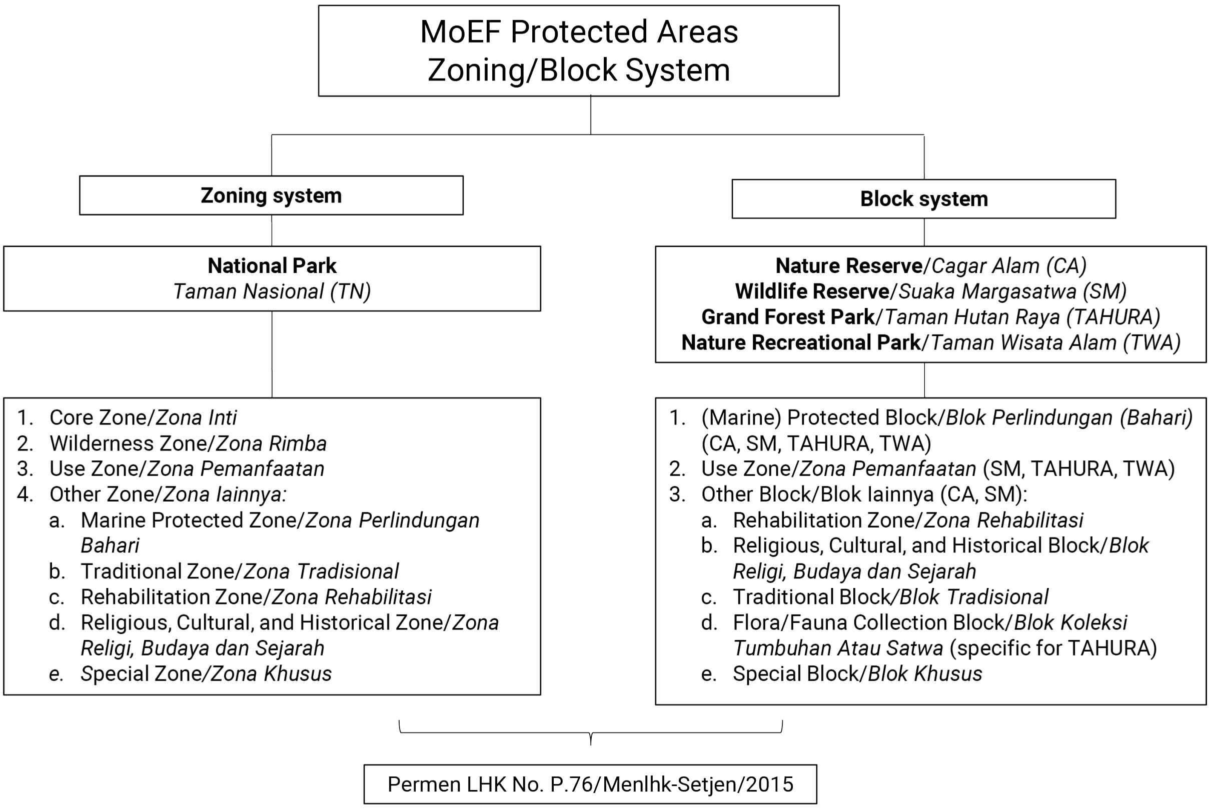

Figure 1.4. MoEF zone/block classification based on types of MoEF PAs.

MPAs under MMAF purview are managed by either national or provincial government agencies. National MPAs (*Kawasan Konservasi Perairan Nasional*/KKPN) are located in trans-provincial areas or in national strategic areas within provincial waters. National MPAs are managed directly by MMAF through dedicated management authority offices (Permen KP No. PER.17/MEN/2008; Permen KP No. PER.02/MEN/2009). For example, TNP (*Taman Nasional Perairan*/Aquatic National Park) Laut Sawu is managed by the National Aquatic Conservation Area/National MPA Management Authority (*Balai Kawasan Konservasi Perairan Nasional*/BKKPN) Office of Kupang (Permen KP No. PER.19/MEN/2007; Case Study 6.A). BKKPN Kupang is a Technical Implementation Unit (*Unit Pelaksana Teknis*/UPT) under direct management of MMAF. In contrast, provincial MMAF MPAs (*Kawasan Konservasi Perairan Daerah*/KKPD) are located within 0–12 nautical miles from the coastline. Provincial MPAs have managing agencies that are overseen by the relevant provincial government under national guidance set by MMAF (UU RI No. 23/2014). The provincial government may delegate an existing marine resource management government agency/office to manage the MPA or establish a new organization to do so. The organizational structure of national and provincial MMAF MPAs is presented in Figure 1.5A and Figure 1.5B, respectively. Despite different institutions managing MPAs in Indonesia, MMAF oversees and supports the overall implementation of MMAF MPAs in the country.

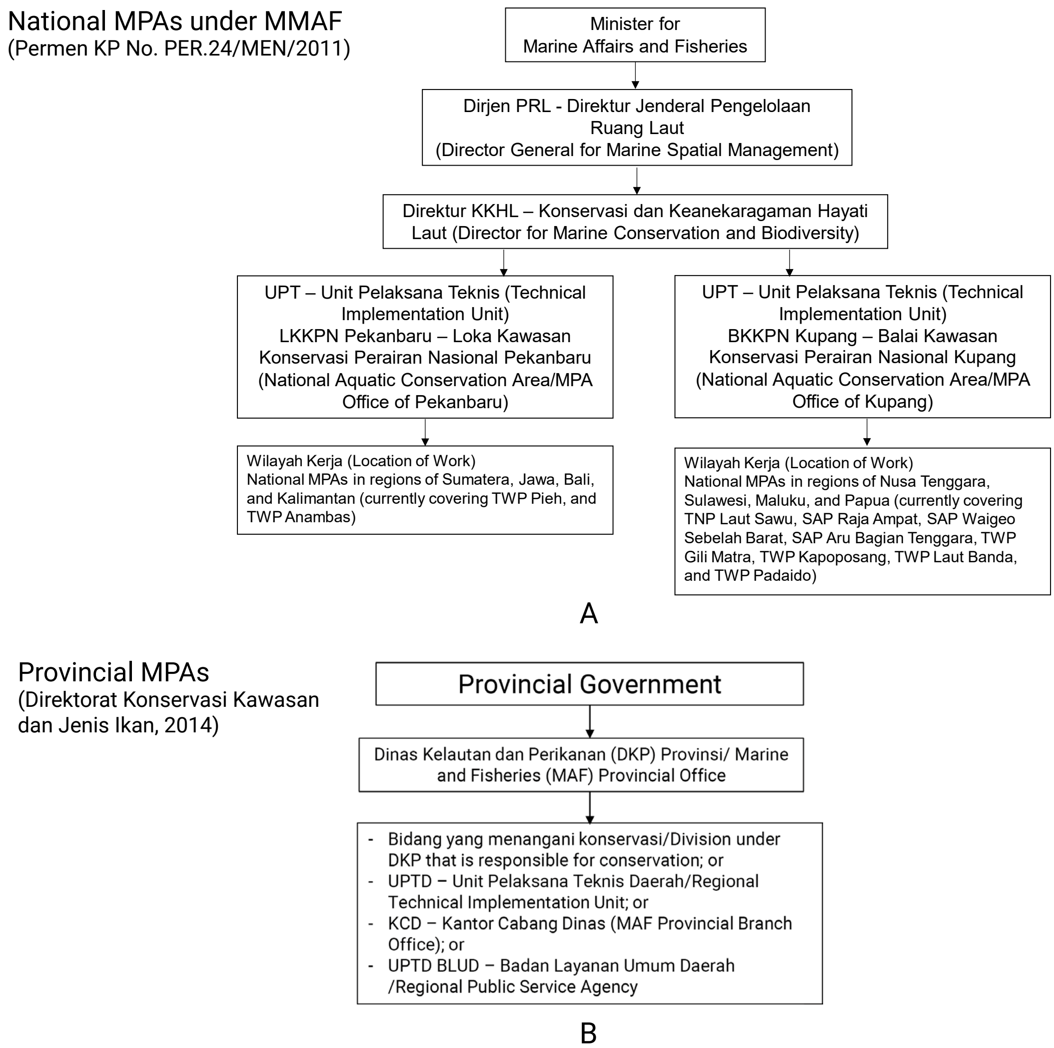

Figure 1.5. Organization structures for the management of National (A) and Provincial (B) MMAF MPAs.

As of December 2019, MMAF managed 166 MPAs across the nation, including ten National MPAs under the direct management of MMAF, and 156 MPAs under the management of provincial governments (Chapter 3). For national MPAs, there are two Regional Technical Implementation Units (*Unit Pelaksana Teknis Daerah*/UPTD) under MMAF managing these MPAs: LKKPN Pekanbaru manages two national MPAs in the western and middle region of Indonesia, and BKKPN Kupang manages eight national MPAs in the eastern region of Indonesia. Provincial MMAF MPAs are managed by the Marine Affairs and Fisheries Provincial Office (*Dinas Kelautan dan Perikanan Provinsi*/DKP) under direction of the provincial government. DKP may establish the MPA management authorities in the form of a UPTD or a Marine Affairs and Fisheries Provincial Branch Office (*Kantor Cabang Dinas*/KCD). Furthermore, a UPTD with advanced financial management can transform into a Local Public Service Agency (Badan *Layanan Umum Daerah*/UPTD-BLUD). In many cases, the establishment of an MPA managing body (i.e. UPTD, KCD, or UPTD-BLUD) will take some time, and before this specialized managing body is formed, the DKP can manage the MPA under the division related to conservation.

The KCD is a DKP branch office that is responsible to manage not only MPAs but also overall marine and fisheries issues at district or provincial levels. The selected type of local management authority depends on the needs and resources at each province. For example, MPAs in Nusa Tenggara Timur (NTT) Province are managed under two KCDs; one KCD manages SAP (*Suaka Alam Perairan/*Aquatic Nature Reserve) Selat Pantar and one KCD manages KKPD Flores Timur, KKPD Lembata, and KKPD Sikka. MPAs in Bali Province are managed by one UPTD, while provincial MPAs in Raja Ampat of Papua Province are managed by a UPTD-BLUD. Currently, there are twelve provinces that have a dedicated MPA management body, i.e. three provinces have a UPTD (Sumatra Barat, Maluku Utara, and Papua Barat), and six provinces have KCDs (Jawa Barat, Jawa Tengah, Jawa Timur, Bali, Nusa Tenggara Barat, and Nusa Tenggara Timur). Note, Nusa Tenggara Barat Province actually has three KCDs, while Nusa Tenggara Timur Province has two KCDs. There are 22 provinces that do not have dedicated MPA management bodies and thus the MPAs within these jurisdictions are managed by the conservation-related division under DKP.

The issuance of a National Law on Local Governance (UU RI No. 23/2014) in 2014 had huge implications for MPA management in Indonesia because the new law mandated the transfer of all types of area management, including MPAs, from district to provincial government. Now, the provincial government needs to hasten the establishment of MPA management bodies with dedicated staff, facilities, work programs, and budget to implement MPAs.

MoEF PAs are managed directly by MoEF under the Directorate General of Forest Protection and Nature Conservation (*Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam*/Ditjen PHKA) (Permen Hut No. P.03/Menhut-II/2007), which in 2015 was changed to the Directorate General of Nature Resources and Ecosystem Conservation (*Direktorat Jenderal Konservasi Sumber Daya Alam dan Ekosistem/*Ditjen KSDAE*)* (Permen LHK No. P.18/MENLHK-II/2015), with management on-the-ground carried out by Technical Implementation Units (*Unit Pelaksana Teknis*/UPTs; Figure 1.6). At the end of 2019, MoEF managed 30 MPAs, including seven marine national parks (*Taman Nasional Laut*/TNL): (1) TNL Kepulauan Seribu, (2) TNL Karimun Jawa, (3) TNL Taka Bone Rate, (4) TNL Wakatobi, (5) TNL Kepulauan Togean, (6) TNL Bunaken, and, (7) TNL Teluk Cendrawasih (Chapter 3). MoEF MPAs are directly managed by either a Nature Resources Conservation Office (*Balai Konservasi Sumber Daya Alam*/BKSDA) or National Park Office (*Balai Taman Nasional*/BTN).

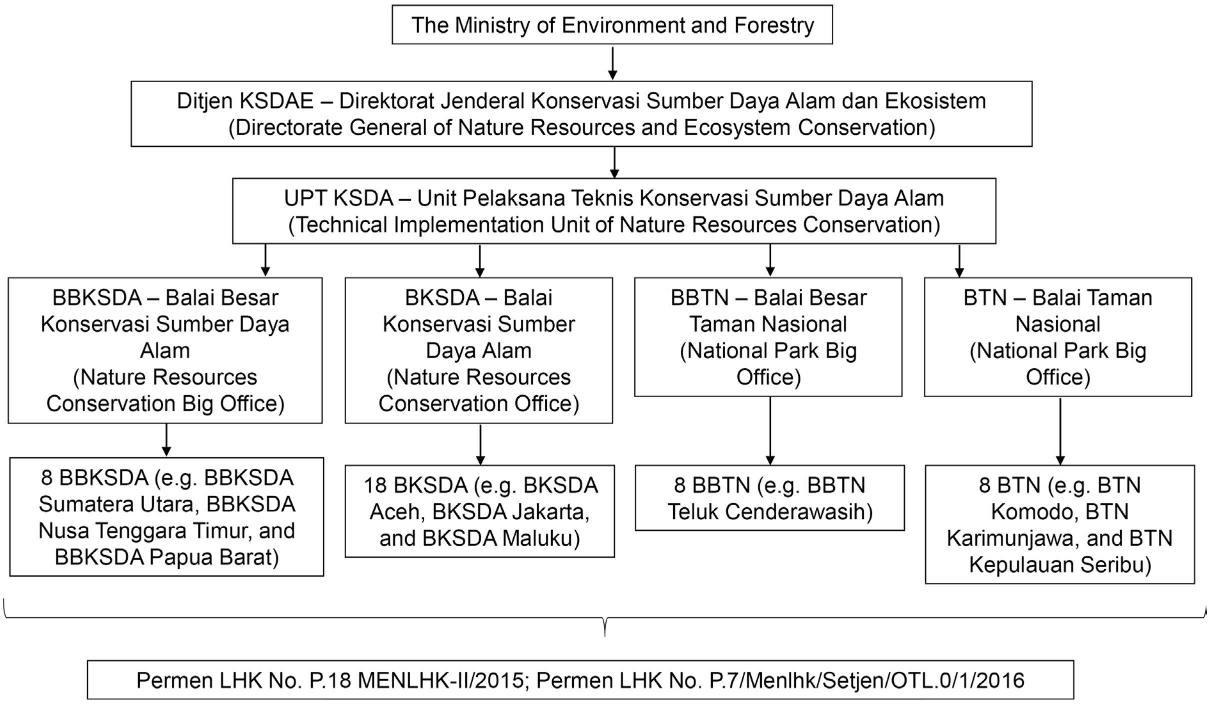

Figure 1.6. Organization structure for management of MoEF PAs and MPAs.

1.5 MPA Establishment and Implementation

MPA establishment and implementation under MMAF and MoEF differs slightly. According to the 2014 guidelines for MPA establishment published by MMAF (Lubis et al. 2014b), the establishment process is governed by two regulations depending on the MPA categories: (1) the establishment procedures for Marine Conservation Areas (KKP) (Permen KP No. PER.02/MEN/2009) and (2) establishment procedures for Marine, Coasts, and Small Islands Conservation Areas (KKP3K) and Maritime Conservation Areas (KKM) (Permen KP No. PER.17/MEN/2008). Figure 1.7 outlines the process for establishment specifically for MMAF's KKP3Ks and KKPs — two MPA categories which have the majority of MPA types.

There are two broad steps of provincial MMAF MPA establishment: (1) initiation (*pencadangan)* — a phase to formally propose an area as an MPA. During this step, common outer boundaries, objectives, and initial ecological and social condition are defined. MPA initiation can be formalized under the provincial governor's decree; and (2) establishment (*penetapan*) — a phase to formally establish the proposed MPA. During this step, the provincial government and MMAF define the type and objective of MPAs, the boundary and zoning system, as well as develop a management plan and management unit. Establishment of an MPA can be formalized under an MMAF minister decree. In some cases, the process to initiate and/or establish an MPA can be complex and time-consuming (Chapter 5), and is influenced by resource availability, political climate, and needs. MMAF includes both initiated MPAs and established MPAs when calculating the total and extent of MPAs in Indonesia.

Unlike MMAF MPAs, MoEF MPAs do not have an "initiation" phase. All MoEF MPAs can be directly established after all requirements are fulfilled (PP RI No. 28/2011). Once or during when an MoEF MPA is being established, the next step is to design and formalize the zoning/block system (Permen LHK No. P.76/Menlhk-Setjen/2015b; Figure 1.8).

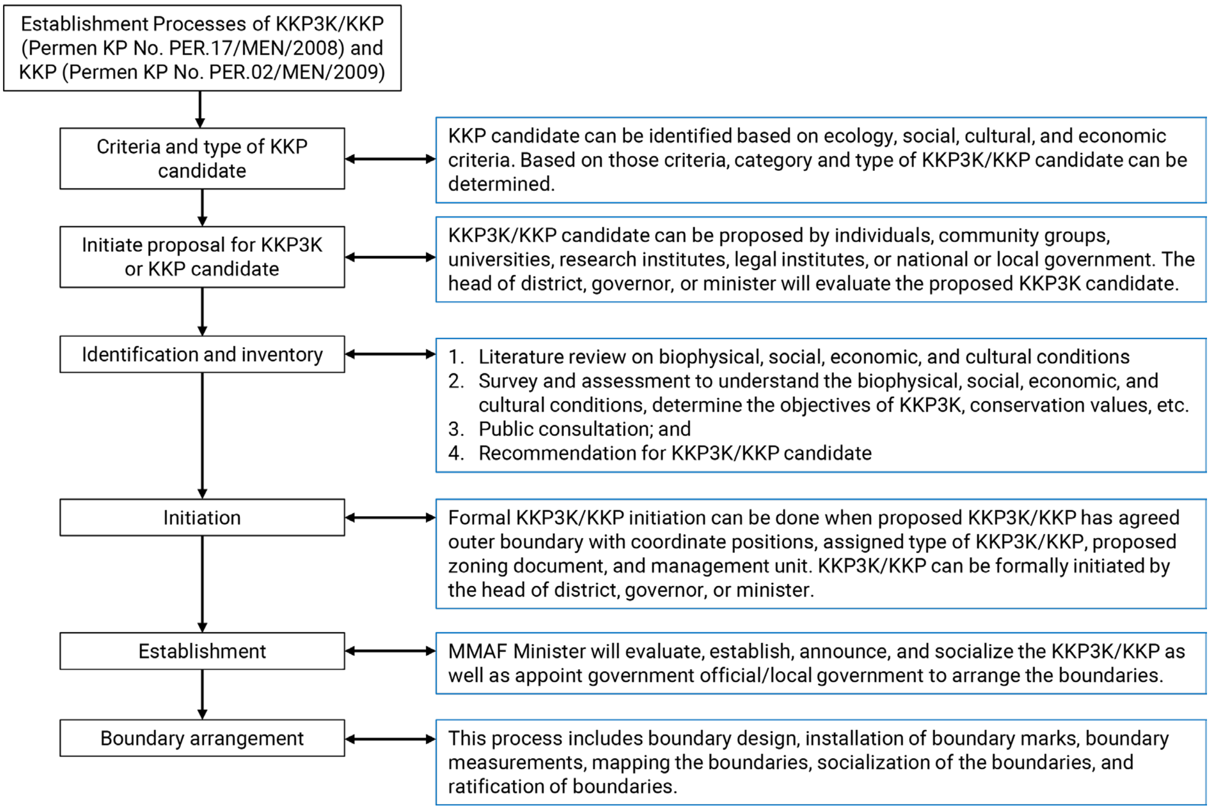

Figure 1.7. Establishment processes of MMAF MPAs (KKP3K and KKP).

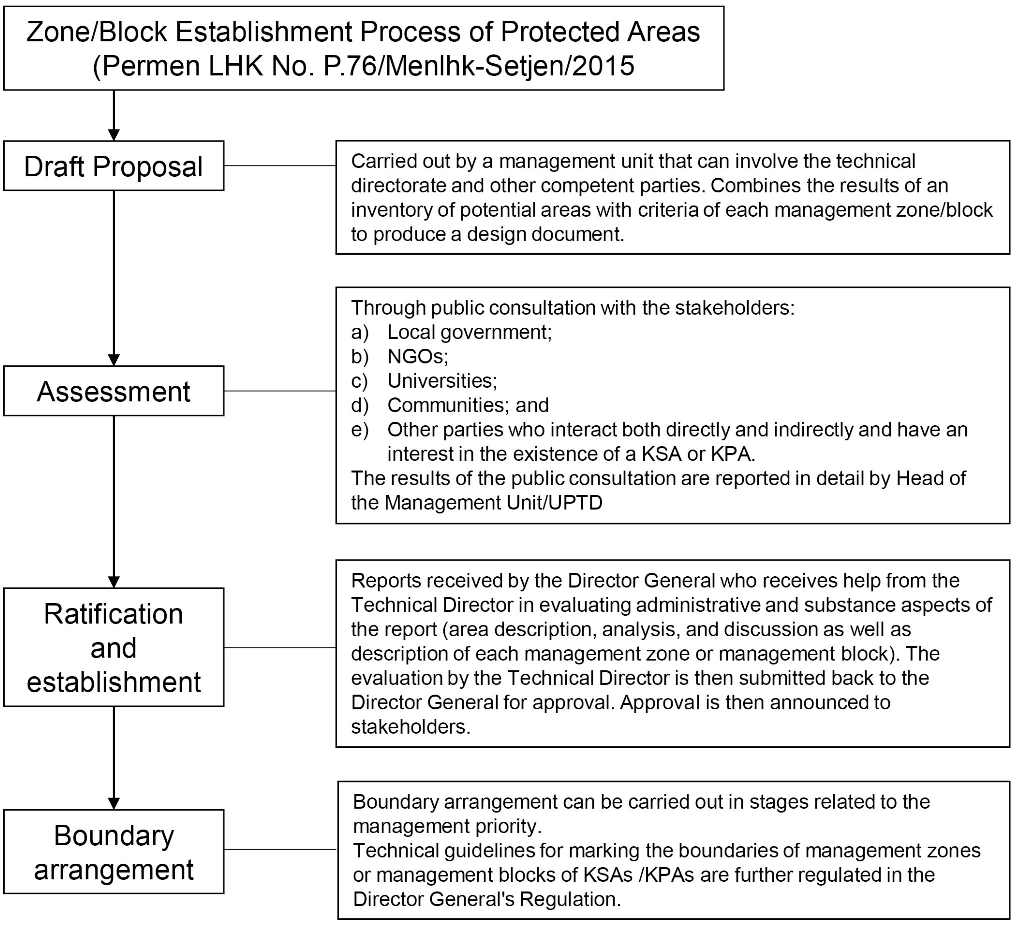

Figure 1.8. Zone/block establishment process of MoEF PAs.

Table 1.2. MPA management under MMAF

Tool/Aspect	Explanation
Regulation and Policy	Besides zonation and management plans, the MPA management authority should also develop other technical regulations such as management Standard Operating Procedures (SOPs), guidelines for monitoring and evaluation, etc.
Institutions	BKKPN and LKKPN are responsible for managing the national MPAs. Provincial MPAs can either be managed directly under the provincial DKP with no specific institutional entity, or the Governor can establish a UPTD or KCD.
Human Resources	The MPA management authority should prepare a team of experts and a technical team to fulfill some functional roles for MPA management, including but not limited to: conservation planning, control and evaluation, and community empowerment.
Facilities and infrastructure	The MPA management authority should develop and provide adequate and necessary facilities and infrastructure for MPA implementation. This can be varied from providing boats for patrol, designating offices within the MPA area, to installing signboards or buoys to mark the MPA boundaries.
Financing	To be implemented effectively and efficiently, an MPA should have adequate financial capacity. Sources of budgets for MPA implementation can be varied from the National Income and Expenditure Budget (Anggaran Pendapatan dan Belanja Nasional/ APBN), Provincial Income and Expenditure Budget (Anggaran Pendapatan dan Belanja Daerah/APBD), and/or other non-binding sources such as donation, entrance fees, corporate social responsibility funding, etc. See Case Study 1.A for example of sustainable financing in the Bird's Head Seascape.

Source: modified from Halim (2014); Lubis et al. (2014a).

Once an MPA is formally established, MPA managers should ensure the management tools are in place and the MPA is well-enforced so it can deliver its intended goals. There are a few tools or aspects that should be fulfilled by MPA managers when implementing their MPA, including regulation and policy, institutions, human resources, facilities and infrastructure, and financing (modified from Halim 2014). Table 1.2 summarizes the explanation and provides examples specifically from MMAF MPA categories for each MPA management tool/aspect.

While some MPA establishment and implementation in Indonesia applies a top-down approach, often this is combined with more "bottom-up" approaches. In the latter, the roles of communities and stakeholders are crucial, especially in building organic relationships and involvement in MPA implementation. A "bottom-up" approach is used for proposing new MMAF MPAs based on community as well as district and provincial government interest following Permen KP No. PER.02/ MEN/2009 and UU RI No. 2/2009. This usually involves local community participation in initiation and zoning, and then, once established, in enforcement and/or monitoring (Kusumawati and Huang 2015). Communities can also have influence in determining the location, size, type, objectives, and zones of an MPA. MoEF PAs are governed based on the National Law, UU RI No. 32/2009b, with a more comprehensive management style but lower level of opportunity for co-management with local stakeholders. The nature of the regulation plays an important factor for either ministry when it comes to co-management. The process of MPA establishment in Indonesia combining "bottom-up" and "top-down" approaches may be a lengthy one, requiring at least five years in many cases. However, appropriate design and implementation, such as for the Raja Ampat MPAs, demonstrates the effective integration of local customs through a bottom-up process, leading to high compliance and positive impacts on the well-being of local communities and conservation outcomes (Ahmadia et al. 2015).

1.6 Monitoring, Evaluation, and Learning

Monitoring, evaluation, and learning (MEL) is essential to improve management effectiveness, and both ministries have processes in place for MPAs. MEL here has a broad definition, including monitoring and evaluation of MPA establishment and implementation processes, assessing the ecological and social outcomes from MPA implementation (Chapter 4), and evaluating MPA management effectiveness (Chapter 5). This can then feed into adaptive management to improve MPA performance. Key successes for MEL within MPAs include that monitoring is conducted regularly, standardized across surveys, and involve various stakeholders and experts to support it — with results feeding back into changes in management. The MEL system is often included in the management plan developed by the MPA management authority and may vary in each MPA depending on the objectives of the MPA and management resource capacity. Despite these differences, to evaluate MPA management effectiveness, the Government of Indonesia (GoI) uses two tools: MMAF uses E-KKP3K — *Evaluasi Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil* (Management Effectiveness of Aquatic, Coasts and Small Islands Conservation Areas) tool (KKJI 2012), and MoEF uses the Management Effectiveness Tracking Tool (METT) (KSDAE 2015) (Chapter 5). In addition to these regular assessments, a formal evaluation process is conducted in MMAF MPAs to review the management plan and zoning system every five years, and a broader long-term plan for the MPA is reviewed every 20 years (Permen KP PER.30/MEN/2010). MoEF MPAs conduct evaluations for zone and block management every ten years, though this can also be done at more frequent intervals if the management authority belives there is a need to adjust zonation or management plans more frequently (Perdirjen KSDAE No. P.14/KSDAE/SET/KSA.0/9/2016).

1.7 Challenges and Opportunities

MPAs in Indonesia that are formally recognized under the GoI's MPA definition are governed by the national government (MMAF or MoEF) or provincial governments (or their delegated agencies). This centralized governance is seen as core to the GoI's definition of MPAs and associated Indonesian laws and regulations on MPAs. Given the wide geographic area of Indonesia and diversity cultures and resource management traditions held by the Indonesian people this can cause some challenges. Other community, local, customary, or private initiatives that may primarily aim to conserve biodiversity and so meet the IUCN definition of an MPA, such as locally managed marine areas (LMMA) or private protected areas, thus cannot be recognized as MPAs unless they are formally proposed to and established by governments — with associated governance rights transferred. Many of these initiatives, especially those that are related to customary/traditional management, have been implemented for generations and are known to have high compliance, and in fact, can contribute to biodiversity conservation similarly to MPAs. Recently, Indonesia has begun discussions on the adoption of the IUCN Other Effective Area-Based Conservation Measures (OECM) framework. OECMs hold great promise for the GoI to recognize the contributions of such initiatives to biodiversity conservation (Chapter 10).

It can be argued that the biggest adjustment from a governance perspective for MPAs was the shift in management of marine waters 0–4 nautical miles, from the district to the provincial level in 2014 (UU RI No. 23/2014). As a result, some structural components for MPAs under district authorities were transferred to provincial governments, including Personnel, Financing, Equipment (Facilities and Infrastructure), and Documentation (*Personil, Pembiayaan, Peralatan dan Dokumentasi*/P3D (UU RI No. 23/2014 Article 41)). Unfortunately, the transition process has been facing challenges such as a lack of human resources, insufficient financial and management planning from the provinces, disruption to the shifting process, and some other constraints, notwithstanding the need of an MPA management entity at the provincial level.

Most local MMAF MPA categories currently do not have dedicated management bodies yet, and marine conservation areas are managed by the MAF provincial offices. Most provincial MMAF MPAs (71%) are managed directly by the provincial government, indicating that the government has not specifically designated a separate MPA management authority to govern a marine conservation area. Only 10% of provincial MMAF MPAs are managed by an MPA management authority (UPTD), and 19% by the provincial branch office (KCD). With the ambitious national target to establish 32.5 million ha of MPAs and improve the management effectiveness of existing MPAs by 2030, dedicated MPA management body establishment is an urgent requirement to support MPA implementation.

Case Study 1.A
Blue Abadi Fund: Sustainable Funding for Marine Conservation Programs in the Bird's Head Seascape

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In 2009, Conservation International (CI), The Nature Conservancy (TNC) and World Wildlife Fund (WWF) launched the Bird's Head Seascape (BHS) Initiative conservation program joint with government, local universities, and other key stakeholders in Papua Barat Province. This initiative recognized the incredible wealth of marine ecosystems in the BHS, and high threat facing them.

Since its inception, the program has aimed to conserve the incredible marine biodiversity of the BHS while empowering local communities and ensuring their food security and livelihoods. The BHS Initiative continues to grow, involving many local and international partners that jointly support community-driven conservation work, proving together that this can happen on a large scale. In the spirit of development, the local community in collaboration with the government has succeeded in building a network of 12 marine conservation areas covering 3.6 million ha. Patrols with the local community have succeeded in reducing illegal and destructive fishing by up to 90%, which in turn resulted in a significant increase in fish biomass, thereby contributing to increased food security. An added value is the increase in marine tourism in the region. This has led to the district government framing its development vision for the province around both marine tourism and sustainable fisheries—a very different vision to that based on extractive mining and logging espoused several decades prior in the region.

After more than a decade of work, this coalition sees the urgent need to ensure that effective conservation interventions are sustained, and to endow local communities and governments with strengthened capacities to manage these conservation areas and programs. A crucial component of this is long-term sustainable financing for the work in the region. To that end, the coalition partners of BHS and the government of West Papua launched the Blue Abadi Fund — an initiative to ensure the financial sustainability of conservation in this seascape.

The Blue Abadi Fund (BAF) is valued at USD 38 million and was set up based on cost modelling carried out with partners when the Fund was launched to support BHS conservation. BAF is not intended to fund core conservation area management activities (e.g. basic operating budgets for management) but is intended to supplement government and other funding sources to fill remaining gaps in conservation areas or conservation programs after core funding has been provided.

Governance

The Fund's decision-making is directed by a Governance Committee (GC) consisting of nine representatives which are appointed by the individual institutions or stakeholder groups that they represent. Currently these are: (1) Papua Barat Provincial Government, (2) Bappenas (National Development Planning Agency), (3) Papuan People's Council, (4) Walton Family Foundation (as current donors), (5) representatives of other major donors (jointly appoint one representative, currently represented by USAID), (6) Conservation International, (7) The Nature Conservancy and WWF-Indonesia (jointly appoint one representative), (8) National Chamber of Commerce and Industry and (9) financial experts (currently represented by Felia Salim). The Committee is assisted in its considerations by three advisory bodies: the Scientific and Conservation Technical Advisory Committee (SCTAC), the Local Representative Committee (LRC), and the Finance Advisory Committee (FAC). Decisions made by the Committee are also based on the direction of the five year BAF Strategic Plan.

The BAF funding process is managed by an institution (currently Yayasan Kehati) that functions as an administrator of operations. Administrators are tasked with carrying out decisions made by the Governance Committee, especially channelling funds to prospective recipients and their associated management bodies. Administrators also play a very important role in preparing the Committee meeting process and reporting on the implementation of funds and progress of projects of fund recipients. They also carry out fund management based on the direction of the BAF Operation Manual, a document that acts as a technical reference for the implementation of grant distribution.

There are two types of grants currently distributed by BAF:
1. Primary grant, which aims to support the management of approximately 3.6 million ha of Marine Protected Areas in the BHS.
2. Innovation Small Grant, which aims to encourage and empower a network of local civil society organizations in the BHS to complement the conservation efforts mandated by the government.

Currently, BAF has channelled approximately IDR 40 billion (up to USD 2.7 million) for the management of conservation areas and promoted conservation programs in the community by local organizations in the BHS.

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Chapter 2. Community Involvement in Marine Protected Area Governance

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Abstract

Good governance is a key indicator for effective management of Marine Protected Areas (MPAs). Community involvement is an integral part of this governance. Community involvement is important to ensure that people's inclusive rights in the sustainable use of marine resources can be fulfilled, that knowledge and practices of community-based management (customary and modern society) are recognized and accommodated in MPA management plans. This chapter provides an introduction to the principles of governance and how they are applied within the formal Indonesian MPA context. This includes literature review and case studies on how communities are involved in MPA governance, and the importance of community ownership and appropriateness to the local context. The final section of this chapter highlights opportunities for an increased role that communities can play in the governance of MPAs in Indonesia. With a rich and diverse history of local and customary wisdom for managing marine resources, there are opportunities to revitalize and transform customary institutions to co-manage effective and inclusive MPAs to achieve positive conservation and socio-economic outcomes.

Abstrak

Tata kelola yang baik merupakan salah satu indikator yang perlu dicapai dalam pengelolaan Kawasan Konservasi Perairan (KKP) yang efektif. Keterlibatan masyarakat merupakan bagian yang tak terpisahkan dalam tata kelola tersebut. Keterlibatan masyarakat penting untuk memastikan hak-hak inklusif masyarakat dalam pemanfaatan sumber daya laut secara berkelanjutan bisa terpenuhi, pengetahuan dan praktik pengelolaan berbasis masyarakat (masyarakat adat dan modern) diakui dan terakomodir dalam rencana pengelolaan KKP. Bab ini memberikan pengantar tentang prinsip tata kelola dan regulasi-regulasi yang terkait. Bagaimana masyarakat dapat dilibatkan dalam tata kelola, rasa kepemilikan, kepengurusan, dan kesesuaian dengan konteks lokal disajikan melalui kajian literatur dan studi kasus. Bagian terakhir dari bab ini menyoroti peluang yang muncul untuk peningkatan peran yang dapat dimainkan masyarakat dalam tata kelola KKP di Indonesia. Dengan sejarah yang kaya dan beragam terkait kearifan lokal maupun adat untuk mengelola sumber daya laut, ada peluang untuk merevitalisasi dan mentransformasi lembaga adat menjadi KKP yang efektif dan inklusif untuk mencapai hasil positif konservasi dan sosial ekonomi.

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2.1 Introduction and Principles of Governance

In this chapter, different types of community involvement in Marine Protected Areas (MPAs) in Indonesia are discussed. Principles of governance are outlined, followed by a literature review detailing the strengths, best practices, and risks of co-managed MPA governance. The second half of the chapter focuses on community involvement in MPAs in Indonesia, with an overview of relevant Indonesian legislation, scope of community involvement, and current opportunities for community involvement.

Governance is a mechanism fundamental to effective Protected Area (PA) management, encompassing the interactions, relationships, and systems that shape management. The definition used by the International Union for the Conservation of Nature (IUCN) is:

> *"the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say. Fundamentally, it is about power, relationships, and accountability: who has influence, who decides, and how decision-makers are held accountable.* (Graham, Amos, and Plumptre 2003)

Locally appropriate governance is crucial for effective and equitable conservation and achieving both biodiversity and social outcomes of conservation. For a more detailed set of definitions, please refer to Chapter 1 .

Contrasting to this, management covers objectives, plans, and tools, for example, management interventions like MPAs. Effective governance is the input of and relationship between institutions, processes, and structures that ensure issues are resolved. In order for management to be effective, governance inputs must be effective.

There is a vast range of PA governance forms throughout the world, which makes assessments and evaluations challenging. To rectify this, IUCN and the United Nations (UN) Convention on Biological Diversity (CBD) distinguish four governance types shown in Table 2.1. Whereas Chapter 1 focuses on governance structures associated with governance Type A MPAs, this chapter is primarily focused on governance Types B, C, and D. It also includes some examples of community involvement in MPA governance or management of governance Type A MPAs.

Table 2.1. Governance types recognized by IUCN.

Governance Type (Letter)	Governance Type
A	Governance by government (see Chapter 1 for more details)
B	Shared governance by various rights holders and stakeholders
C	Governance by private individuals and organizations
D	Governance by indigenous peoples and/or local communities

Source: Borrini-Feyerabend et al. (2014)

This chapter adopts a broad definition of "community", covering IUCN governance types B-D. These will be presented in the context of Indonesia later in this chapter in section 2.7 Community involvement in marine governance in Indonesia:

- **Type B: Shared governance** — this broad term refers to governance arrangements that include a range of different stakeholders, often including national government, provincial and/or local government, private sector, non-government organizations (NGOs), universities, and local community institutions and stakeholders. These types of shared governance can vary significantly in terms of scope of involvement of local communities. Shared governance — often termed co-management — arrangements can include locally managed marine areas (LMMAs).

- **Type C: Governance by private individuals and organizations** — entrepreneurial or private MPAs are defined by activities of commercial enterprises such as dive centers or hotels, including self-financing, conservation planning, and management (Bottema and Bush 2012). Areas are frequently owned by the private company/individual or leased from the local community or government.

- **Type D: Governance by indigenous peoples and/or local communities** — this includes customary institutions based around cultural customs or traditions, and how they govern access to and conservation of resources (Coulthard 2011). This category also includes Territorial Use Rights in Fisheries (TURFs), where individuals or a group of fishers are granted access and use privileges to exploit fisheries resources in a particular area (Dang et al. 2017). Indigenous and Community Conserved Areas (ICCAs) — territories of life — which are defined as territories and areas conserved by indigenous peoples and local communities, are another example. Communities act as custodians who make and enforce rules that support both conservation of nature and community well-being, frequently based around a close and deep connection between people and land or ocean-based around sociocultural and spiritual identity (Farvar 2018).

It must be noted that these categories are not absolute. Governance arrangements may draw elements from different governance types, like co-management that includes private sector and/or local community involvement. Furthermore, what may be regarded as "private-led governance "in one context could be regarded as "co-management" in another. These categories should therefore be regarded as guidance.

There are numerous disciplinary approaches and frameworks used to examine natural resource management and governance—for example, resilience, environmental conservation, environmental and resources economics, political ecology, and common-pool resource governance (Cox et al. 2016). Ostrom's eight principles for effective Common Pool Resource (CPR) governance are widely recognized as a useful conceptual framework for characterizing governance institutions (Ostrom 2015):

1. Define clear group boundaries.
2. Match rules governing use of common goods to local needs and conditions.
3. Ensure that those affected by the rules can participate in modifying the rules.
4. Make sure the rule-making rights of community members are respected by outside authorities.
5. Develop a system, carried out by community members, for monitoring members' behavior.
6. Use graduated sanctions for rule violators.
7. Provide accessible, low-cost means for dispute resolution.
8. Build responsibility for governing the common resource in nested tiers from the lowest level up to the entire interconnected system.

Ostrom argues for a diagnostic approach that uses *"a common framework to diagnose the source, and possible amelioration, of poor outcomes for ecological and human systems"* (Ostrom and Cox 2010), while recognizing that these are highly context-specific and grounded in the unique social, cultural, economic, ecological, political, legislative, and geographic realities of each CPR.

2.2 Inclusivity and Equity in Conservation

There is a wide consensus that communities must be actively engaged in conservation for it to be effective and fair. The term "inclusive conservation" is used for this people-centered approach to conservation, and was recently adopted by the Global Environment Facility (GEF) in its 2018–2020 biodiversity financing program (Farvar 2018).

Inclusive conservation is:

> *"conservation where indigenous peoples and local communities are the key actors governing, managing, and conserving their lands, waters, and other gifts of nature and, as necessary and desired, invite others to collaborate with and support them on community-defined terms"* (Farvar 2018).

Inclusive conservation views communities as allies and partners in conservation, as opposed to "fortress conservation" approaches that exclude the rights, perspectives, and resource use of local communities (Ferse et al. 2010). Inclusive conservation recognizes that local and indigenous knowledge, and the value and belief systems that exist within, have conserved ecosystems throughout the world for generations.

Closely-related is the notion of "equitable conservation", present in Aichi Target 11 of the CBD which advocates that "*10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas…*". In addition, the CBD "Program of Work on Protected Areas" is structured around four elements of which element 2 is focused on "Governance, Participation, Equity and Benefit Sharing". Within element 2, Goal 2.1 calls for the promotion of "*equity and benefit sharing*" and Goal 2.2 calls for enhancing "*involvement of indigenous and local communities and relevant stakeholders*".

This view is guided by a recently developed equity framework for PAs that outlines three interlinked dimensions, supported by enabling conditions (Figure 2.1):

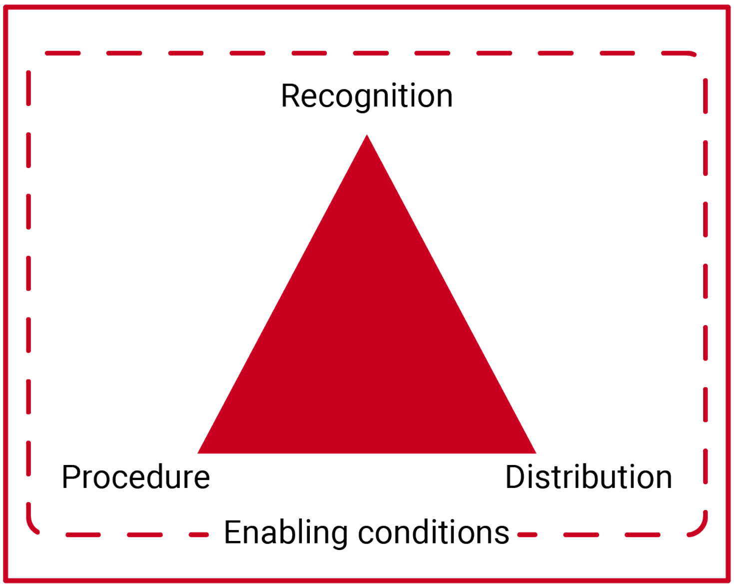

Figure 2.1. Equity framework for Protected Areas in conservation. Source: McDermott, Mahanty, and Schreckenberg (2013); Schreckenberg et al. (2016).

Table 2.2. Three dimensions of equity, equity principles for each equity dimension, and enabling conditions to support equitable conservation

<table>
<tr><th>Equity Dimensions</th><th>Equity Principles</th><th>Enabling Conditions</th></tr>
<tr><td>RECOGNITION</td><td>1. Recognition and respect for human rights
2. Recognition and respect for statutory and customary property rights
3. Recognition and respect for the rights of indigenous peoples, women, and marginalized groups
4. Recognition of different identities, values, knowledge systems, and institutions
5. Recognition of all relevant actors and their diverse interests, capacities, and powers to influence
6. Non-discrimination by age, ethnic origin, language, gender, class, and beliefs</td><td rowspan="3">1. Legal, political, and social recognition of all protected area governance types
2. Relevant actors have awareness and capacity to achieve recognition and participate effectively
3. Alignment of statutory and customary laws and norms
4. An adaptive learning approach</td></tr>
<tr><td>PROCEDURE</td><td>7. Full and effective participation of all relevant actors in decision-making
8. Clearly defined and agreed responsibilities of actors
9. Accountability for actions and inactions
10. Access to justice, including an effective dispute-resolution process
11. Transparency supported by timely access to relevant information in appropriate forms
12. Free, prior, and informed consent for actions that may affect the property rights of indigenous peoples and local communities</td></tr>
<tr><td>DISTRIBUTION</td><td>13. Identification and assessment of costs, benefits, and risks and their distribution and trade-offs
14. Effective mitigation of any costs to indigenous peoples and local communities
15. Benefits shared among relevant actors according to one or more of the following criteria:
- equally between relevant actors or
- according to contribution to conservation, costs incurred, or
- recognized rights and/or priorities of the poorest
16. Benefits to present generations to not compromise benefits to future generations</td></tr>
</table>

Source: Franks, Martin, and Schreckenberg (2016) as cited in Schreckenberg et al. (2016).

Three dimensions of equity, equity principles, and the necessary enabling conditions (Table 2.2) provide a guideline for stakeholders involved in resource management in order to achieve equitable and inclusive conservation. The framework adopts a people-centered approach to conservation based around equity and justice. Although the number of PAs globally has increased dramatically in recent decades, there has been criticism that the benefits of biodiversity conservation have come at a cost to indigenous and local communities (Schreckenberg et al. 2016). The equity framework provides a human-rights based approach to conservation that is centered on dignity and respect that **includes** rather than excludes communities. Speaking with and listening to communities in order to recognize their rights, values, skills, and priorities, designing and implementing processes that ensure inclusive participation, and fair distribution of the costs and benefits of conservation are crucial steps in reducing conflict and fostering community compliance and support for conservation measures. Inclusive and equitable conservation measures place local communities as the primary actor involved in management. The governance mechanisms that input into this management must be equitable and inclusive.

When considering equity in conservation it is crucial to move beyond the frequent homogenization and generalization of communities as a single unit, recognizing that all communities are made up of a diverse range of perspectives, values, and identities (Agrawal and Gibson 1999; Voyer et al. 2015). Community identity must not be equated with villages, as villages often contain diverse peoples with different identities and values or distinct communities can span multiple villages (Aswani, Albert, and Love 2017). This can lead to polycentric governance systems: individuals, systems, or institutions of power and decision-making independent of each other yet frequently overlapping at different spatial scales and structural levels (Aswani, Albert, and Love 2017). An example of this could be a village composed of groups or individuals from different ethnic, religious, or tribal backgrounds, and the mixture of unique cultural and political systems that govern day-to-day life. However, in many nations — such as Indonesia — villages are a recognized unit of governance in national law that can in theory be allocated rights or empowerment through some form of ordainment.

Attention must be given to "social differences", such as age, gender, ethnicity, religion, and economic and political status, and how these can shape behavior, perceptions of and responses to management, and knowledge of and access to marine resources (Fabinyi, Knudsen, and Segi 2010). In particular the gendered nature of marine resources must be carefully considered, with women's roles historically ignored, invisible, and unrecognized despite the pivotal roles they play in household food and nutrition security (Kawarazuka and Béné 2010). Research has highlighted that MPAs are frequently gender insensitive, failing to account for the gendered nature of marine resource knowledge and use (De la Torre-Castro et al. 2017; Fröcklin et al. 2013; Kleiber, Harris, and Vincent 2018).

2.3 The Case for Community Involvement in MPAs

Research indicates that the empowerment of people and equitable sharing of benefits increases the likelihood of effective conservation (Schreckenberg et al. 2016). Community involvement in MPA governance can foster or legitimize a sense of ownership and stewardship of resources (Bennett and Dearden 2014; Christie and White 2007; Clifton 2013). Community participation in the creation, design, and implementation of MPAs, recognition of community rights to rule-making, delineation of MPA boundaries and zonation, and the development of systems for monitoring, enforcement, and conflict resolution reduce the likelihood of conflict between stakeholders in MPAs (Ostrom 2015).

A focus on social outcomes can support

poverty alleviation, livelihood development, and other tangible economic incentives, and a reduction in illegal and destructive practices (Campbell et al. 2013). If these are delivered equitably across and between communities, it can contribute to support of and compliance for management regulations and the achievement of biodiversity outcomes.

Respect for and utilization of local and indigenous knowledge and integration of cultural norms and traditions are crucial in promoting local stewardship and legitimacy, while also providing context-specific understandings of biophysical and sociocultural processes (UN Environment 2019; Voyer et al. 2015). Studies in Indonesia have shown that the absence of existing customary institutions for marine governance results in limited acceptance and awareness of MPAs, indicating the effective role of developing hybrid customary-modern management regimes (Ferse et al. 2010). Failing to take account of and integrate existing institutions can also reduce legitimacy, leading to the perception of MPAs as being imposed by external elites with little understanding of people's concerns and priorities (Bennett and Dearden 2014). Genuine community involvement in governance can therefore ensure that management planning and outcomes reflect and take account of local needs and local conditions (Bennett and Dearden 2014; Cinner 2007; Schreckenberg et al. 2016). Involvement of local communities in governance can also raise awareness of graduated sanctions and defined boundaries, and improve rights to participate in and enforce rules and regulations, all of which can greatly reduce the risk of conflict (Campbell et al. 2013; Ostrom 2015).

Compared with high income countries where "top-down", state-led approaches have and continue to be used, shared governance, governance by private entities, and governance by indigenous peoples and/or local communities are frequently adopted in low- and middle-income countries, as they can be cost-effective, especially in large archipelagic countries such as Indonesia (Ban et al. 2011; Christie and White 2007).

2.4 Risks from Lack of Community Involvement in MPAs

One of the main challenges of community involvement in governance is the need to balance and reconcile different aims. MPAs are frequently heralded as a "win-win" solution to meet conservation and development aims, yet research has shown this is rarely the case in reality (Chaigneau and Brown 2016). Tensions exist between MPAs primarily focused on conservation and rooted in scientific knowledge, and customary approaches being built upon predominantly cultural foundations (Fache and Breckwoldt 2018). This extends to a broader tension between views of the marine environment to support subsistence and livelihoods compared with a more traditional conservation perspective (Clifton 2013). If communities are meaningfully involved in MPA governance, with management genuinely integrating their concerns and values, the risk of conflict due to competing aims can be greatly reduced.

Conflict is a major challenge associated with MPA governance, with conflicts occurring in various directions, and involving different actors: communities with managers, communities with monitors and enforcement, communities with the government, and communities with private sector actors involved in the development of MPAs. Conflicts can also occur within and between communities, where ethnic, religious, and political tensions are often expressed through resource access and control (Harkes and Novaczek 2002; Mony, Satria, and Kinseng 2017). An important step to reduce conflict is to clearly acknowledge and recognize the rights, roles, and responsibilities of communities in regulations, as outlined in the equity framework above. Research in Indonesia has highlighted conflict between communities because community fishing regulations were not sufficiently acknowledged in fisheries law or applied to offenders (Campbell et al. 2013; Kusumawati and Huang 2015). This is linked to the broader governance challenge of overlapping legislation which can lead to confusion regarding authority and responsibilities (Clifton, 2013; Kusumawati and Huang 2015), with a heightened risk since the period of recentralization of marine governance in 2014 from district to province level (Ross et al. 2019).

Conflicts in conservation activities have included the process of establishing MPAs and the management measures implemented. Social conflicts have arisen due to perceived restrictions on fisheries access for communities related to zoning and bans on activities deemed contrary to conservation activities (e.g. destructive fishing practices). Delineation of MPA boundaries without community participation in consultation processes have led to limited community compliance with zoning boundaries, in turn increasing the likelihood of conflicts due to unintentional violations. The procedural pillar of the equity framework is key to reducing these conflicts by ensuring meaningful participation of stakeholders and rights holders.

The third pillar of the equity framework, concerning distribution, must also be considered to reduce conflict. Studies about customary management systems in Indonesia have raised concerns about exclusion of some communities and individuals within communities who lacked ethnic, religious, or kinship ties to powerful individuals, and unequal distribution of benefits between the tourism and small-scale fisheries sectors (Satria, Matsuda, and Sano 2006; Steenbergen 2016).

2.5 Community MPA Governance Best Practices

Strong governance that influences human behavior and reduces impacts on marine and coastal ecosystems is essential for MPAs to be truly effective (UN Environment 2019). Common Pool Resources can achieve this through adopting a range of meaningful context-specific governance incentives (Campbell et al. 2013; Ferse et al. 2010; UN Environment 2019). An incentive is defined as a particular governance approach that is designed to encourage people to behave in a way that supports the achievement of certain strategic policy outcomes such as biodiversity conservation (UN Environment 2019). Table 2.3 outlines the five categories of incentives in terms of definition and examples: economic, communication, participation, knowledge, and legal. MPA managers can decide which incentives are used based on the local context.

Table 2.3. Types, definition, and examples of governance incentives to improve effective management of MPAs.

Incentive type	Definition	Example of incentives
Economic	Using economic and property rights approaches to promote the fulfilment of MPA objectives.	- Assigning property rights - Promoting economically and ecologically sustainable resource-use - Investing MPA income in improvements in local infrastructure and living standards - Reducing the leakage of benefits

Communication	Promoting awareness of the conservation features of the MPA, the related objectives for conserving them, and the measures for achieving these objectives and promoting awareness of the related benefits.	- Awareness raising - Promoting recognition of MPA regulations and restrictions - Promoting recognition of MPA benefits
Participation	Providing for users, communities, and other interest groups to participate in and influence MPA decision-making that may potentially affect them, to promote their "ownership" of the MPA and thereby their potential to participate in the implementation of decisions.	- Decentralizing responsibility - Building on local customs - Establishing collaborative platforms - Building trust and capacity for cooperation
Knowledge	Respecting and promoting the use of different sources of knowledge (local-traditional and expert-scientific) to better inform MPA decisions.	- Promoting collective learning - Agreeing on approaches for addressing uncertainty - Independent advice and arbitration - Maximizing scientific knowledge to guide/inform MPA decision-making
Legal	Establishment and enforcement of relevant laws, regulations as a source of "state steer" to promote compliance with decisions and thereby the achievement of MPA obligations.	- Capacity for enforcement - Penalties for deterrence - Clear and consistent legal definitions - Attaching conditions to use and property rights

Source: Campbell et al. (2013); UN Environment (2019)

Recent years have seen the proliferation of LMMAs in the Indian Ocean region. In Madagascar, this has resulted in a rapid expansion of over 100 LMMAs since 2014. A successful example is Velondriake LMMA, Madagascar, established by the local population with support from the NGO Blue Ventures Conservation acting as a co-management authority. This LMMA was originally initiated through an experimental non-extractive zone closure model that periodically closed reef flats to octopus fishing, with immediate tangible economic incentives due to the rapid growth rate and high market value of octopus. Research in Velondriake LMMA has also highlighted long-term biodiversity benefits, with total fish biomass 189% higher in community No-Take Zones (NTZs) than in control sites (Gilchrist et al. 2020). This approach acted as a successful "entry-point" to conservation and natural resource management, leading to expansion of other measures such as permanent reef closures (Harris 2007).

The model has had national success, leading to the creation of a national LMMA network in Madagascar called MIHARI, and adoption of the model throughout much of the Western Indian Ocean region, including Tanzania, Kenya, Comoros, Mauritius, and Mozambique (Mayol 2013). Research about LMMAs in the region has revealed that success was dependent on factors such as the presence of informed and committed community members, past training in community-based marine resource management, a supportive and clear legal framework, external funding and opportunities to facilitate exchange visits to an existing LMMA, and the provision of immediate economic incentives to communities (Harris 2007; Kawaka et al. 2017).

In many Pacific Island nations there are deep cultural and spiritual connections with the ocean, with a range of different customary tools to protect the marine environment (Aburto et al. 2015). The successful proliferation of LMMAs has been built upon the successful revival of village-based authority for customary resource-use supported by legal recognition and government support (Johannes 2002). In Fiji, the establishment of a network of LMMAs covers approximately 22% of Fiji's inshore fishing areas (Bartlett, Pakoa, and Manua 2009; Robertson et al. 2020). Customary tenure that regulates access to and use of marine resources, and temporal closures called *tabu*, increasingly exist alongside and within gazetted MPAs (Fache and Breckwoldt 2018). A comprehensive study of LMMAs in the Pacific Islands found that a major measure of satisfaction among communities was the ability to exercise control over their resources (Techera et al. 2009).

MPAs designed and implemented by private individuals or organizations are an additional type of MPA governance categorized under a broad definition of community. One such best practice example is in Chumbe Island Coral Park in Zanzibar, Tanzania. Private funding allowed a model deemed too politically and economically risky by NGOs to be implemented (UN Environment 2019). Chumbe is now self-financed through high-end ecotourism, with funding contributing towards the training and provision of jobs for people from the local community, conducting awareness-raising campaigns, and implementation of an effective enforcement strategy.

2.6 MPA Governance in Indonesia

MPAs are defined by IUCN as '*A clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*' (IUCN WCPA 2018). Therefore, the IUCN definition of MPAs allows for a diverse range of governance types, provided the area is primarily being managed for biodiversity outcomes. The Government of Indonesia (GoI) defines MPAs as: "*marine and coastal areas that are protected and managed within a zoning system to achieve sustainable fish resources as well as marine habitat*" (PP RI No. 60/2007). Under the legal instruments used to designate MPAs in Indonesia (Chapter 1), however, all MPAs must fall under governance by the Ministry of Marine Affairs and Fisheries (MMAF) or the Ministry of Environment and Forestry (MoEF). Therefore, all formally recognized MPAs in Indonesia are Type A – Governance by government. This has major implications for those areas in Indonesia that have biodiversity conservation as a primary objective and meet the IUCN definition of an MPA but not the GoI MPA definition, such as some LMMAs or privately protected areas. Though the governance body may desire its site to be recognized as an MPA (and could be if measured against IUCN's definition), because of differences with Indonesia's own MPA definition, the GoI does not allow this. In the future there is significant potential these areas could be recognized as Other Effective Area-Based Conservation Measures (OECMs; Chapter 10). However, for now, many examples we discuss in the remainder of this chapter meet the IUCN MPA definition, but are not formally recognized as MPAs in Indonesia or are recognized as MPAs only because they are located within a larger MPA under state governance.

For this chapter we adopt a broad definition of "community", covering shared governance (IUCN Governance Type B); private individuals and organizations (Type C); and governance by indigenous peoples and/or local communities (Type D). These are presented under a heading of "Community Involvement in Marine Governance in Indonesia", with the following text describing examples of different governance types in Indonesia. Table 2.5 below provides a broader overview of different examples. After this, two in-depth case-studies of community involvement in governance Type A MPAs are presented.

2.7 Community Involvement in Marine Governance in Indonesia

A period of decentralization of marine resource management took place In Indonesia from 1999–2014 after the passing of a Local Autonomy Law (UU RI No. 22/1999), which gave district governments authority for marine resource management within a 4 nautical mile boundary from the coastline, while provincial governments had authority from 4–12 nautical miles (Satria et al. 2006). Recent years have seen a recentralizing of MPA authority to the provincial government level through UU RI No. 23/2014. Under this new law, the provincial government has authority to manage areas from 0–12 nautical miles from coastlines, including the MPAs that were once managed by district governments. The following sections will present the major national legislation that affects community involvement in governance in Indonesia.

Table 2.4. Overview of Indonesian national-level regulations affecting community involvement in MPA governance or coastal management.

Focus of regulation	Law/Regulation	Description and Articles
Community-based management	Kepmen KP No. 41/2000 on the General Guidelines for Sustainable and Community-Based Management of Small Islands. This Decree has been amended by Permen KP No. PER. 20/MEN/2008 on the Utilization of Small Islands and Surrounding Waters.	Article 2 (1) and (2): The utilization of small islands and the waters around is carried out for the benefit of development in the economic, social, and cultural aspects for community-based and sustainable purposes. It shall be carried out by taking into account the following aspects (especially related to communities): - Integration between the activities between governments, business sectors, and the community in planning and spatial use of small islands and the surrounding waters. - Culture and rights of indigenous peoples, local communities, and traditional communities.
	Law UU RI No. 27/2007 juncto UU RI No. 1/2014 on Management of Coastal Areas and Small Islands	This law amended the articles on coastal waters commercial use right (*Hak Pengusahaan Perairan Pesisir*/HP-3) as introduced by UU RI No. 27/2007. The coastal waters commercial use right as described under Article 19 in UU RI No. 1/2014 mentions that:

1 2 3 4 5 6 7 8 9 10 11

		1. Each person conducting coastal water and small islands resource utilization for the following activities is required to obtain a management permit: (a) salt production, (b) marine bio-pharmacology, (c) marine biotechnology, (d) sea waters utilization other than energy harvest, (e) marine tourism, (f) installation of underwater pipes and cables, and (g) removal of sinking ship cargo; 2. Management permit for activities other than those referred to in article 19(1) shall be provided in accordance with the provisions of the legislation; 3. In the event of resource utilization activities of coastal and small-islands waters that have not been regulated by the provisions referred to in paragraph (1) and paragraph (2), they are regulated through Government Regulation.
Recognition of local and indigenous knowledge	Permendagri No. 52/2014 on the Guideline of Acknowledgement and Protection of Customary Law Community (*Masyarakat Hukum Adat*/MHA)	This regulation describes the procedures for acknowledgement and protection of a Customary Law Community[1]. Article 2 states that the Governor and head of district/ mayor carry out acknowledgement and protection of Customary Law Community. Meanwhile Article 4 mentions that acknowledgement and protection as mentioned in Article 2 is conducted through the following steps: (a) identification of Customary Law Community, (b) verification and validation of Customary Law Community, and (c) establishment of Customary Law Community.
	Permen No. 8/KP 2018 on the Procedure for Declaration of MHA Management Area in Spatial Utilization of Coastal Areas and Small Islands	Article 2 describes procedures to secure the spatial areas in the coastal areas and small islands belonging to an Customary Law Community into various government zoning (development) plan documents in the coastal areas namely: Zoning Plan for Coastal Areas and Small Islands (*Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil*/RZWP3K), Zoning Plan for National Strategic Areas (*Rencana Zonasi Kawasan Strategis Nasional*/RZ-KSN), Zoning Plan for Special National Strategic Areas (*Rencana Zonasi Kawasan Strategis Nasional Tertentu*/RZ-KSNT), and Zoning Plan for Inter-regions (*Rencana Zonasi* (RZ) *antarwilayah*).
	Permen LHK No. P.34/ MENLHK/SETJEN/ KUM.1/5/2017 on the Recognition and Protection of Local Wisdom for Natural Resource and Environment Management	This regulation declares the government's formal recognition and protection of the use of local wisdom for management of the environment and natural resources. Among other features, it allows communities to inventory and register their local wisdom with the government of a relevant level (Article 9, Article 11). It also mandates the relevant level of government to verify and validate the community proposal (Article 10). The local wisdom management area covers both land and coastal waters.
Management of MPAs	Permen KP No. PER.17/ MEN/2008 on the Conservation Area in Coastal Areas and Small Islands	This regulation also acknowledges local wisdom or *adat* (customary) through the gazettement of Maritime Conservation Areas (Article 8).
	Permen KP No. PER.02/ MEN/2009 on the Procedure for MPA establishment	This regulation describes the procedure for MPA establishment which also mentions the requirement of community and other stakeholder agreement within its process (Article 5, 9, 15. 16, 17).

[1]A customary law community in Indonesia is 'citizens who have unique characteristics: they live in harmony in groups accroding to their customary law; have ties to ancestral origins and/or common residence area; have a strong realtionship with the land and the environment; apply value systems that determine economic, politics, social, cultural and law institutions; and have used the same area for generations" (Article 1, Permendagri No. 52/2014)

	Permen KP No. 13/PERMEN-KP/2014 on the Marine Conservation Area Network	Supports MPA networks, quite similar to the management approach offered by the Ecosystem Approach to Fisheries Management (EAFM) framework, which is holistically taking ecological (Article 3, Article 4) and socio-economic (Article 5) aspects into account in order to protect and preserve the ecosystem and its functions, as well as providing food, income, and livelihoods for society.
	Permen KP No. 21/PERMEN-KP/2015 on the Partnership on Management of Marine Conservation Areas	Establishes a partnership system with the local community in managing the marine conservation area based on two main parties. First, the management organization unit that represents the provincial government, and second, the local community including traditional/tribal communities, NGOs, corporations, research institutions, and higher education institutions (Article 3). The two parties propose and discuss several programs on aquatic conservation area management (Article 5, Article 6, Article 7). The result of the discussion then will be sent to the general director or governor (Article 8) to be released as provincial regulations/permits and to be implemented by the two parties.
	Perdirjen PRL No. 03/PEER-DJPRL/2016 on the Guidance Utilization of MPAs' Sustainable Fishery Zones for Fishing Activities of Local Community and Traditional Community	This regulation provides a step-by-step procedure on how to develop TURFs (managed by local community and traditional community) within MPAs that will be legalized through a partnership agreement between the MPA authority and local/traditional community.

Source: Halim et al. (2020); Muawanah et al. (2018); Ross et al. (2019), as well as the latest relevant regulations.

2.7.1 Governance Type B: Shared Governance by Various Rights Holders and Stakeholders

Co-management has been promoted to support MPA implementation — with shared decision-making between different stakeholders promoted as leading to better conservation outcomes (Borrini-Feyerabend 1996). Co-management, however, can be highly variable in strength based on the different roles of stakeholders (Borrini-Feyerabend 1996). Strong community led co-management requires the willingness of government to decentralize political and administrative power to communities (Sen and Nielsen 1996). In Indonesia, formal regulations to recognize MPA co-management are not available, but some co-management components are embedded within MPAs (Table 2.4). However, these tend to represent instructive co-management (where mechanisms exist for dialogue between government and users, but normally entail the government informing users of decisions) or consultative co-management (mechanisms exist for the government to consult with users, but decisions are taken by the government) and so are more focused towards government governance than community governance (Sen and Nielsen 1996). These partnerships between government and community stakeholders to support MPA management are recognized under the Perdirjen KSDAE No. P. 6/KSDAE/SET/Kum.1/6/2018 for MoEF PAs/MPAs and Permen KP No. 21/PERMEN-KP/2015 for MMAF MPAs. The purpose of the partnership is the implementation of ecosystem and resource conservation based on negotiations and cooperation agreements between stakeholders. Thus, management becomes more open and can accommodate the needs and aims of the community due to its proximity to the MPA. The partnership formed is considered capable of realizing effective marine conservation management for the sustainability of ecosystems and biological resources as well as community welfare. MPA management that involves the community is closely related to community institutional development as an organizational and control system in management.

Shared governance is also often incorporated into LMMAs that frequently involve stakeholders from the local community, government, NGOs, and academia in decision-making. LMMAs in Indonesia are frequently nested within existing customary systems and have often involved initial or ongoing engagement with national and global LMMA networks, though are not formally recognized by the GoI as MPAs.

One such example is Tanimbar Kei LMMA, Maluku Tenggara, Maluku Province (see Table 2.5 for details of stakeholders, scope of involvement, types of involvement, regulations, and formal letters of agreement). This LMMA was established as a partnership between community members and an NGO: the Indonesian Locally Managed Marine Area Network (I-LMMA) (Steenbergen 2016). This LMMA collaboration was initiated after Tanimbar Kei's village head participated in a workshop by I-LMMA in 2005 and then invited I-LMMA to the island, leading to the establishment of an LMMA (Steenbergen 2016). The LMMA has received legal recognition for ownership and governance rights from the sub-district government. With a strong *adat* customary system in the village, I-LMMA's inception strategy was deliberately aligned strongly with customary institutions. As part of the LMMA, a concession system for seasonal fishing "licenses" has been sold to outside fishers, creating a significant source of collective income that was used to finance ongoing LMMA activities, support communal events or activities, provide aid for poor households in crisis, and to support students in their final year of tertiary education (Steenbergen 2016).

Studies have shown positive effects on the trochus fishery, with annual monitoring activities in the first four years of the project showing an increase in average trochus size (from 7 cm in 2006 to 13 cm in 2010), and a consistent rise in total annual trochus harvest (from 814 kg in 2006 to 2,334 kg in 2010). During the same time period, coral reef monitoring activities around the island showed significant growth of hard corals in previously degraded sites (Steenbergen 2016).

Although there are concerns regarding distributive equity within the LMMA (favoring of families with kinship ties to the *adat* representatives) and long term compliance, Tanimbar Kei LMMA provides an example of a co-management arrangement involving community members and an NGO, supported by legal recognition for ownership and management rights from the sub-district government. Despite the sub-district government legal recognition of Tanimbar Kei LMMA, it has now been incorporated into the larger provincial government TPK (*Taman Pulau Kecil*/ Small Islands Park) Kei Kecil—a MMAF governed MPA (Type A governance)—though the LMMA continues to function despite no legal recognition by the TPK Kei Kecil management authority. Instead, the MPA management authority informally acknowledges the presence of the LMMA and MMAF staff informally enable the existing LMMA governance to continue.

2.7.2 Governance Type C: Governance by Private Individuals and Organizations

There are several examples of private sector involvement in MPA governance in Indonesia. One such example is the Misool Marine Reserve, where a private no-take area was created in 2005 in southeast Misool by a tourism operator (Misool Foundation 2020). This area has since expanded in 2010 to include two no-take areas and a restricted fishing gear area covering 1,220 km^2. The Misool Marine Reserve was created by Misool Eco Resort and Yayasan Misool Baseftin by directly leasing marine areas from the local community and the government. Therefore, the Raja Ampat Regency Government directly gave legal recognition to Misool Eco Resort and Yayasan Misool Baseftin to govern these marine areas. While the no-take areas were set up to protect biodiversity from fisheries and other destructive activities, as they were established by a private organization and their legal recognition came from a lease from the regency government this did not result in formal recognition by the GoI as an MPA. However, despite this lack of recognition, these areas have been successful for biodiversity conservation with a significant increases in shark abundance and a 250% increase in reef fish biomass (Misool Foundation 2020).

In parallel to the establishment and expansion of Misool Marine Reserve, the larger Perairan Kepulauan Misool, part of TWP (*Taman Wisata Perairan*/Aquatic Tourism Park) Raja Ampat, was established that incorporated the Misool Marine Reserve area (see Table 2.5). Perairan Kepulauan Misool is under the governance of the provincial MMAF of Papua Barat (Type A governance). Therefore, the Misool Marine Reserve area is now recognized as an MPA, by this provincial government layering of MPA designation over the existing marine reserve. The Misool Marine Reserve continues to operate, and the zonation system developed and implemented for Perairan Kepulauan Misool reflects the NTZ and restricted fishing gear area from the Misool Marine Reserve. While the regency government continues to legally recognize the Misool Marine Reserve, there is no formal legal recognition for the governance of Misool Marine Reserve by Yayasan Misool Baseftin as part of the provincial government MPA designation — as the legal instruments for MPA designation provide no mechanism for this. Therefore, the Misool Marine Reserve now operates based on informal recognition from the MPA management authority.

When combined with state and community contributions to governance, involvement of the private sector can contribute to effective MPA governance, in particular through conservation finance and provision of tangible economic incentives. Similar examples to the above situation for Misool Marine Reserve exist in other locations with tourism in Indonesia (e.g. the Wakatobi Resort Collaborative Reef Conservation Program in TNL Wakatobi). For long-term sustainability, legal recognition is required for these private sector MPAs and community participation and engagement must be embedded in these systems to avoid conflict and ensure legitimacy (Bottema and Bush 2012).

2.7.3 Governance Type D: Governance by Indigenous Peoples and/or Local Communities

Indonesia has an extremely rich cultural heritage of customary beliefs and local knowledge regarding marine resource use and regulation. These exist in diverse cultural and geographic forms known as *adat*, in communities where customary tenure rights are still partially or fully practiced. In the marine context these also include TURFs — see Case Study 2.A. While many of these practices could be considered OECMs (Chapter 10), some of these customary practices meet the IUCN definition of an MPA but are not recognized as MPAs in Indonesia.

One such example of communal territorial ownership is *petuanan laut* — an *adat* tenure claim to customary marine management — which has enabled the implementation of *sasi laut* practiced in customary villages in Maluku and Papua Barat (Halim et al. 2020; Mony et al. 2017). *Sasi* encompasses temporal and spatial prohibitions on harvesting natural resources in the territory of a village, such as crops, trees, and other forest products, and resources from the tidal and marine zones, while also regulating social interactions. Marine *sasi*, known as *sasi laut*, normally prohibits the use of destructive and intensive fishing gears (poisons, explosives, and fine-mesh nets) in certain areas, while also defining seasonal rules of entry and harvest for different marine zones including establishing some permanent closure areas (Harkes and Novaczek 2002; Mony et al. 2017). In Maluku Tengah, *sasi laut* is enforced by an institution called a *kewang* that is drawn from *adat* kinship groups in the community. This institution functions as a local police force, setting and guarding regulations through legitimacy based on *adat* or customary law (Mony et al. 2017). *Sasi* exists across many locations in eastern Indonesia, and while some communities practicing *sasi* fall within formally established MPAs, many communities practice *sasi* outside of formal MPAs. There is significant potential to increase recognition of the biodiversity contribution from *sasi* areas — especially areas under permanent closure to fisheries activities.

2.7.4 Community Involvement in Governance Type A: Governance by Government

Many customary governance institutions by local communities remain functional or are intentionally re-established within governance Type A MPAs within Indonesia to support management activities. For example, the role of the *Panglima Laôt* (Sea Commander; see case study 10.A) in Aceh, where a customary system empowers private individuals elected by fishers to adjudicate and manage disputes, while also regulating, prohibiting, and sanctioning actions (Campbell et al. 2012; Kusumawati and Huang 2015). A study of two MPAs in Weh Island, Aceh — TL (*Taman Laut*/Aquatic Park) Pulau Weh Sabang and SAP (*Suaka Alam Perairan*/ Aquatic Nature Reserve) Pesisir Timur Pulau Weh — highlighted the connection between *Panglima Laôt* cooperation with government and participation in effective management (Kusumawati and Huang 2015). In SAP Pesisir Timur Pulau Weh (see Table 2.5 below for further detail), the *Panglima Laôt* is formally recognized by the Aceh Provincial Government, which means that the *Panglima Laôt* has de jure authority to determine fishing access rights, fishing gear, prohibit fishing on religious days, initiate searches for lost fishermen, decide compensation in fishing boat collisions, and arbitrate general disputes (Kusumawati and Huang 2015). Another example is the implementation of *Kaombo*, a customary closed area, by customary law community (*Masyarakat Hukum Adat/*MHA) *Sarano Wali* in TNL Wakatobi (Case Study 2.B). The MHA *Sarano Wali* has been officially recognized by the government of Indonesia and the co-management of the *Kaombo* area has been integrated into the TNL Wakatobi and district regulations. However, overall governance of the MPA remains with the government.

In Lombok Barat, *awig-awig* ("local rule") customary measures in different communities involve rule-setting such as prohibition of destructive fishing methods, designation of zoning and closure systems, and enforcement of fines and punishments for transgressions (Satria and Matsuda 2004). Having been revitalized by the local community, *awig-awig* played an important role in overcoming destructive fishing practices within TWP (*Taman Wisata Laut/*Aquatic Tourism Park) Gili Matra's Sustainable Fishing Zones due to the ease of enforcing rules developed for specific communities, their culture, social structure, and ecosystem (Satria, Matsuda, and Sano 2004). The existence and effective practice of *awig-awig* is strongly supported through recognition by the Lombok Barat Regency Government.

These examples demonstrate the breadth of culturally and historically embedded knowledge and belief systems that involve marine resource use in Indonesia that can support MPAs. For some of these examples of *adat* law and customary marine resource regulation systems, social change, modernization, state and religious group involvement, and lack of formal recognition have significantly weakened institutional sustainability of these practices since the 1970s (Mony et al. 2017). Some studies have also raised concerns about equity and the potential for elite capture. Despite these challenges, recent transformations present an opportunity for their adaptation and reintegration as will be discussed later in this chapter.

Table 2.5. Examples of community involvement in MPAs in Indonesia. All formally recognized MPAs in Indonesia are governed by government, therefore, community involvement often involves co-management or informally recognized governance practices in parts of the MPAs.

Formal MPA recognized by the Government of Indonesia					Community involvement within the MPA				
MPA Name	**MPA Authority**	**Supervising Ministry**	**MPA Size (ha)**	**IUCN Governance Type**	**Enabling Regulatory Framework for Partnership**	**Community Partners**	**Type of (Community) Involvement**	**Partnership Document**	**Size of co-managed area (ha)**
SAP Pesisir Timur Pulau Weh	DKP (*Dinas Kelautan dan Perikanan*/Marine and Fisheries Office) Aceh Province	MMAF	3,207.98	A		*Panglima Laôt in Sabang*	Panglima Laôt able to regulate, prohibit, and sanction actions (Case Study 10.A)	Perda Daerah Istimewa Aceh No. 7 tahun 2000 on Arrangement of Adat life	not identified to have a specific size of co-managed area, but covering a whole Weh Island's water
TWP Anambas	LKKPN (*Loka Kawasan Konservasi Perairan Nasional/* National Aquatic Conservation Area Office) – Pekanbaru Satker (*Satuan Kerja*/Work Unit) TWP Anambas	MMAF	1,262,686	A	Perdirjen PRL No.3/2016 re.Utilization of Sustainable Fishgery Zone for Fishing Activities by Local & Traditional Communities	Batu Belah Village	Managed Access for Fishery on Sustainable Fishery Zone of TWP Kepulauan Anambas for Fishing Activity	Partnership Agreement (Jan 17, 2017)	780
TNL Kepulauan Seribu	Balai Taman Nasional Kepulauan Seribu/Kepulauan Seribu National Park Office	MoEF	107,489	A	Perdirjen KSDAE No.6/2018 re. Technical Guidance for Conservation Partnership	Forum Peduli Pengelolaan Akses Area Perikanan (Community-based organization)	Enhancing the Park's Function as the buffer and fishery utilization zones, through the management of Yellowtail fusiliers (*C. cuning*) and Reef Squid (S. lessoniana) around Panjang Besar Island, Panjang Kecil Island, and Pemagaran Island.	PKS.290/T.13/TU/HMS/03/2018 (Mar 16, 2018)	856

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Formal MPA recognized by the Government of Indonesia					Community involvement within the MPA				
MPA Name	**MPA Authority**	**Supervising Ministry**	**MPA Size (ha)**	**IUCN Governance Type**	**Enabling Regulatory Framework for Partnership**	**Community Partners**	**Type of (Community) Involvement**	**Partnership Document**	**Size of co-managed area (ha)**
TNL Karimun Jawa	Balai Taman Nasional Karimun Jawa/Karimun Jawa National Park Office	MoEF	110,117	A	Perdirjen KSDAE No.6/2018 re. Technical Guidance for Conservation Partnership	Kawasan Perikanan Desa Nyamuk (Community-based organization)	Enhancing the Park's Function through Community Empowerment, by Granting Fishery Access in TNL Karimun Jawa	PKS.49/T.34/TU/ KSA/11/2017 (Nov 25, 2017)	620
TWP Gili Matra	BKKPN (*Balai Kawasan Konservasi Perairan Nasional*/ National Aquatic Conservation Area Office) – Kupang Satker (*Satuan Kerja*/Work Unit) TWP Gili Matra	MMAF	2,954	A		Local community (*awig-awig*)	*Awig-awig* customary rule	Perdes Gili Indah No. 12/ Pem.1.1/2001 on the Coral Reef Management for Fisheries and Tourism.	not identified to have a specific size of co-managed area
						Gili Indah Youth Task Force (*Satuan Tugas/Satgas*), dive centers, and hotels	Satgas for collaborative marine patrols, supported by donations from local businesses and provision of dive centre speed boats. Zoning system negotiated between fishers and Satgas; members of Gili Eco Trust charge dive tax to fund Satgas and compensate fishers.	Perdes Gili Indah No. 12/ Pem.1.1/2001 on the Coral Reef Management for Fisheries and Tourism. Gili Eco Trust—alliance of dive operators	not identified to have a specific size of co-managed area

Formal MPA recognized by the Government of Indonesia					Community involvement within the MPA				
MPA Name	MPA Authority	Supervising Ministry	MPA Size (ha)	IUCN Governance Type	Enabling Regulatory Framework for Partnership	Community Partners	Type of (Community) Involvement	Partnership Document	Size of co-managed area (ha)
TNL Wakatobi	Balai Taman Nasional Wakatobi National Park Office	MoEF	1,320,987	A	Perdirjen KSDAE No.6/2018 re. Technical Guidance for Conservation Partnership	Padakauwang Sama (Community-based organization)	Enhancing the Park's Function through Community Empowerment, by Granting Fishery Access in TNL Wakatobi	PKS.1681/T.21/TU/REN/9/2017 (Sep 27, 2017)	9,262
						Posa'Asa (Community-based organization)	Enhancing the Park's Function through Community Empowerment, by Granting Fishery Access in TNL Wakatobi	PKS.1682/T.21/TU/REN/9/2017 (Sep 27, 2017)	720
					Perdirjen KSDAE No.6/2018 re. Technical Guidance for Conservation Partnership	Wakatobi Dive Resort	Collaborative Reef Conservation Program between Wakatobi Resort and local communities created a no-take marine sanctuary.		not identified to have a specific size of co-managed area
					Perdirjen KSDAE No.6/2018 re. Technical Guidance for Conservation Partnership	Masyarakat Hukum Adat Sarano Wali	*Kaombo* customary closed areas (Case Study 2.B).	Perbup Wakatobi No. 29/2019, PKS No. 1146/T.21/TU/KSA/08/2019	17.42

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Formal MPA recognized by the Government of Indonesia					Community involvement within the MPA				
MPA Name	MPA Authority	Supervising Ministry	MPA Size (ha)	IUCN Governance Type	Enabling Regulatory Framework for Partnership	Community Partners	Type of (Community) Involvement	Partnership Document	Size of co-managed area (ha)
TNL Bunaken	Balai Taman Nasional Bunaken/ Bunaken National Park Office	MoEF	89,000	A	Perdirjen KSDAE No.6/2018 re. Technical Guidance for Conservation Partnership	Cahaya Tatapaan (Community-based organization)	Enhancing the Park's Function through Community Empowerment, by Granting Fishery Access on Traditional Utilization Zone of TNL Bunaken	PKS.472/BTNB/TU/ TEK/11/2017 (Nov 29, 2017)	140
						Cahaya Trans (Community-based organization)	Enhancing the Park's Function through Community Empowerment, by Granting Fishery Access on Traditional Utilization Zone of TNL Bunaken	PKS.471/BTNB/TU/ TEK/11/2017 (No 29, 2017)	134
TNL Taka Bone Rate	Balai Taman Nasional Taka Bone Rate/Bone Rate National Park Office	MoEF	530,765	A	Perdirjen KSDAE No.6/2018 re. Technical Guidance for Conservation Partnership	Forum Peduli Laut Rajuni & Latondu	Enhancing the Park's Function through Community Empowerment, by Granting Fishery Access in TNL Taka Bone Rate	PKS.1285/T.45/TU/ SET/2017 (Nov 18, 2017)	640

Formal MPA recognized by the Government of Indonesia					Community involvement within the MPA				
MPA Name	**MPA Authority**	**Supervising Ministry**	**MPA Size (ha)**	**IUCN Governance Type**	**Enabling Regulatory Framework for Partnership**	**Community Partners**	**Type of (Community) Involvement**	**Partnership Document**	**Size of co-managed area (ha)**
TPK Kei Kecil	DKP (*Dinas Kelautan dan Perikanan*/Marine and Fisheries Office) Maluku Province	MMAF	150,000	A		*adat* leaders, *adat rahan,* dina village, religious leaders, and the the Indonesian Locally Managed Marine Area Network (I-LMMA)	Tanimbar Kei LMMA under shared governance by the village of Tanimbar Kei and I-LMMA. Implementing rotational fishery closures and harvest restrictions; enforcing sanctions for regulation violations; produced small scale fisheries management plan and designed concession system for fishing licenses	Perdes Tanimbar Kei No 1/2008 Perbup Maluku Tenggara No. 166/2018 on the Protection and Management of Coastal and Marine Resources based on *Tanebar Evav* (Tanimbar Kei) Customary Law Community (MHA) of Kei Kecil Barat Sub-district of Maluku Tenggara District	40,000
TWP Raja Ampat – Perairan Kepulauan Misool	UPTD (*Unit Pelaksana Teknis Daerah*/Regional Technical Implementation Unit) BLUD (*Badan Layanan Umum Daerah*/Regional Public Service Agency)	MMAF	346,189	A		Misool Eco Resort / Yayasan Misool Basefin	Misool Marine Reserve governed by Misool Eco Resort / Yayasan Misool Basefin	25 and 15 year lease agreements to Misool Eco Resort /Yayasan Misool Basefin for Misool Marine Reserve from the Raja Ampat Regency government.	122,000

Sources: Campbell et al. (2013); Kusumawati and Huang (2015); MMAF Republic of Indonesia and USAID Sustainable Ecosystems Advanced (SEA) Project (2018); Ross et al. (2019); Steenbergen (2016); Westlund et al. (2017).

Note: All formally recognized MPAs in Indonesia are governed by government, therefore, community involvement often involves co-management or informally recognized governance practices in parts of the MPAs.

Case Study 2.A
Protecting Territorial Use Rights in Fisheries (TURF) in Raja Ampat

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In recent years, nearshore fisheries around the world have begun trialling various approaches to incentivize local communities to take on greater responsibilities and stewardship roles over their local marine areas. These efforts aim to promote collective action to overcome the "tragedy of the commons" scenario and limit "open access" systems by conferring user rights to particular groups or communities.

One such model approach, known as Territorial Use Rights in Fisheries (TURFs), is attracting increasing attention globally from both marine conservation communities and fishers (Halim et al. 2020). TURFs allocate exclusive harvesting rights to a given fishing community or group, at the exclusion of others, effectively providing a mechanism to manage access to a fishery. TURFs can work particularly well in areas where coastal communities already have some form of traditional tenure (however informal/customary) over their marine waters. The limited access promotes local livelihoods and social cohesion, and incentivizes sustainable use, as fishers are more inclined to protect and manage the resource (Figure 2.A.1).

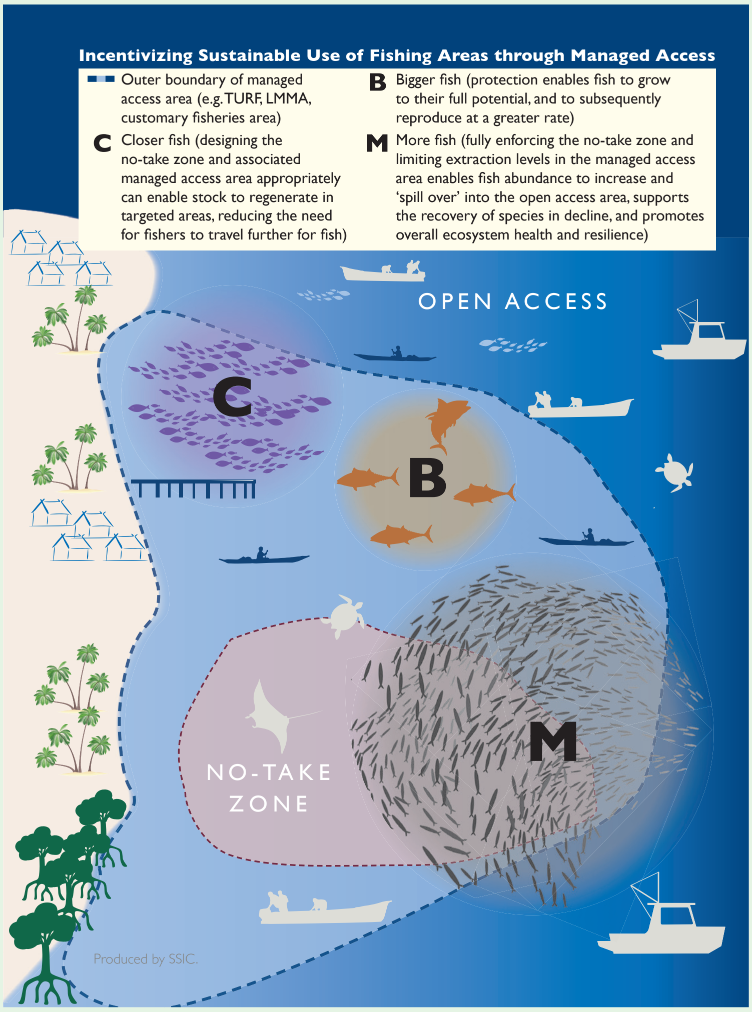

Figure 2.A.1. Concept of incentivizing sustainable fisheries through managed access TURF management (Image by USAID SEA Project/SSIC)

In Raja Ampat, Papua Barat, local communities have long had traditional mechanisms for managing access to resources through the *sasi* system. Commonly used on land (to manage village land divisions and access to resources such as betel nut trees, etc.), the system is transferable to marine waters but is complex and challenging to implement. Land can be demarcated, and titling has some history, albeit handed down orally through generations. In marine waters, demarcation is more challenging and reaching consensus on boundaries and village rights to different areas can be difficult.

Since 2016, communities and local governments in Teluk Mayalibit and Selat Dampier(Batanta-Salawati Islands) initiated demarcation and establishment of TURFs, or Customary Fishery Areas (CFA; KPA/*Kawasan Perikanan Adat*) as they are named in Raja Ampat (Kushardanto et al. 2019). In 2017, twelve managed access and reserve areas covering 51,300 ha of marine waters were established in Teluk Mayalibit and in 2018, 19 managed access and reserves covering 211,000 ha were established in Selat Dampier (Figure 2.A.2). These two regions were already recognized as MPAs, with a zoning regime formally declared through MMAF Decree Kepmen KP No. Kep.64/MEN/2009, limiting access to some key zones as NTZs.

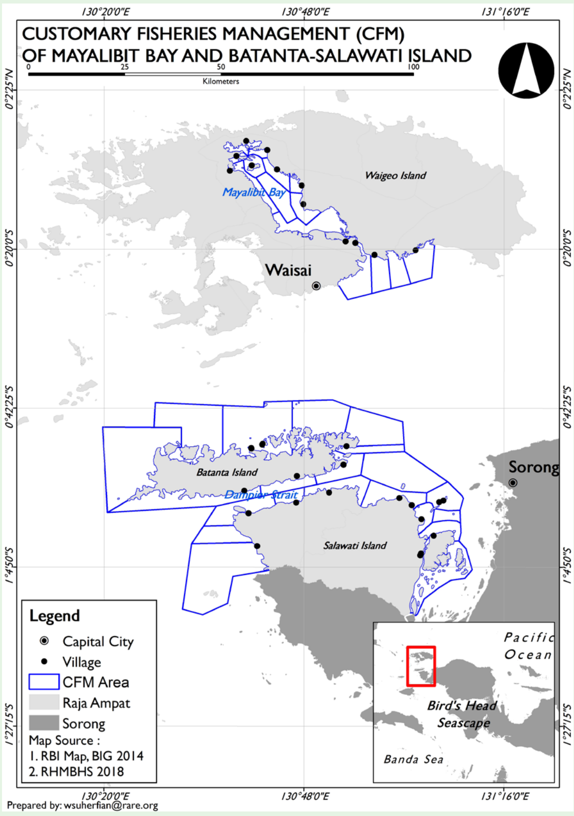

Figure 2.A.2. Location of eluk Mayalibit and Selat Dampier (Batanta-Salawati Islands) Customary Fishery Areas (TURFs) in Raja Ampat, Papua Barat, Indonesia.

Implementing TURFs in these areas has required extensive discussions and the development of agreements in and between communities. In meetings, local leaders often cited incidents where fishers from one village fishing in another village's waters created social conflicts. In Kabillol Village (Mayalibit), people recalled a time when such incidences led to physical fighting, and in Araway Village the fishing areas boundaries were not aligned with village boundaries, requiring extensive mediation between neighbors.

Nonetheless, perseverance, patience, mediation, and inter-village discussions and meetings have successfully led to the establishment of 36 TURFs, reflecting agreed 'customary fishing areas' (rather than reflecting ownership) across these two sites. These TURFs are effectively promoting sustainable fisheries management in more than 230,000 ha of marine waters, and at each site the TURFs have been established alongside community-designated NTZs, to further promote the sustainability of harvests in each area and protect biodiversity in the region.

The next key step in TURF implementation is to ensure that each site is genuinely only accessed and utilized by those communities with fishing rights to the area, or by fishers from neighboring communities with acquired permission (as agreed). Social marketing and behavior change campaigns provided training for fishing communities on how to manage and enforce their TURFs and monitor and document their catches and transform fishing communities to be more sustainable in Raja Ampat—increasing awareness of limited access areas for TURFs and the harvest control rules within them; and advancing compliance with sustainable fishing regulations. Based on surveys conducted in June 2019, approximately 90 percent of local fishers in Teluk Mayalibit and 79 percent in Selat Dampier are now aware of the fisheries management access rights (Figure 2.A.3). Implementation of fisheries regulations within each TURF include restrictions in gear type, limiting seasonal access to some key areas, and promoting targeted harvesting (in terms of type, size, and volume of yield) to support optimal market sales, with the aim of enhancing local livelihoods.

As part of establishing TURFs in Raja Ampat, RARE has supported social marketing and behavior change campaigns. These have increased fishing community awareness of limited access areas for TURFs and the harvest control rules within them, and also led to increased compliance with sustainable fishing regulations (Figure 2.A.3).

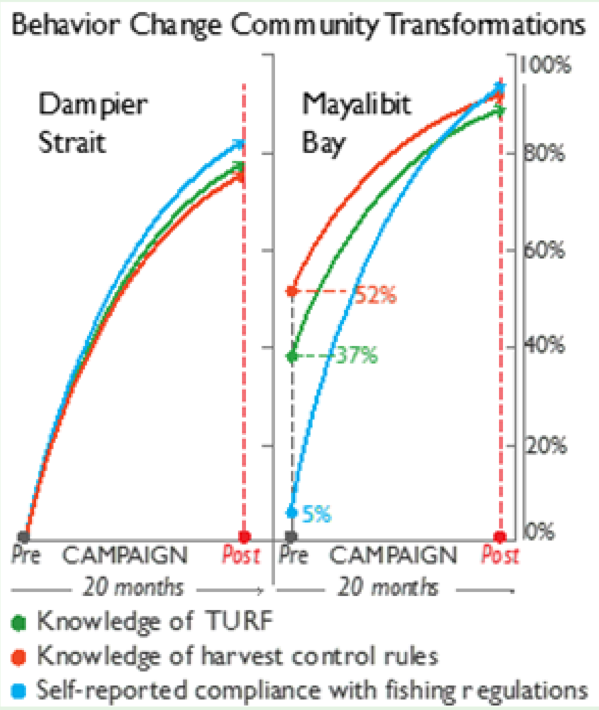

Figure 2.A.3. Effects of social marketing and behavior change campaigns in Raja Ampat. Figure prepared by Sustainable Solutions International Consulting.

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Case Study 2.B
***Kaombo* as part of Customary Law Community *Sarano Wali* in Sulawesi Tenggara**

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In Binongko Island, Taman Nasional Laut (TNL; Marine National Park) Wakatobi, Sulawesi Tenggara, there is a customary institution (*pranata adat)* called *Sarano Wali* that has existed since the time of the Butonese Sultanate in 1634. This customary institution is implemented by the *Cia-Cia* ethnic group and is present in six villages (Jaya Makmur, Lagongga, Kampo-kampo, Oihu, Haka, Waloindi) and one sub-district (*kelurahan:* Wali) in Binongko Island. The customary institution of *Sarano Wali* has now been formally acknowledged by the Government of Indonesia and has been registered as one of Indonesia's customary law communities (*Masyarakat Hukum Adat*/MHA). Customary law communities *Sarano Wali* is led by *Lakina Wali* (head of customary law communities *Sarano Wali*), from the *Cia-Cia* ethnic group. The role of *Lakina Wali* is to guide and maintain the implementation of the customary system, including customary rules for coastal areas.

In carrying out his administration, the *Lakina Wali* is accompanied by several *Sara Hu'u* (customary figures), including: *Bonto Siolimbona* (Chairperson of Customary Affairs/*Ketua Adat*); *Bonto Wali* (Deputy Chairperson of Customary Affairs at Wali/*Wakil Ketua Adat Wali*); *Bonto Popalia* (Deputy Chairperson of Customary Affairs at Popalia/*Wakil Ketua Adat Popalia*); *Jou Palahindu* (Deputy Chairperson of Customary Affairs at Palahidu/*Wakil Ketua Adat Palahidu*); and the Commander-in-Chief of the Binongko Island Traditional Council of Deliberation (*Pangalasa Pemimpin Musyawarah Adat)*.

Kaombo is one of customary law communities *Sarano Wali*'s customary rules to manage an area and is implemented by all *Cia-Cia* communities. *Kaombo* represents an area with a prohibition on individuals taking something when it is not their right, and traditional and social sanctions for any violations that occur. There are two categories of *Kaombo*, differentiated based on the type of resource ownership. Private *Kaombo* are private property rights such as a garden, and customary *Kaombo* are customary ownership rights or collective property rights such as forests, mangroves, and coastal areas. The determination of *Kaombo* access (Figure 2.B.1) in the coastal areas initially used an open and close mechanism, with several months of open access, and some months where access and use was prohibited. After an agreement was made, the *Kaombo* coastal areas are now permanently closed. There is no fishing activity or resource utilization except for ecological monitoring.

The legal recognition of these agreements are from:
– Reinforcement of the Guardian and *Kaombo* Customary Territories on 24 October 2015 which was agreed between customary law communities *Sarano Wali*, Wakatobi National Park Office (*Balai Taman Nasional Wakatobi*/BTNW), Wali Village Chief, Village Forest Counseling Center (*Sentra Penyuluhan Kehutanan Pedesaan*/SPKP), community leaders, representatives of local government, Yayasan WWF Indonesia, and local NGOs.
– Establishment of Perbup No. 29/2019 on 2 September 2019 on the Protection and Management of Coastal and Marine Resources based on the customary law communities *Sarano Wali* in Binongko Island, Wakatobi District.
– The Cooperation Agreement (*Perjanjian Kerjasama*/PKS) between the Head of BTNW and the Head of the *Sarano Wali* Customary Institution No. 1146/T.21/TU/KSA/08/2019

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concerning conservation partnerships in the context of community empowerment, in the form of providing access to the use of traditional water resources in the local utilization zone of TNL Wakatobi.

The customary institution of the customary law communities *Sarano Wali* in the TNL Wakatobi area is outlined in the Program Implementation Plan (*Rencana Pelaksanaan Program/* RPP) and Annual Workplan (*Rencana Kerja Tahunan/*RKT) between BTNW, MHA *Sarano Wali*, and Yayasan WWF Indoneisa 2019–2023. The RPP activities for the next five years include consultation and capacity-building, supervision, data and information provision, and business development (RPP and RKT 2019).

Figure 2.B.1. Map of MPAs (Kaombo) customary law communities Sarano Wali on Binongko Island (TNL Wakatobi).

Data from the 2017 *Kaombo* ecological condition monitoring and repeat monitoring show that *Kaombo* has been proven to provide positive biodiversity, social, and economic outcomes. Biodiversity outcomes include an increase in the number of small-sized fish (WWF Indonesia 2019). Positive social outcomes are: management of coastal resources based on existing customary law without conflict with statutory provisions; construction of a surveillance post that gives responsibility to the *Sarano Wali* to protect the customary *Kaombo* area; increased capacity of MHA *Sarano Wali* in managing *Kaombo* areas; and an increase in capacity in monitoring *Kaombo* conservation areas to determine ecological conditions. In terms of economic benefits, *Kaombo* provides: financial support for fishery products by MHA *Sarano Wali* fishers and market access; increased capacity for handling post-capture fisheries for fishermen who catch around the *Kaombo* area before marketing preparations; and marketing and processing fishery products into shredded fish products to increase the economic value of customary law communities *Sarano Wali*.

Monitoring data has highlighted that there are still violations of the provisions of the *Kaombo*. These violations were given *adat* sanctions in the form of customary fines (*bhoka*). All forms of settlement of violations in the *Kaombo* area are deliberated by traditional management and the local community. The money from the sanctions will then be divided by 50%, given as a reward to the residents and/or customary officials who contributed to the arrest of the perpetrators of the violations, with the remainder allocated to the customary law communities *Sarano Wali's* cash fund. These cash funds are used for customary activities and operational supervision of the *Kaombo* area.

Currently, there have been collaborative and synergistic management efforts between various parties, including the TNL Wakatobi, Wakatobi Local Government, Coremap II Wakatobi, Yayasan WWF Indonesia, TNC, and several other NGOs. This partnership-based management helps increase public awareness and accelerates the achievement of conservation outcomes. Then, the continuity of management and leadership efforts that care about Wakatobi as a conservation area to maintain the sustainability of this partnership-based management is needed.

2.8 Opportunities

Opportunities exist for Indonesia to further integrate communities into MPA design and implementation to deliver effective conservation. As Indonesia has a diverse range of communities that rely on marine resources to support livelihoods and well-being, frequently in contexts of poverty, governance of MPAs must be centered on equity and inclusivity, in particular as the majority of MPAs are located in nearshore areas. With only 50 of 196 MPAs in Indonesia having zonation as of December 2019 (Chapter 6) and GoI aiming to establish approximately 10 million ha of new MPAs, there is a great opportunity to involve communities throughout the MPA design and implementation stages, including zonation. Several regulations, i.e. Perdirjen KSDAE No. P.6/KSDAE/SET/Kum.1/6/2018 for MoEF PAs and MPAs and Permen KP No.21/PERMEN-KP/2015 for MMAF MPAs, provide the legal groundwork for establishing these partnerships with local communities.

In particular there is an opportunity to transform existing forms of customary management into fisheries management rights approaches such as TURFs, as discussed in Case Study 2.A, while also integrating contemporary understandings from fisheries and rights-based management (Halim et al. 2020). Conflict can be reduced by the establishment of Traditional Zones that give back access and use rights for communities and the establishment of communication platforms such as a Coastal Concerned Community Communication Forum (Mahmud, Satria, and Kinseng 2016). These hybrid approaches that integrate customary institutions and local knowledge with modern management approaches can be highly effective in increasing compliance, reducing conflict, and fostering a sense of ownership, supported by tangible benefits from MPA implementation through increased fish biomass, leading to income from tourism and fishing. Community involvement in planning and implementation of MPAs can ensure clear delineation of use zones for conservation, fishing, and tourism (Campbell et al. 2013).

Haruku village in Maluku Tengah provides a successful example of how *sasi laut* was transformed through a shift of authority from the church back to the indigenous *kewang*. Further effective transformations of *sasi laut* were acknowledgement and support of the role of women and formalizing local norms and unwritten regulations (Mony et al. 2017). When customary practices such as *sasi laut* are reinforced by modern institutions and statutory law, the combination can be highly effective in building resilience and adaptability into governance regimes (McLeod, Szuster, and Salm 2009). Recent government moves to map and recognize *adat* law communities—there are currently twelve with full recognition—are positive steps that can facilitate these transformations further (Halim et al. 2020). These partnership agreements can provide opportunities for communities to manage their resources, especially in the form of Traditional Zones. Law UU RI No. 27/2007 juncto UU RI No. 1/2014 on Management of Coastal and Small Islands and Permendagri No. 52/2014 on the Guideline of Acknowledgement and Protection of Customary Law Community provides a supportive high-level regulatory framework.

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With a rich and diverse history of customary measures for managing the marine environment, there is an opportunity to revitalize and transform these institutions for effective and inclusive conservation within MPAs. For transformations of customary systems and integration/overlap with MPAs and broader coastal management to be successful, they must be built upon mutual recognition, respectful co-existence, complementarity, coordination, and synergy, otherwise there is a risk of contradiction and conflict, co-option and neglect (Stevens, Jaeger, and Broome 2016). A major step in achieving this is legal recognition of the rights and roles of communities as stakeholders in MPA governance. In areas without existing customary institutions, or ones blatantly inappropriate, the MPA design process can utilize participatory modelling, mapping, and roleplaying games with stakeholders to analyze the effects of different policy scenarios on behavior change (Ferse et al. 2010).

There is an opportunity for greater involvement of private sector actors in MPA design and implementation within hybrid and adaptive governance arrangements. If combined with state and community contributions to governance, involvement of the private sector can contribute to effective MPA governance, in particular through conservation finance and provision of tangible economic incentives for local communities through livelihood provisions and infrastructure development. For long-term sustainability, community participation and engagement must be embedded in these systems to avoid conflict and ensure legitimacy (Bottema and Bush 2012).

2.9 Summary

Governance is a mechanism fundamental to effective MPA management, encompassing the interactions, relationships, and systems that shape management. Governance appropriate to the context is crucial for effective and equitable conservation. Recognition and incorporation of the skills, values, identities, and concerns of local communities is fundamental to achieving biodiversity and social outcomes of conservation. Effective governance should define clear group boundaries, match rules to local needs and conditions, ensure communities can participate in rulemaking that is respected by outside authorities, develop a monitoring and enforcement system with graduated sanctions and conflict resolution mechanisms, and ensure transparency and accountability.

Moving forward there are a number of excellent opportunities for Indonesian MPAs to build upon these successes. With a rich and diverse history of customary measures for managing the marine environment, there is an opportunity to revitalize and transform customary institutions for effective and inclusive MPAs that support the livelihoods of small-scale fishers through conferring fisheries management rights, while also achieving biodiversity outcomes. Private entities can further support MPA development through sustainable financing measures and the creation of tourism livelihood opportunities. A crucial step to realize these opportunities is legal recognition of coastal communities as major actors in MPA design and implementation.

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Section II.
Marine Protected Area Implementation in Indonesia – Progress Towards National and Global Targets

Chapter 3. Status and Trends in Indonesian Protected Area Coverage of Marine Ecosystems

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Abstract

Indonesia's coastal marine ecosystems face many threats, leading to government commitments to increase the number and extent of Marine Protected Areas (MPAs) across the nation. Here we review changes in the number and extent of MPAs in Indonesia from the 1970s until the present with a focus on (i) current extent and expansion pathways of Indonesia's protected area network for marine ecosystems, (ii) current coastal marine habitat cover contained within Indonesia's protected areas, (iii) current and future priorities for national Ministry of Marine Affairs and Fisheries (MMAF) MPA targets, (iv) the existing marine extent and protection provided by MMAF marine conservation areas, and (v) future targets for the MPA development. As of 2019, there are 23.9 million ha of marine ecosystems contained within 300 nationally recognized protected areas—with 196 of these formally designated as MPAs (23.1 million ha) and 104 as protected areas that incorporate marine ecosystems (0.8 million ha). This means Indonesia has protected 7.3% of territorial waters and nearly reached national MPA targets of 23.4 million ha by 2020. Currently, 47% of coral reefs, 25% of mangrove forests, and 37% of seagrass beds that have been mapped in Indonesia are included within national protected areas. However, only 7% of coral reefs, <1% of mangroves forest, 7% of seagrass beds are contained within non-extractive zones — zones where extractive activities are not allowed, such as Core Zones, Protection Zones, Tourism Zones, etc. — within MPAs. This means there is substantial scope to further expand marine protection to protect coastal marine habitats.

Abstrak

Ekosistem pesisir dan laut Indonesia dihadapkan pada berbagai ancaman, sehingga pemerintah berkomitmen dalam meningkatkan jumlah dan luasan Kawasan Konservasi Perairan (KKP) di seluruh nusantara. Dalam bab ini, tren perubahan jumlah dan luasan KKP di Indonesia dari tahun 1970-an hingga saat ini ditinjau dengan fokus kajian pada (i) status luasan dan perluasan kawasan konservasi yang melindungi ekosistem pesisir dan laut, (ii) status tutupan habitat pesisir dan laut penting dalam kawasan konservasi di Indonesia, (iii) prioritas target untuk KKP yang dikelola oleh Kementerian Kelautan dan Perikanan (KemenKP) saat ini dan di masa depan, (iv) status luasan dan perlindungan dari KKP KemenKP yang ada, dan (v) target masa depan untuk pengembangan KKP di Indonesia. Per tahun 2019, terdapat 23,9 juta ha ekosistem laut yang terlindungi dalam 300 kawasan konservasi di Indonesia, termasuk di antaranya 196 KKP (23,1 juta ha) dan 104 kawasan konservasi yang mencakup perlindungan ekosistem pesisir dan laut (0,8 juta ha). Ini berarti Pemerintah Indonesia telah melindungi 7,3% perairan teritorial dan hampir mencapai target nasional untuk menetapkan 23,4 juta ha KKP per tahun 2020. Saat ini, sebanyak 47% terumbu karang, 25% hutan mangrove, dan 37% padang lamun yang telah dipetakan di Indonesia, sudah terlindungi dalam kawasan konservasi nasional. Namun, hanya 7% terumbu karang, <1% hutan mangrove, dan 7% padang lamun yang terlindungi dalam zona non-ekstraktif KKP, yaitu zona dimana kegiatan ekstraktif (mengambil atau menangkap sumber daya laut) tidak diperbolehkan, seperti Zona Inti, Zona Perlindungan, Zona Pariwisata, dll. Hal ini mengindikasikan bahwa masih terdapat ruang untuk memperluas perlindungan laut untuk melindungi habitat pesisir dan laut di masa depan.

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3.1 Introduction

Tropical coastal marine ecosystems — including coral reefs, mangrove forests, and seagrass beds — are the most biodiverse of all marine ecosystems (Sala and Knowlton 2006), yet they face some of the greatest global threats (IPCC 2019). Local threats such as coastal development, sedimentation, and over- and destructive-harvesting are causing widespread direct damage to tropical marine ecosystems, as well as leading to cascading effects on ecosystem functions. Globally, the effects of climate change are causing a myriad of impacts on these ecosystems – from back-to-back coral bleaching, to increased tropical storm frequency and severity, to sea level rise (IPCC 2019). Still, tropical coastal marine ecosystems continue to provide many benefits to local communities — in some cases, to some of the poorest and most vulnerable peoples globally — including food security and nutrient provision, livelihoods, coastal protection, and cultural values (Cinner 2014; Hicks et al. 2019; Millennium Ecosystem Assessment 2005). The global importance of tropical coastal marine ecosystems for both biodiversity and people has motivated high-level policy interventions to protect them.

At the international level, multiple ambitious global agreements over the past decade have encouraged nations to adopt Marine Protected Areas (MPAs) as a tool to achieve biodiversity protection and the sustainable use of resources. MPAs are defined by the International Union for the Conservation of Nature (IUCN) as "*A clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*" (IUCN-WCPA 2018). For an area to be an MPA, it must therefore explicitly seek to produce positive outcomes for biodiversity – though, sustainable use of resources is also compatible with this definition (Day et al. 2012). Many global MPA targets include quantifiable time-bound area-based commitments for MPA expansion alongside other less tangibly defined goals around representativeness of habitat inclusion, connectivity, effective management, and equitability. For example, the 2010 Convention of Biological Diversity (CBD) Aichi Target 11 called for: "*By 2020...10% of coastal and marine areas...are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas*" (Table 3.1). In addition, the United Nations General Assembly Sustainable Development Goals (SDGs) in 2015 also requested: "*By 2020, conserve at least 10% of coastal and marine areas, consistent with national and international law and based on the best available scientific information*" (Table 3.1). These area-based global targets have been criticized for focusing on quantity (area expansion) at the expense of quality – i.e. biodiversity outcomes (Barnes et al. 2018), sustainable use (De Santo 2013), or effective and equitable management (Campbell and Gray 2019). There is also debate around the level of protection MPAs must achieve to contribute towards ocean protection targets, requiring a careful balance between non-extractive use area to maximize biodiversity outcomes (e.g. Sala et al. 2018) and the need for MPAs to exist in areas with high human dependence and complex socio-ecological systems (Campbell et al. 2012; Foale and Manele 2004). In many cases, however, these global MPA targets have encouraged governments — such as the Government of Indonesia (GoI) — to set equally ambitious national targets to reach area-based goals. In consideration of the 2020 milestones for multiple global and national MPA targets (Table 3.1), here we evaluate Indonesia's protected area progress for marine ecosystems.

Table 3.1. Key global, regional, and national MPA targets influencing coastal and marine conservation in Indonesia.

Year Announced	Statement/Target	Agency	Reference
1945	The Indonesian government is required by constitution to manage natural resources for the benefit of Indonesian citizens	Government of Indonesia	Article 33, The 1945 Constitution of the Republic of Indonesia (UUD RI 1945)
1999	The Indonesian government established the Ministry of Marine Exploration, which later became the Ministry of Marine Affairs and Fisheries (MMAF)	Government of Indonesia	Keppres RI No. 355/1999
2006	Establish 10 million ha of MPAs by 2010	MMAF	Target and Conservation Status (KKJI 2012)
2009	A comprehensive, ecologically representative and well-managed region-wide Coral Triangle MPA System (CTMPAS) in place — composed of prioritized individual MPAs and networks of MPAs that are connected, resilient, and sustainably financed, and designed in ways that (i) generate significant income, livelihoods, and food security benefits for coastal communities; and (ii) conserve the region's rich biological diversity. In accordance with emerging scientific consensus, CTMPAS will include...significant percentage of total area of each major nearshore habitat type within the Coral Triangle region (e.g., coral reefs, seagrass beds, mangrove forests) [which] will be in some form of designated protected status, with 20% of each major marine and coastal habitat type in strictly protected "no-take replenishment zones" (to ensure long-term, sustainable supplies of fisheries)	Coral Triangle Initiative	Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security, Regional Plan of Action 2010-2020 (CTI-CFF 2009)
2010	By 2020, at least ... 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes	UN/Government of Indonesia ratification	Aichi Target 11 (Convention on Biological Diversity 2010)

2015	By 2020, conserve at least 10% of coastal and marine areas, consistent with national and international law and based on best available scientific information	UN Ministry of National Development implementation	Sustainable Development Goal 14 (UN 2015) National Middle-Term Development Plan 2015-2019 (KemenPPN/ Bappenas RI 2015)
2015	The Government of Indonesia (MMAF) committed to establishing 20 million ha of MPAs by 2019	MMAF	Permen KP No. 45/PERMEN-KP/2015
2016	Designate and implement at least 30% of each marine habitat in a network of highly protected MPAs and other effective area-based conservation measures, with the ultimate aim of creating a fully sustainable ocean, at least 30% of which has no extractive activities, subject to the rights of indigenous peoples and local communities	IUCN World Conservation Congress	Increasing Marine Protected Area coverage for effective marine biodiversity conservation (WCC 2016)
2019	The Government of Indonesia committed to establishing 23.4 million ha of MPAs by 2020 and 26.9 million ha of MPAs by 2024	Ministry of National Development/ MMAF	National Middle-Term Development Plan 2020-2024 (KemenPPN/ Bappenas RI 2019a)
2019	Establish 32.5 million ha of MPAs by 2030	Ministry of National Development/ MMAF	Roadmap of SDGs Indonesia Towards 2030 (KemenPPN/ Bappenas RI 2019b)
2019	Commitment to establish Marine Conservation Area at least 10% of the Indonesian waters and jurisdiction, managed effectively	Government of Indonesia	Marine Spatial Plan Development (PP RI No. 32/2019)

Note: most Indonesian national targets were issued in Bahasa Indonesia, and these have been translated to English by the authors.

3.2 Indonesian National Marine Protection Context

Indonesia is an archipelagic nation located at the global epicenter of marine biodiversity – with over 2,000 fish species (Allen 2008), 500 scleractinian coral species (Veron et al. 2009), and the greatest mangrove richness recorded globally (Duke, Ball, and Ellison 1998). Indonesia is one of the world's most mega biodiverse countries, containing 16% of global coral reefs (Burke et al. 2011), 20% of global mangrove forests (Bunting et al. 2018), and >5% of global seagrass beds (Green, Short, and Frederick 2003). Indonesia, therefore, contains one of the greatest combined extents of coral reefs, mangrove forests, and seagrass beds within a single nation globally. This has led to Indonesian tropical coastal marine ecosystems consistently being identified as crucial for global biodiversity conservation by multiple independent global prioritization exercises (Gownaris et al. 2019).

Within Indonesia, coastal marine ecosystems provide many social and economic benefits to coastal communities, with almost 60 million Indonesians living within 10 km of coastal areas and 30 km of coral reefs (Burke et al. 2011). Many within this population, including an estimate of 1.7 million reef fishers (Teh and Sumaila 2013), are dependent on marine resources for their needs. For example, Indonesian coral reef benefits are estimated to be USD 1.6 billion annually, with USD 1.2 billion from fisheries annually and USD 314 million from coastal protection annually (Burke, WRI, and Spalding 2002). Estimates suggest that Indonesia could lose USD 2.6 billion over 20 years from overfishing, destructive fishing, and sedimentation (Burke et al. 2002). With a projected rapid growth of coastal populations in Indonesia, i.e. up to 240% until 2060 (Neumann et al. 2015), Indonesia could further lose economic value of marine resources when threats to those resources are not well-managed. In response to marine resource threats and the need for sustainable fisheries management, the GoI has implemented a series of policies and tools, including the implementation of provincial marine zoning plans (*Rencana Zonasi Wilayah Pesisir dan Pulau-pulau Kecil*/RZWP3K), MPAs, and fisheries management across the country. Such efforts were strengthened after the release of regulations Permen KP No. 12/PERMEN-KP/2020 and Permen KP No. PER.14/MEN/2011.

In Indonesia, MPAs are managed by the Ministry of Marine Affairs and Fisheries (MMAF) and Ministry of Environment and Forestry (MoEF). MMAF uses the term "marine conservation areas" for formally recognized MPAs, with MMAF defined MPAs officially called "Marine, Coasts, and Small Islands Conservation Area" (*Kawasan Konservasi Perairan, Pesisir, dan Pulau-Pulau Kecil*/KKP3K). Formally recognized MPAs in Indonesia are broadly defined as "spatially defined, marine, coastal or small island areas that are protected and managed by a zoning system to achieve sustainable management of fisheries resources and environmental outcomes" (PP RI No. 60/2007). While there are many common elements between the IUCN MPA definition and the Indonesian MPA definition, the Indonesian legal definition positions marine conservation areas as a tool to achieve dual sustainable fisheries and biodiversity conservation objectives. While some Indonesian MPA laws echo this broad definition (e.g. UU RI No. 45/2009 on Fisheries), many Indonesian laws introduce modifications based on different MPA outcomes or context. For example, UU RI No. 27/2007 concerning Coastal and Small Islands Management defines "Conservation Areas" as areas focused on "protecting, preserving, and utilizing coastal areas and small islands and their ecosystems to ensure the existence, availability, and sustainability of coastal resources and maintaining and increasing biodiversity".

In addition to these legal instruments used to designate MPAs under Indonesian law, there are many terrestrially-focused protected areas that incorporate marine ecosystems (particularly coastal mangrove forests) that have been designated using other processes under MoEF regulations. While many marine areas within these MoEF protected areas are not formally classified as MPAs under the Indonesian legal MPA definition, they are actively managed for biodiversity conservation, and provide a significant amount of additional coastal marine habitat protection within formal protected area networks. Here we review the (i) current extent and expansion pathways of Indonesia's protected area for marine ecosystems, (ii) current coastal marine habitats (coral reefs, mangroves forests, and seagrass beds) cover contained within Indonesia's protected areas, (iii) changing priorities for national MMAF MPA targets, (iv) existing marine extent and protection provided by MMAF marine conservation areas, and (v) future targets for MPA implementation.

3.3 Indonesia's Rapidly Expanding MPA Number and Extent

Over the past four decades, the protected areas including marine ecosystems in Indonesia have expanded to 300 protected areas spanning 34 provinces as of 2019 (Figure 3.1). These protected areas consist of 196 formally recognized MPAs managed by MMAF and MoEF, as well as 104 other protected areas that incorporate marine ecosystems managed by MoEF. The establishment of SM (*Suaka Margasatwa*/ Wildlife Reserve) Pulau Baun, Maluku, by MoEF in 1974 provided protection to mangrove forests, and so represents the first government area-based protection of marine ecosystems in Indonesia. SM Pulau Baun, however, was terrestrially focused – designated using terrestrial protected area laws. Therefore, the first formal Indonesian MPA was TWP (*Taman Wisata Perairan*/ Aquatic Tourism Park) Taman Laut Banda, established by MoEF in 1977 in Maluku (Figure 3.2A). Through the 1980s MoEF continued to establish protected areas which incorporated marine ecosystems (Figure 3.2). By the mid-1990s Indonesia had 24 nationally recognized protected areas that covered 2.8 million ha and was equivalent to 0.1% of Indonesian coastal waters (Alder, Sloan, and Uktolseya 1994). There were, however, many additional areas designated using terrestrial protected area laws that substantially expanded marine ecosystems within formal protection (Figure 3.2). MPAs continued to be established at a steady rate, with a large increase in area associated with the designation of four national parks – TNL (*Taman Nasional Laut*/Marine National Park) Kepulauan Seribu (107,489 ha), TNL Taka Bone Rate (530,765 ha), TNL Wakatobi (1,390,000 ha), and TNL Teluk Cendrawasih (1,453,500 ha) – in 2001-2002 (Figure 3.2B). Since 2004, MoEF focused on managing existing MPAs rather than designating new ones.

During the 1990s and early 2000s Indonesia managed fisheries and marine resources through a maximum sustainable yield approach, with the objective of increasing fisheries yields nationally through expansion of fisheries in eastern Indonesia and the introduction of new gear types (Mous et al. 2005). This maximum sustainable yield approach led to some concerns of fisheries overexploitation (Mous et al. 2005) and also placed pressures on community customary management practices (Harkes and Novaczek 2002). MMAF was established in 1999, with the aim of increasing fisheries

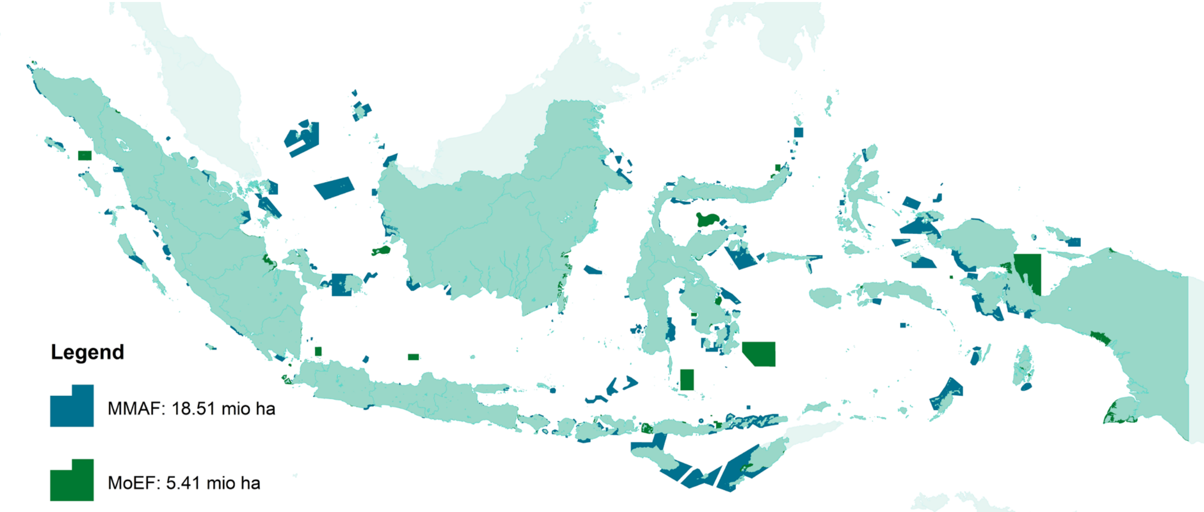

Figure 3.1. Map of MPAs and terrestrial protected areas containing mangrove forests that are managed by MMAF or MoEF in Indonesia.

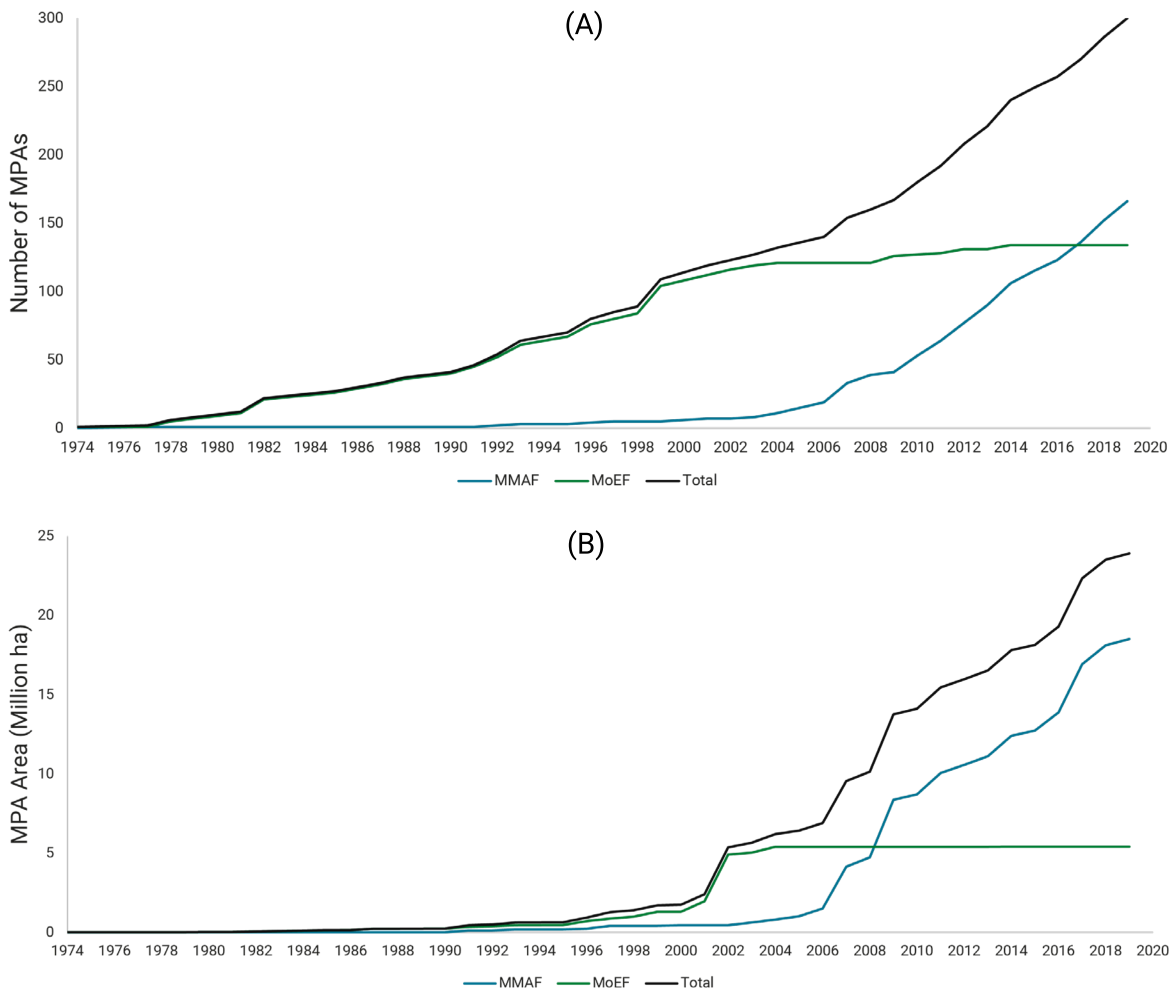

Figure 3.2. Change in (A) number of MPAs, and (B) MPA extent (million ha) across Indonesia.

sustainability in Indonesia. To reduce threats over marine resources, MMAF developed MPAs as a spatial management tool for the dual benefits of protecting biodiversity and improving fisheries sustainability. The management of MPAs in Indonesia was also expanded at this time to recognize local customary governance of specific areas within protected areas (Wiadnya et al. 2011), with zonation allowing for community managed areas.

MMAF has become the primary government ministry responsible for MPA implementation. The first MMAF marine conservation area was a KKPD (*Kawasan Konservasi Perairan Daerah*/Provincial MPA) Pesisir Selatan, Sumatra Barat, initiated in 2003. In 2006 MMAF committed to a target of establishing 10 million ha of MPAs by 2010 (Table 3.1; KKJI 2012). By the end of 2010, MPAs in Indonesia have surpassed this target, with 14.1 million ha of MPAs – consisting of 8.7 million ha of MMAF MPAs and 5.3 million ha of MoEF MPAs and protected areas containing marine ecosystems (Figure 3.2A). This was comprised of 180 protected areas — 53 MPAs managed by MMAF, 30 MPAs managed by MoEF, and 97 protected areas with marine ecosystems managed by MoEF.

In 2015, MMAF set a new target of 20 million ha of MPAs by 2020 – which was revised in 2019 to 23.4 million ha of MPAs by 2020 (Table 3.1). From the period 2015 to 2019, MMAF rapidly initiated new MPAs, averaging 14 new MPAs per year and on average 1.3 million ha per year (Figure 3.2). MMAF's MPA target also contributed to an increased size of individual MPAs; as average MPA size has also rapidly increased. In the 1970s the average new MPA size was 1,800 ha, increasing to 46,000 ha in the 1980s, and 55,000 ha in the 1990s. In the period from 2006-2010 – the buildup to the 2010 target of 10 million ha of MPAs – the average new MPA size increased to 345,700 ha. In the last decade, from 2010-2019 the average new MPA size continues to be quite large, at 83,000 ha. To motivate further establishment of MPAs, in 2019 MMAF set additional new targets: 24.5 million ha of MPAs by 2024 and 32.5 million ha of MPAs by 2030 (Table 3.1).

In 2019, to reflect collaborative management of MPAs, eight MoEF MPAs representing 0.7 million ha were transferred to MMAF management (Perpres RI No. 56/2019). By the end of 2019, MMAF managed 166 MPAs covering 18.5 million ha and MoEF managed 30 MPAs and 104 terrestrially designated protected areas that incorporate marine ecosystems spanning 5.4 million ha. This means MPAs and marine components of terrestrially-focused protected areas covered 23.9 million ha marine areas (or 7.3% of Indonesian waters) spanning 34 provinces in Indonesia (Figure 3.1, Figure 3.2). This significant increase of MMAF's MPA area (Figure 3.2) spurred the Ministry's target increase to 32.5 million ha by 2030, to fulfill Aichi Target 11 to protect 10% of marine and coastal area (Table 3.1).

When considering protection by big island group, the Sunda Kecil Region (spanning Bali, Nusa Tenggara Barat, and Nusa Tenggara Timur) protects 38% of the region's waters, the greatest of any Indonesian region (Table 3.2). In contrast, Jawa and Maluku protect the least, at 4% and 6%, respectively. However, the geographical scale and areas under protection are very different between these two regions, with Maluku designating protection over 1.4 million ha of marine areas, while Jawa has designated 0.4 million ha (Table 3.2). At province level, Papua Barat, Maluku, and Nusa Tenggara Timur provinces have the most MPAs and terrestrial protected areas including marine ecosystems, at 22, 20, and 19 respectively, closely followed by Sulawesi Tenggara which has 18 (Table 3.3). MPAs are well-spaced within the network, with 64% of MPAs separated by less than 20 km, and 24% of MPAs separated between 20 to 50 km (Figure 3.3, Table 3.4).

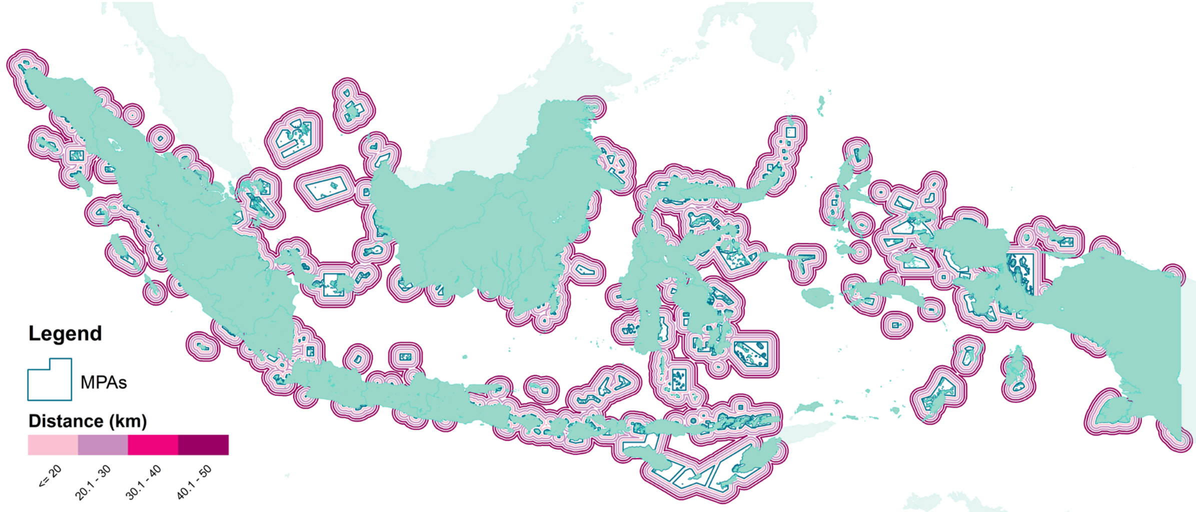

Figure 3.3. Distance between MPAs in Indonesia

Table 3.2. Regional marine areas, number of MPAs, and MPA extent in Indonesia.

Regions	Coastal waters up to 12 nautical miles (ha)	MMAF MPAs		MoEF MPAs		Total MPAs		
		Number of MPAs	MPA Extent (ha)	Number of MPAs	MPA Extent (ha)	Number of MPAs	MPA Extent (ha)	Proportion of coastal waters within MPAs (%)
Sumatra	32,946,109	46	4,841,315	21	348,585	67	5,189,900	16
Kalimantan	10,723,819	12	1,276,602	24	143,481	36	1,420,083	13
Jawa	10,854,952	18	178,964	13	272,716	31	451,680	4
Sunda Kecil (Bali, NTB, NTT)	12,066,772	21	4,338,457	21	265,758	42	4,604,215	38
Sulawesi	29,071,837	44	3,277,306	19	2,502,568	63	5,779,874	20
Maluku (Maluku & Maluku Utara)	24,940,695	15	1,433,189	13	21,232	28	1,454,421	6
Papua (Papua Barat & Papua)	19,405,474	10	3,168,532	23	1,853,939	33	5,022,471	26
TOTAL	140,009,658	166	18,514,365	134	5,408,279	300	23,922,645	

Note: Regions were grouped based on geographic areas and proximity of provinces. The seven regions represent five major islands (Sumatra, Kalimantan, Jawa, Sulawesi, and Papua) and two regions with many small islands (Sunda Kecil and Maluku). The region's waters are defined as 12 nautical miles of the region's coastline. MoEF MPAs include 30 formally recognized MPAs and 104 protected areas that incorporate coastal and marine ecosystems.

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Table 3.3. Provincial marine areas, number of MPAs, and MPA extent in Indonesia.

Provinces	Provincial waters 12 nautical miles (ha)	MMAF MPAs		MoEF MPAs		Total MPAs		
		Number of MPAs	MPA Extent (ha)	Number of MPAs	MPA Extent (ha)	Number of MPAs	MPA Extent (ha)	Proportion of provincial waters within MPAs (%)
Aceh	4,397,171	7	174,324	3	231,401	10	405,725	9
Sumatra Utara	4,320,180	4	167,714	2	9,189	6	176,903	4
Sumatra Barat	3,741,334	10	377,648	3	640	13	378,288	10
Riau	1,935,039	4	285,366			4	285,366	15
Kepulauan Riau	10,201,576	5	3,062,209	1	989	6	3,063,198	30
Kepulauan Bangka Belitung	3,924,308	6	584,263	2	4,306	8	588,569	15
Jambi	388,591	4	74	2	2,610	6	2,685	1
Bengkulu	1,513,282	3	87,476	4	1,185	7	88,660	6
Lampung	1,720,904	3	102,241	3	12,435	6	114,676	7
Sumatra Selatan	803,724	-	-	1	85,830	1	85,830	0
DKI Jakarta	590,567	-	-	2	107,579	2	107,579	18
Jawa Barat	1,594,119	3	33,250	3	1,710	6	34,960	2
Banten	1,127,173	2	7,491	3	52,414	5	59,904	5
Jawa Tengah	1,746,148	4	57,655	2	110,117	6	167,773	10
DI Yogyakarta	236,580	2	3,570			2	3,570	2
Jawa Timur	5,560,365	7	76,998	3	896	10	77,893	1
Bali	935,631	5	44,730	2	5,460	7	50,190	5
DKI Jakarta	590,567	-	-	2	107,579	2	107,579	18
Jawa Barat	1,594,119	3	33,250	3	1,710	6	34,960	2
Jawa Tengah	1,746,148	4	57,655	2	110,117	6	167,773	10
Jawa Timur	5,560,365	7	76,998	3	896	10	77,893	1
Bali	935,631	5	44,730	2	5,460	7	50,190	5

Nusa Tenggara Barat	2,849,147	11	243,806	5	10,114	16	253,920	9
Nusa Tenggara Timur	8,281,994	5	4,049,920	14	250,185	19	4,300,105	52
Kalimantan Barat	3,332,176	4	744,636	6	78,542	10	823,178	25
Kalimantan Tengah	1,245,992	1	61,362	2	205	3	61,567	5
Kalimantan Selatan	2,312,561	2	179,660	10	39,420	12	219,080	9
Kalimantan Timur	3,070,143	2	290,670	6	25,314	8	315,984	10
Kalimantan Utara	762,947	3	274			3	274	0
Sulawesi Utara	4,954,095	7	271,151	1	89,065	8	360,216	7
Gorontalo	877,321	12	40,552	2	1,103	14	41,655	5
Sulawesi Tengah	7,679,045	4	1,338,292	6	367,257	10	1,705,549	22
Sulawesi Tenggara	4,687,686	10	426,274	8	1,514,353	18	1,940,628	41
Sulawesi Selatan	8,783,453	8	1,051,157	1	530,765	9	1,581,922	18
Sulawesi Barat	2,090,237	3	149,880	1	24	4	149,904	7
Maluku	15,701,836	8	1,189,831	12	21,222	20	1,211,054	8
Maluku Utara	9,238,859	7	243,358	1	10	8	243,368	3
Papua	8,928,084	2	229,984	9	308,492	11	538,476	6
Papua Barat	10,477,390	8	2,938,548	14	1,545,422	22	4,483,970	43

Note: Provincial waters are defined as 12 nautical miles from provincial coastline. MoEF MPAs include 30 formally recognized MPAs and 104 protected areas that incorporate coastal marine ecosystems.

Table 3.4. MPA isolation by Indonesian province.

Provinces	Number of MPAs separated from their nearest-neighbor MPA by the following distances			
	≤20 km	20-50 km	50-100 km	>100 km
Aceh	5	5	0	0
Sumatra Utara	0	4	2	0
Sumatra Barat	7	3	0	1
Riau	0	1	2	1
Kepulauan Riau	4	1	0	1
Kepulauan Bangka Belitung	4	4	0	0
Jambi	0	2	0	0
Bengkulu	5	0	1	1
Lampung	0	5	1	0
Sumatera Selatan	0	1	0	0
DKI Jakarta	0	2	0	0
Jawa Barat	4	0	0	2
Banten	4	1	0	0
Jawa Tengah	1	2	2	0
DI Yogyakarta	0	2	0	0
Jawa Timur	6	3	0	1
Bali	7	0	0	0
Nusa Tenggara Barat	11	5	0	0
Nusa Tenggara Timur	18	0	1	0
Kalimantan Barat	7	2	1	0
Kalimantan Tengah	2	0	1	0
Kalimantan Selatan	10	1	1	0
Kalimantan Timur	7	0	0	1
Kalimantan Utara	2	1	0	0
Sulawesi Utara	7	0	0	0
Gorontalo	12	2	0	0
Sulawesi Tengah	8	2	0	0
Sulawesi Tenggara	15	3	0	0
Sulawesi Selatan	4	4	1	0
Sulawesi Barat	2	2	0	0
Maluku	13	5	1	1
Maluku Utara	3	0	1	4

Papua	5	2	0	4
Papua Barat	15	5	2	0

Note: Distances between MPAs can be used as a proxy for potential connectivity between MPAs.

Box 3.A
196 Formally Recognized MPAs in Indonesia

By the end of 2019, there were 166 MMAF MPAs (officially called marine conservation areas; *Kawasan Konservasi Perairan*/KKP), and 30 MoEF MPAs. The boxes within this chapter provide an opportunity to dig deeper into the coverage and future directions for these formally recognized MPAs.

The 196 MPAs cover a total of 23,146,375 ha, nearly reaching the national target of 23.4 million ha of MPA development by 2020. The largest proportion of MPA coverage is located in Sulawesi (25%, n=50), followed by Sumatra (22%, n=49) and Papua (20%, n=12) (Figure 3.A.1). Though Jawa has 25 MPAs, these only represent 2% of overall MPA area, while the Maluku region has 18 MPAs, which represent 6% of total MPA coverage.

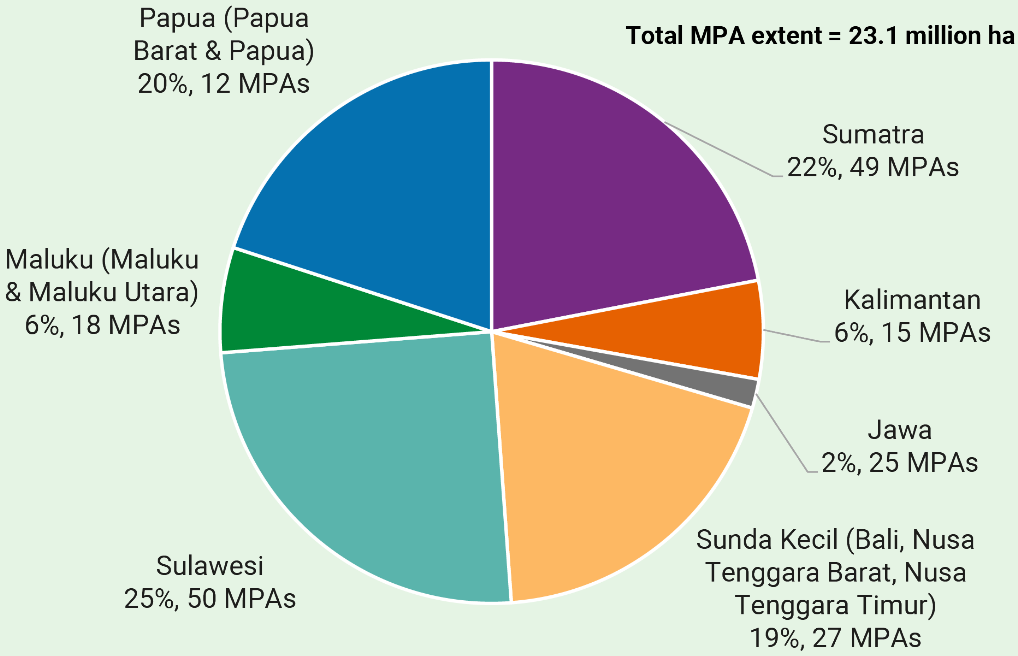

Figure 3.A.1. Proportion of the total area (ha) and number of MPAs by Region to total MPA extent in Indonesia.

Recently, there has been focus on improving coordination for MPA management between MMAF and MoEF, in part driven based by Presidential Regulation (Perpres RI No. 56/2019). This regulation sets out a National Plan of Action (NPOA; *Rencana Aksi Nasional*/RAN) on integrated Management of national parks and National MPAs, 2018 – 2025. The NPOA mentions 17 conservation areas covering seven national parks, and 10 National MPAs to be managed with coordination across ministries/institutions emphasizing community involvement. Coordination is under the Coordinating Ministry of Maritime Affairs involving MMAF, MoEF, Indonesian Institute of Science (*Lembaga Ilmu Pengetahuan Indonesia*/LIPI), Indonesia Agency for Assessment and Application of Technology (*Badan Pengkajian dan Penerapan Teknologi*/BPPT), the Ministry of Research and Technology/National Agency of Research and Innovation (*Kementerian Riset dan Teknologi*/Kemenristek; *Badan Riset dan Inovasi Nasional*/BRIN), The Ministry of Tourism and Creative Economy (*Kementerian Pariwisata dan Ekonomi Kreatif*/Kemenparekraf), and others. The seven national parks consist of TNL Kepulauan Seribu, TNL Karimun Jawa, TNL Bunaken, TNL Wakatobi, TNL Taka Bone Rate, TNL Teluk Cendrawasih, and TNL Kepulauan Togean Islands. Ten national MPAs consist of TWP Kepulauan Anambas, TWP Pulau Pieh, TWP Kapoposang, TWP Gili Matra, TWP Taman Laut Banda, TWP Padaido, TNP (*Taman Nasional Perairan/ Aquatic* National Park) Laut Sawu, SAP (*Suaka Alam Perairan*/Aquatic Nature Reserve) Kepulauan Waigeo Sebelah Barat, SAP Kepulauan Raja Ampat, and SAP Kepulauan Aru Tenggara.

3.4 Coastal Marine Habitat Protection

Coral reefs, mangrove forests, and seagrass beds are recognized as important habitats for marine biodiversity. These three ecosystems are important due to their integrated function as nurseries for juvenile fishes and invertebrates (Lefcheck et al. 2019). Several international targets have identified the importance of ensuring coastal marine habitats are protected (Table 3.1). For example, a regional target set by the 2009 Coral Triangle Initiative Regional Plan of Action (CTI-RPOA), which was endorsed by and developed under leadership from the GoI, calls for 20% of coastal marine habitats to be included in non-extractive zones, though there is no agreed target date (Table 3.1). The IUCN World Conservation Congress in 2016 called for countries to "*designate and implement at least 30% of each marine habitat in a network of highly protected MPAs*" (Table 3.1). There is growing momentum within the NGO community, working in partnership with MMAF, to try and incorporate 30% of coastal marine habitats within the Indonesian MPA network.

As of 31 December 2019, 43% (876,800 ha) of coral reefs, 25% (672,900 ha) of mangrove forests, and 37% (48,300 ha) of seagrass beds that have been mapped in Indonesia are included within national protected areas (Figure 3.4A). These results suggest that Indonesia has included >30% of mapped coral reefs and seagrass beds within MPAs, but mangrove forests protection needs to be expanded. The greatest provincial coral reef extent in Indonesia is in Sulawesi –

approximately 659,720 ha – with Sulawesi currently having the greatest proportion of reefs within protected areas at 57% (Figure 3.5, Table 3.5) Sunda Kecil, Papua, and Kalimantan all have lower reef extent but protect high proportions – 60%, 57%, and 55%, respectively (Figure 3.5, Table 3.3) Papua and Sunda Kecil both consistently perform well for inclusion of coastal marine habitats within protection, with mangrove forests inclusion at 38% and 25%, and seagrass beds inclusion at 90% and 54%, respectively (Figure 3.5, Table 3.5). Overall, substantial MPA expansion is required in most provinces to include 30% of each coastal marine habitat within protected areas (Table 3.6).

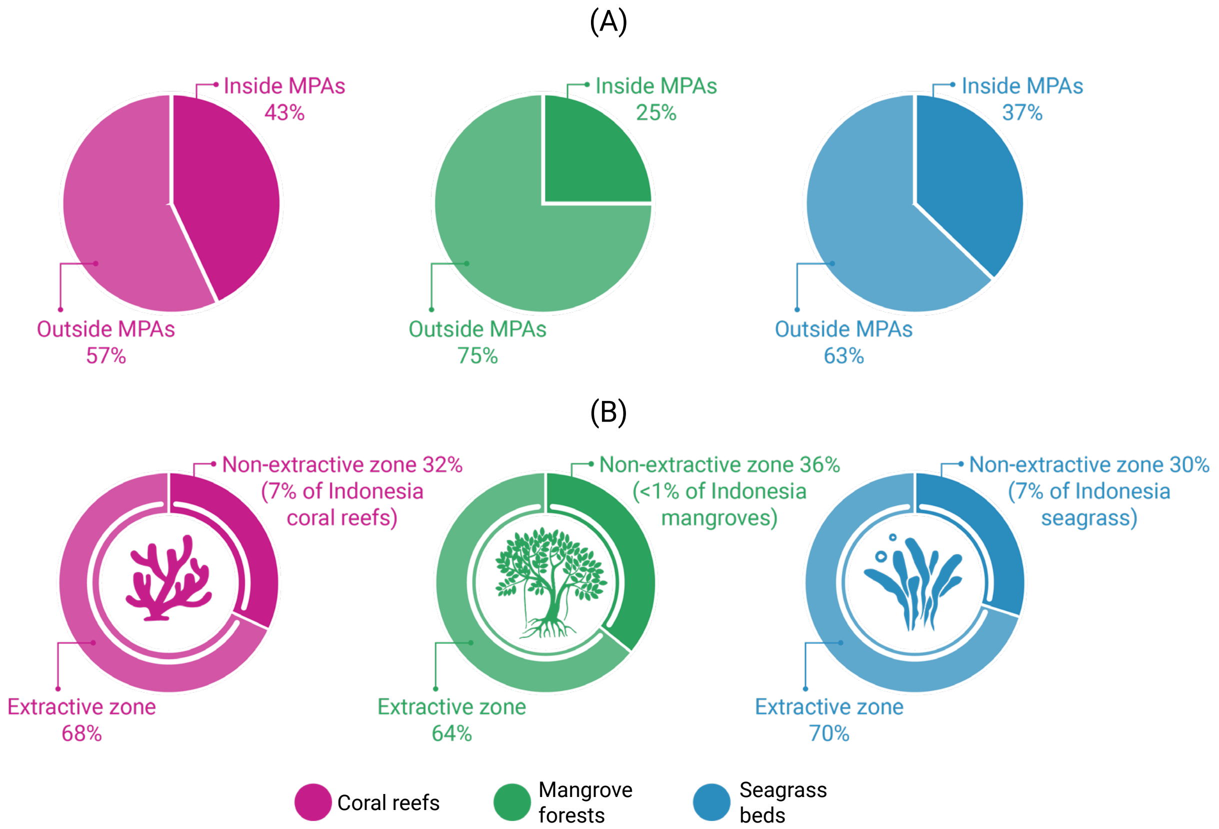

Figure 3.4. National coastal marine habitats within MPAs in Indonesia. (A) Percentage of national coastal marine habitat contained within MPAs and protected areas that incorporate marine ecosystems. (B) Percentage of coastal marine habitat contained within extractive vs non-extractive zones within MPAs. Figure (A) includes all 300 MPAs and terrestrially-focused protected areas that protect marine ecosystems, while Figure (B) only includes 30 MMAF MPAs and nine MoEF MPAs that have zones. There are eight MoEF MPAs that have zones and are not included in the analysis due to inaccessibility of spatial data.

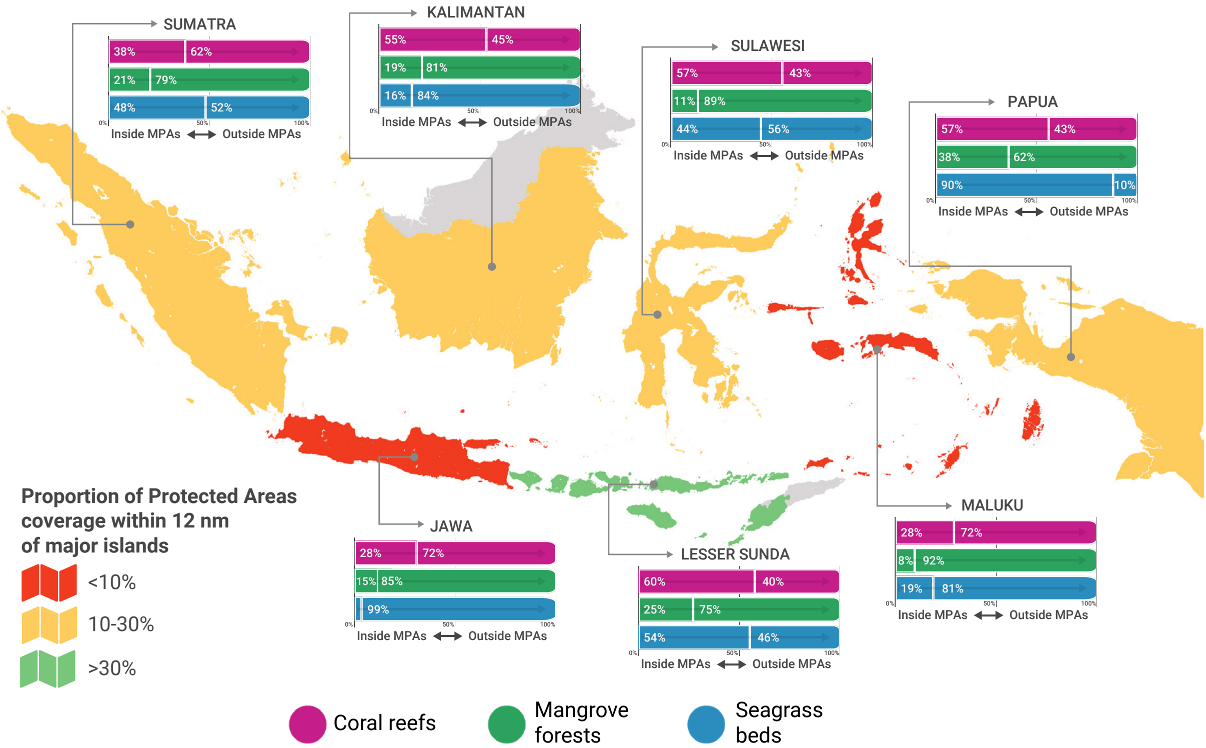

Figure 3.5. Coastal marine habitats protection included within MPAs and protected areas that incorporate marine ecosystems for each region for coral reefs, mangrove forests, and seagrass beds. Each chart shows the percentage of regional coastal marine habitat within 12 nautical miles contained within MPAs and protected areas that incorporate marine ecosystems.

Table 3.5. Distribution of mapped coastal marine habitat and protection within each region.

Regions	Coral reefs			Mangroves forests			Seagrass beds		
	Extent within 12 nautical miles (ha)	Protection within MPAs (%)	Protection within non-extractive zones (%)	Extent within 12 nautical miles (ha)	Protection within MPAs (%)	Protection within non-extractive zones (%)	Extent within 12 nautical miles (ha)	Protection within MPAs (%)	Protection within non-extractive zones (%)
Sumatra	383.348	38	1	533.940	21	<0,1	1.938	48	0
Jawa	92.226	28	3	35.025	19	0,1	446	1	0
Sunda Kecil	108.577	60	7	37.357	25	0,1	23.385	54	8
Kalimantan	110.077	55	39	554.539	15	<0,1	2.080	16	14
Sulawesi	659.720	57	10	224.575	11	1,6	57.402	26	7
Maluku	300.439	28	1	144.193	8	0,3	34.627	31	<1

Papua	210.346	57	11	1.128.804	38	1,3	9.404	90	31
Indonesia	**2.038.522**	**43**	**7**	**2.658.433**	**25**	**0,7**	**129.283**	**37**	**7**

Note: Regional coastal marine habitats are defined as 12 nautical miles from the region's coastline. Non-extractive zones represent the percentage of protected coastal marine habitats that are in non-extractive use areas (such as Core Zones, Buffer Zones, Protected Zones, Tourism Zones, etc.). The analysis for non-extractive zones included 30 MMAF MPAs and nine MoEF MPAs that have zones and excluded zones in terrestrial protected areas that have mangroves. There are eight MoEF MPAs that have zones and are not included in the analysis due to inaccessibility of spatial data.

Table 3.6. Distribution of mapped coastal marine habitat per province.

Regions	Provinces	Coral reefs			Mangroves forests			Seagrass beds		
		Extent (ha)	Protection within MPAs (%)	Protection within non extractive zones (%)	Extent (ha)	Protection within MPAs (%)	Protection within non-extractive zones (%)	Extent (ha)	Protection within MPAs (%)	Protection within non-extractive zones (%)
Sumatra	Aceh	71.509	32,6	0,1	26.399	4,7	0,0	0	0,0	0,0
	Sumatra Utara	49.708	12,0	1,0	47.888	19,5	0,0	40	60,1	0,0
	Sumatra Barat	35.655	14,2	6,0	17.010	5,4	0,3	0	0,0	0,0
	Riau	0	0,0	0,0	164.472	1,0	0,0	0	0,0	0,0
	Kepulauan Riau	169.138	48,2	0,5	52.875	3,1	0,0	1.898	47,9	0,0
	Kepulauan Bangka Belitung	43.201	64,3	2,4	49.935	9,3	0,0	0	0,0	0,0
	Jambi	0	0,0	0,0	8.445	31,0	0,0	0	0,0	0,0
	Bengkulu	7.390	23,8	0,0	1.492	79,9	0,0	0	0,0	0,0
	Lampung	6.592	4,4	2,4	5.896	21,0	0,0	0	0,0	0,0
	Sumatera Selatan	156	0,0	0,0	159.529	53,8	0,0	0	0,0	0,0
Jawa	DKI Jakarta	5.287	60,1	17,5	18	32,9	0,0	0	0,0	0,0
	Jawa Barat	1.515	72,0	0,0	3.297	2,3	0,0	0	0,0	0,0
	Banten	4.967	68,7	0,0	2.146	91,1	0,0	115	3,6	0,0
	Jawa Tengah	7.386	80,7	28,9	8.523	0,4	0,4	0	0,0	0,0
	DI Yogyakarta	54	0,0	0,0	0	0,0	0,0	0	0,0	0,0
	Jawa Timur	73.017	16,4	0,0	21.041	22,4	0,0	331	0,0	0,0

1 2 3 4 5 6 7 8 9 10 11

Sunda Kecil	Bali	2.675	33,1	2,0	1.985	71,2	0,0	1.170	26,5	0,2
	Nusa Tenggara Barat	29.483	29,0	1,8	12.607	14,0	0,1	5.489	22,8	4,6
	Nusa Tenggara Timur	76.419	73,1	8,8	22.764	27,0	0,2	16.727	66,7	9,9
Kalimantan	Kalimantan Barat	4.297	66,0	0,0	123.427	2,5	0,0	0	0,0	0,0
	Kalimantan Tengah	0	0,0	0,0	27.710	0,7	0,0	0	0,0	0,0
	Kalimantan Selatan	6.844	16,9	0,0	54.089	72,9	0,0	0	0,0	0,0
	Kalimantan Timur	98.705	57,6	43,3	198.864	20,7	0,1	2.080	15,5	13,7
	Kalimantan Utara	231	0,0	0,0	150.448	0,0	0,0	0	0,0	0,0
Sulawesi	Sulawesi Utara	29.429	30,2	1,3	10.488	27,4	22,2	60	0,0	0,0
	Gorontalo	10.740	21,4	0,0	9.837	11,3	0,0	777	15,7	0,0
	Sulawesi Tengah	131.973	63,2	31,8	34.046	35,1	3,4	16.494	33,0	21,9
	Sulawesi Tenggara	139.751	67,8	7,5	69.833	11,0	0,2	9.426	100,0	3,7
	Sulawesi Selatan	325.679	55,8	4,1	16.450	0,0	0,0	7.871	2,1	0,0
	Sulawesi Barat	22.148	17,1	0,0	3.539	0,7	0,0	0	0,0	0,0
Maluku	Maluku	222.745	31,7	1,5	184.129	5,7	0,3	24.496	20,9	0,0
	Maluku Utara	77.694	19,2	0,0	40.446	2,0	0,0	32.907	17,2	0,0
Papua	Papua	95.031	16,4	1,3	715.741	43,5	0,0	0	0,0	0,0
	Papua Barat	115.315	89,6	18,6	413.063	28,1	3,6	9.404	89,6	30,7

Note: The extent of marine habitat was calculated from coastlines to 12 nautical miles. The percentage of non-extractive zones was calculated as a proportion of the extent of each coastal marine habitat protected within non-extractive use areas (such as Core Zones, Rehabilitation Zones, Protected Zones, Tourism Zones, etc.) to the total extent of coastal marine habitat within each province.

Nationally, only 7% of coral reefs, <1% of mangroves forests, and 7% of seagrass beds are contained within non-extractive zones, i.e. zones where extractive activities are not allowed; this includes Core Zones, Rehabilitation Zones, Wilderness Zones, Protection Zones, and Tourism Zones (Chapter 6; Figure 3.4B). Therefore, substantial progress is required to meet the CTI-RPOA goal of 20% of coastal marine habitats in non-extractive zones. The proportion of coastal marine habitats contained within non-extractive zones is highly variable between regions (Table 3.5) and provinces (Table 3.6). Kalimantan includes 39% of reefs within non-extractive zones, giving the largest percentage of non-extractive zone coverage for reefs (Table 3.5). In contrast, Sumatra and Maluku include approximately 1% of their reefs within non-extractive zones (Table 3.5). Mangrove forests inclusion in non-extractive zones is much lower than reefs. Sulawesi has the greatest mangrove forests extent under non-extractive zones at 1.6% followed by Papua (1.3%), while other regions have very limited mangrove forests included within formally recognized MPA non-extractive zones (<1%) (Table 3.3). Seagrass beds inclusion in non-extractive zones is highly variable, with 31% of government mapped seagrass beds in Papua, less than 1% of government mapped seagrass in Maluku within non-extractive zones and none of the seagrass beds in Sumatra and Jawa are protected within non-extractive zones (Table 3.5).

Caution is required in interpreting the coastal marine habitat protection data. Firstly, while reliable maps exist of coral reef extent (UNEP-WCMC et al. 2018) and mangrove forests extent change (Bunting et al. 2018) for Indonesia, seagrass beds extent remains poorly mapped. The nationally recognized Indonesian seagrass beds maps (sourced from Badan Informasi Geospasial 2014) only include 129,200 ha of seagrass beds extent, likely to be a significant underestimate because of many data gaps. Much of the best seagrass beds mapping is also likely to have been conducted within MPAs. Older independent research estimates have suggested national coverage of 3 million ha (Green et al. 2003). Therefore, our seagrass beds conclusions should be treated with caution until a better seagrass beds layer is available for Indonesia. Secondly, our results only consider formally designated MoEF and MMAF protected areas. There are many other forms of customary or community protection present in Indonesia that are likely to include coastal marine habitats. Our results should therefore be considered a minimum extent estimate of coastal marine habitat protection, representing the levels of protection nationally recognized and documented by MoEF and MMAF.

3.5 Addressing the Next Steps for MPA Implementation in Indonesia

Indonesia has protected 7.3% of territorial waters, via MPAs (23.1 million ha) and terrestrially designated protected areas that include marine ecosystems (0.8 million ha). Thus, Indonesia has nearly met the national MPA target of 23.4 million ha by 2020 (Table 3.1). However, protection of coastal marine habitats is highly variable between provinces, with relatively low mangrove forests cover, and incomplete maps of seagrass beds extent making assessment of seagrass beds challenging. Coastal marine habitats contained within non-extractive zones—7% for coral reefs, <1% for mangroves forests, and 7% for seagrass beds — fall far short of the Coral Triangle Initiative (CTI) regional target of 20% (Table 3.1). Mangrove forests have the lowest protection within MPAs and in non-extractive zones, and therefore, more MPAs or terrestrial conservation areas should focus on expanding mangrove protection. The fact that the majority of MPAs in Indonesia are established to support sustainable fisheries should provide impetus for protecting mangrove forests.

Indonesia has made substantial progress on extent-based commitments under Aichi Target 11 (Table 3.1), though some components of this target remain to be achieved. While the next round of targets

Box 3.B
Coastal Marine Habitat Protection for 196 Formally Recognized MPAs

Currently, Indonesia has coastal marine habitats that have been mapped covering 2,038,522 ha of coral reefs, 2,658,433 ha of mangrove forests, and 129,283 ha of seagrass beds. Compared to the total area of those coastal marine habitats, only 3% of mangrove forests (73,680 ha) are protected within Indonesia's formally recognized 196 MPAs (Figure 3.B.1). Meanwhile, seagrass beds and coral reefs show higher percentages that were covered within MPAs- 36% of seagrass beds (46,626 ha) and 43% of coral reefs (868,061 ha). These results suggest that Indonesia has included >30% of mapped coral reefs and seagrass beds within MPAs. The low coverage of mangrove forests within MPAs does not accurately reflect mangrove forests protection, as many terrestrially protected areas have included mangrove forests.

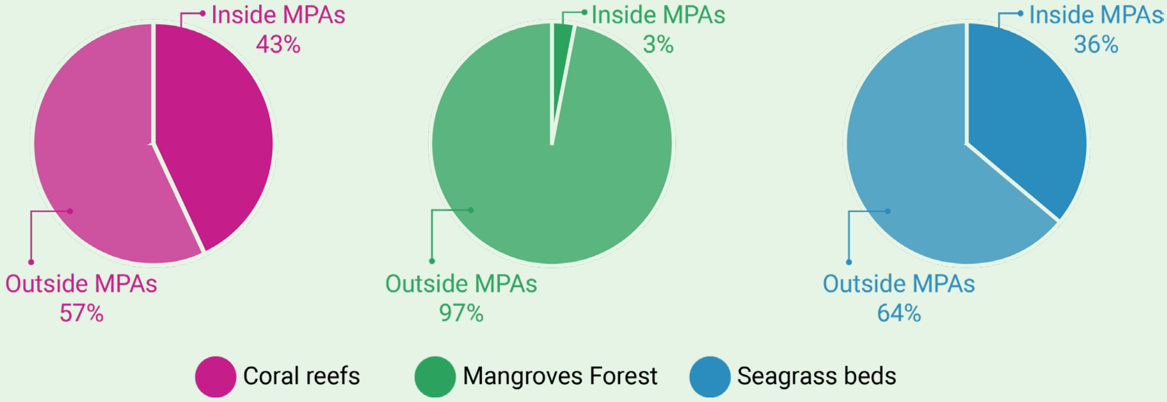

Figure 3.B.1. The proportional percentages of coastal marine habitats within and outside 196 MPAs compared to mapped coastal marine habitats in Indonesia.

More than 30% of coral reefs at all regions, except in Jawa and Maluku, have been protected within MPAs, with the highest protection was in Sulawesi (57%) and Papua (57%) (Table 3.B.1). For mapped seagrass beds, Papua has the largest percentage of protection within MPAs, reaching 90%, while Sulawesi (26%), Kalimantan (16%), and Jawa (1%) have the lowest seagrass beds protection. Compared to coral reefs and seagrass beds, mangrove forests have the least protection within MPAs, ranging from 1% (Sumatra) to 12% (Jawa), with an average of 3%. Following the national target to establish 32.5 million of MPAs by 2030, this presents a huge opportunity to expand the protection of each important coastal marine habitat and prioritize expansion in regions that currently have less than optimal percentage of protection.

The 196 MPAs in Indonesia have protected between 1% (Sumatra) and 39% (Kalimantan) of mapped coral reefs within non-extractive zones, with an average of protection of 8% (Table 3.B.1). Seagrass bed protection within non-extractive zones has a huge range, from none (Sumatra and Jawa) to 31% (Papua), with an average of 7%. Compared to other important coastal marine habitats, mangrove forests have the least protection within non-extractive zones, with an average of 0.7%. These results suggest that the expansion of coastal marine habitats within non-extractive zones is urgently required to fulfill the 20% protection target of CTI-RPOA (CTI-CFF 2009).

Table 3.B.1. The proportion of coastal marine habitat protection within 196 MPAs and non-extractive zones to the total extent of coastal marine habitat in each region.

Region	Coral reefs			Mangroves forests			Seagrass beds		
	Extent within 12 nautical miles (ha)	Protection (%)	Non extractive zones (%)	Extent within 12 nautical miles (ha)	Protection (%)	Non extractive zones (%)	Extent within 12 nautical miles (ha)	Protection (%)	Non extractive zones (%)
Sumatera	383.348	38	1	533.940	1	<0,1	1.938	48	0
Jawa	92.226	24	3	35.025	12	0,1	446	1	0
Sunda Kecil	108.577	55	7	37.357	3	0,1	23.385	47	8
Kalimantan	110.077	55	39	554.539	3	<0,1	2.080	16	14
Sulawesi	659.720	57	10	224.575	5	1,6	57.402	26	7
Maluku	300.439	28	1	144.193	2	0,3	34.627	31	<1
Papua	210.346	57	11	1.128.804	3	1,3	9.404	90	31
Indonesia	**2.038.522**	**43**	**7**	**2.658.433**	**3**	**0,7**	**129.283**	**36**	**7**

Note: Regional coastal marine habitats are defined as 12 nautical miles from the region's coastline. Non-extractive zones represent the percentage of protected coastal marine habitats that are in non-extractive use areas (such as Core Zones, Buffer Zones, Protected Zones, Tourism Zones, etc.). The analysis for non-extractive zones included 30 MMAF MPAs and nine MoEF MPAs that have zones, and excluded zones in terrestrial protected areas that have mangroves. There are eight MoEF MPAs that have zones and are not included in the analysis due to inaccessibility of spatial data.

is still being debated, there is a strong global push behind a new global target of 30% ocean protection by 2030, building on momentum from the IUCN World Conservation Congress resolution in 2016 (Table 3.1). Progress over recent decades suggests Indonesia is well placed to meet the area component of this future target, but substantial headway is required on other components.

Moving forward — given that Indonesia is close to meeting area-based targets — it is necessary to increase focus on the non-area-based components of global and national targets. While some future MPA expansion is required, this should be focused to ensure that future MPAs add to the representativeness of connectivity for coastal marine habitats. Increasingly, MPA effort can be shifted away from expansion of MPAs, and be more focused in building effective and equitable MPA management (Campbell and Gray 2019). Management capacity has been found to be a major predictor of MPA outcomes (Gill et al. 2017). In some cases, building effective and equitable MPA management may require linkages with other management efforts. In the case of mangrove forests, for example, it is important for work to align with the Indonesian National Mangrove Action plan jointly implemented by MoEF and MMAF (Perpres RI No. 73/2012). This plan aims to protect and restore Indonesian mangrove forests nationally.

In the future, MPAs need strengthened regular monitoring and evaluation to inform adaptative management (Mangubhai et al. 2011). NGOs, working in partnership with MMAF, have produced several dashboard reports to consider the status and trends of MPAs (e.g. Ahmadia et al. 2017; Setyawan et al. 2018). These reports can inform government and partners on status and trends in key outcome variables within MPAs. In addition, there are several case study approaches using impact evaluation to identify the causal effects of MPAs. These monitoring and evaluation approaches should be built upon to inform adaptive management.

While we focus on state-governed MPAs in this chapter, there is increased interest in other governance approaches to MPAs that meet the IUCN definition. It is important to ensure MPA implementation and decision-making take account of local people's needs, while also building on existing customary management within areas. This will require balancing "bottom-up" and "top-down" integration, emphasizing community involvement, and will require broadening the recognition of MPAs beyond state governed areas to other forms of governance. For example, co-management approaches can share MPA governance between communities and government. Areas exist within Indonesia that meet the IUCN MPA definition that are governed by local communities or the private sector and so are currently unrecognized by the GoI as MPAs. Supporting these areas could play an important role in further enhancing biodiversity protection in Indonesia.

There is increased interest in the role Other Effective Area-Based Conservation Measures (OECMs) can play in conservation (IUCN-WCPA Task Force on OECMs 2019; Chapter 10). OECMs are areas that do not usually have biodiversity conservation as a primary objective but play a major role in supporting long term biodiversity. Many Indonesian communities have a rich history of implementing natural resource management systems free from formalized government recognition that meet the definition of OECMs. Where these areas are located outside of government recognized MPAs, they can make a crucial contribution to biodiversity conservation. In some cases, these management systems may have been stable and effective for centuries; it is important to recognize them so that they are able to continue to flourish, undisrupted by attempted implementation of "top-down" management to integrate into MPA.

Our results show Indonesia has made substantial progress towards national and international area-based ocean protection commitments for coastal ecosystems. However, future work is required to meet all aspects of international and regional targets, and to build effectiveness of Indonesia's MPA estate.

3.6 Methods

We sourced MPA shapefiles — including zonation — from MoEF and MMAF (Jakarta, November 2019). Coral reef extent data was sourced from UNEP-WCMC et al. (2018). Mangove forests extent for 2016 was sourced from Bunting et al. (2018), and seagrass beds maps were from Geospatial Information Bureau (Perka BIG No.8/2014). The coral reefs and mangrove forests layers represent a consistent mapping effort based on remote sensing data. Spatial analysis was conducted in ArcGIS 10.7.1. provincial waters were established by buffering provincial maps for 12 nautical miles. MPAs were then overlaid to identify MPA extent within each province and around big island groups (spanning multiple provinces). Critical habitat layers were cut to provincial waters and MPA outer boundaries to identify percentage protection by province and big island. MPA zonation plans were reviewed and all MPA zone types were classified as either "non-extractive zone" or "extractive zone". Non-extractive zones are locations that prohibit all extractive harvesting, including Core Zone, Tourism Zone, and Fisheries Recovery Zone. Extractive Zone included all other areas within MPAs where some form of extract harvest is allowed. These zones are normally focused on sustainable fisheries or sustainable extractive use and implement fisheries gear restrictions and limit access for non-residents to harvest. For non-extractive zone analysis, we only used data from 196 formal recognized MPAs (166 MMAF MPAs and 30 MoEF MPAs) that already have zones, i.e. 30 MMAF MPAs and nine MoEF MPAs. There are eight MoEF MPAs that already have zones but are not included in the analysis due to inaccessibility of the spatial data.

Box 3.C
Focused Efforts to Improve Management Effectiveness for 35 selected MPAs

Effective management within 196 MPAs is an enormous challenge to be achieved. MMAF has selected 35 MPAs that can be used to identify and demonstrate how to rapidly develop management effectiveness so that lessons learned can then be transferred to other MPAs (Kementerian Kelautan dan Perikanan Republik Indonesia 2019; Perpres RI No. 2/2015). These consist of ten national MPAs and 25 provincial MPAs, meant to achieve effective management by 2019, evaluated using the Management Effectiveness of Aquatic, Coasts, and Small Islands Conservation Areas (*Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*/E-KKP3K) tool.

The selected 35 MPAs are located in 17 provinces within six regions covering 10,854,547 ha. Most of these MPAs are located in the Sunda Kecil (34% of overall coverage, nine MPAs) and Sumatra (28% of overall coverage, nine MPAs) regions. Kalimantan and Jawa regions have the least selected MPA coverage, i.e. 3% (one MPA) and <1% (two MPAs) respectively. A total of 26 of the 35 MPAs have been established by MMAF decrees between 2009-2019. The remaining four MPAs were initiated through the head of district decrees, with five MPAs initiated through governor decrees. In regard to the level of management effectiveness measured via E-KKP3K, 26 of 35 selected MPAs were "conservation area managed minimally" (Green level), while the other MPAs were "conservation area established" (Yellow level). This means most of these selected MPAs have basic management tools and need to improve their level to "conservation area managed optimally" (Blue level) and "self-reliant conservation area" (Gold level) (Chapter 5). MMAF can play a significant role to support the provincial Marine and Fisheries Bureau – who manages the provincial MPAs – by providing necessary guidance and resources to support MPA management.

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Chapter 4. Ecological and Social Status and Trends of Marine Protected Areas in Indonesia

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Abstract

With the Government of Indonesia's target to continue establishing new Marine Protected Areas (MPAs), effective management is crucial to reach the dual MPA goals of biodiversity conservation and sustainable use. As the threats to biodiversity increase and vary, regular monitoring is essential to effectively manage MPAs and adapt to changes. This chapter summarizes status and trends in key ecological and social indicators that are important for monitoring ecosystem health, human well-being, and marine resource use and dependence across Indonesian MPAs. The analysis consists of data from 33 MPAs (or 17% of MPAs in Indonesia), spanning 13 provinces and nine years. Hard coral cover remained stable in most of the provinces over time with an average of 37 ± 2% across Indonesia. The average of abundance and biomass of key fisheries averaged 612 ± 157 ind/ha and 156 ± 40 kg/ha, while herbivorous fish averaged 1,361 ± 208 ind/ha and 490 ± 95 kg/ha, respectively. Social conditions show that food security increased, while marine tenure and place attachment declined. Long term ecological and social monitoring efforts contribute greatly to better understand the relationship among indicators that influence/are influenced by MPA implementation. Considering both ecological and social conditions in making decisions for effective management can help to reach both biodiversity goals and sustained benefits to people.

Abstrak

Seiring dengan target Pemerintah Indonesia dalam membangun Kawasan Konservasi Perairan (KKP) baru, maka pengelolaan yang efektif sangat penting untuk mencapai dua tujuan KKP, yaitu konservasi keanekaragaman hayati dan pemanfaatan berkelanjutan. Karena ancaman terhadap keanekaragaman hayati terus meningkat dan bervariasi, pemantauan berkala menjadi penting sebagai bagian dari pengelolaan KKP secara efektif dan untuk adaptasi terhadap perubahan-perubahan yang terjadi. Bab ini merangkum status dan tren indikator-indikator utama ekologi dan sosial yang penting untuk memantau kesehatan ekosistem, kesejahteraan manusia, serta pemanfaatan dan ketergantungan sumber daya laut di seluruh KKP di Indonesia. Analisis dalam bab ini menggunakan data dari 33 KKP dan kawasan konservasi yang meliputi ekosistem pesisir (atau 17% KKP di Indonesia), tersebar di 13 provinsi dan dalam kurun waktu sembilan tahun. Hasil analisis menunjukkan tutupan karang keras stabil di sebagian besar provinsi dari waktu ke waktu dengan rerata 37 ± 2% di seluruh Indonesia. Rerata kelimpahan dan biomassa ikan ekonomis penting adalah 612 ± 157 ind/ha dan 156 ± 40 kg/ha, sedangkan ikan herbivora reratanya 1.361 ± 208 ind/ha untuk kelimpahan dan 490 ± 95 kg/ha untuk biomassa. Untuk indikator-indikator sosial, kondisi ketahanan pangan masyarakat meningkat, sementara kondisi hak ulayat dan kelekatan terhadap tempat menurun. Upaya pemantauan ekologi dan sosial jangka panjang berkontribusi besar untuk lebih memahami hubungan antar berbagai indikator yang memengaruhi/dipengaruhi oleh penerapan KKP. Mempertimbangkan kondisi ekologi dan sosial dalam membuat keputusan untuk pengelolaan KKP yang efektif dapat membantu mencapai tujuan keanekaragaman hayati dan pemanfaatan sumber daya laut berkelanjutan bagi masyarakat.

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4.1 Introduction

Coastal and marine areas contain rich biodiversity and are essential for supporting community livelihoods. To protect these ecosystems globally, through CBD Aichi Target 11 and other national and international targets, many nations have agreed to protect 10% of their coastal and marine areas by 2020. Following international agreement, the Government of Indonesia (GoI) set a target to protect 23.4 million ha of marine areas within Marine Protected Areas (MPAs) by 2020 and 32.5 million ha by 2030. As of 2019, the GoI has established 196 MPAs managed by the Ministry of Marine Affairs and Fisheries (MMAF) and Ministry of Environment and Forestry (MoEF) that covers a total area of 23,146,375 ha (Chapter 3). MPAs are established to meet defined conservation objectives such as protecting vulnerable marine ecosystems or supporting the population recovery of threatened species. MPAs in Indonesia aim to conserve biodiversity and support human well-being especially through sustainable fisheries. Increasingly, MPAs are expected to go beyond providing biodiversity outcomes with minimal human well-being impact, to enhancing human well-being while delivering conservation outcomes (Eklund et al. 2019). To achieve these ambitious objectives, MPAs must be adaptively managed. This enables management decisions that are achieving desired outcomes to be maintained, but — more crucially — management decisions that fail to achieve desired outcomes to be revisited and altered.

Adaptive management depends on MPA managers understanding the ecological and social outcomes of their existing management regimes. Ecological and social monitoring generates a better understanding of the changes in the local marine environment and the communities that rely on marine resources for their livelihoods and well-being. Without this understanding, it is unclear whether the management actions and protection efforts are achieving their goals. Regular ecological and social monitoring is therefore critical to inform adaptive management (Mangubhai et al. 2011). Monitoring can also provide useful evidence in decisions on where to place future MPAs and combine with CARE (Connected, Adequate, Representative, Efficient) principles to help develop zoning plans (Moilanen, Wilson, and Possingham 2009; Chapter 6). Monitoring is a necessary component of MPA management effectiveness and MPA effectiveness evaluations. Trends through time can show us how ecological and social conditions are changing due to MPA implementation and how effective and successful the MPA is in achieving its intended ecological and social outcomes. Monitoring and management effectiveness should be regularly and transparently conducted, as it can serve as a tool for reflection and introspection process (Chapter 5).

This chapter summarizes status and trends in key ecological and social indicators that are important for monitoring ecosystem health, human well-being, and marine resource use and dependence across Indonesian MPAs. With robust, long-term monitoring programs that have been designed and implemented across Indonesia by MPA management authorities, academics, and Non-Government Organizations (NGOs), there are rich ecological and social monitoring datasets to support evaluation. Many of these have been previously published in regional evaluations (e.g. State of the Seascapes; Ahmadia et al. 2017; Setyawan et al. 2018). Here, for the first time, we bring together data from 989 ecological sites and 7,579 households (403 settlements) across 33 MPAs (or 17% of MPAs in Indonesia) that span thirteen provinces and nine years (2009–2018 for ecological data and 2010–2019 for social data). These data were collected by ten organizations consisting of government, universities, and NGOs in Indonesia (Figure 4.1). For more details of survey protocols and how the ecological and social indicators were calculated, see Appendix 4.1.

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Figure 4.1. Map of MPAs in Indonesia included in the social and ecological analysis.

4.2 Trends in Ecosystem Health

We present the status and trends for five ecological indicators. Indicators were: (i) hard coral cover, (ii) key fisheries abundance, (iii) key fisheries biomass, (iv) herbivorous fish abundance, and (v) herbivorous fish biomass. We also calculated the standard error (SE) for each result which represents the amount of variation around the MPA and/or Province (mean ± SE). The SE value shows one standard error above and below the mean value.

All data were collected inside the MPA using Point Intercept Transect (PIT) for benthic and Underwater Visual Census (UVC) for fish. Benthic surveys recorded benthic animal and substrate at 0.5 m intervals on 50 m transects, with three transects per site. Mean hard coral cover (including: all scleractinian corals, *Heliopora*, *Millepora*, and *Tubipora*) was used as an indicator of benthic health. Hard coral provides important habitat or other reef species, and high coral coverage is generally associated with healthier reefs (Hughes et al. 2007). Fish surveys were conducted to record fish species, abundance, and length estimates. Fish lengths were converted to biomass using standardized fish length-weight conversion coefficients from Fishbase (Froese and Pauly 2019). UVC transect widths and number of replicates per site differed between protocols (Appendix 4.1), but all transects were on deep reefs between 7–12 m depth. Fish census data were standardized to allow comparisons, with abundance calculations converted to individuals per ha and biomass calculations converted to kilograms per ha. Key fisheries abundance and biomass (Families: Lutjanidae, Haemulidae, and Serranidae) can be used as proxy of fishing impacts on reefs, where lower biomass and abundance may indicate high fishing pressures in the area (Setyawan et al. 2018). The species within these families represent important high-value commercial species that are often sold for both domestic and international markets in Indonesia (Halim et al. 2019; Khasanah et al. 2019). Herbivorous fish abundance and biomass (Families: Acanthuridae, Scaridae, and Siganidae) were used as indicators of ecological functions occurring on reefs, though these species are also targeted by small-scale fisheries and domestic consumption. Herbivores play an important role in grazing algae on the reef, reducing coral-algae competition, and helping maintain reef health (Hughes et al. 2007).

To report on current status, each indicator used the most recent year of monitoring after 2016 — when the last reports of widespread coral bleaching occurred in Indonesia — for each MPA (Appendix 4.2), aggregated to the provincial level. Coral bleaching is a major global threat to coral reefs in the world, and is caused by anthropogenic activities that lead to warmer sea surface temperature (Hughes et al. 2018). Bleaching can lead to coral mortality, decreasing hard coral cover, which leads to changes in reef fish abundance and biomass (Bachtiar and Hadi 2019; Chaijaroen 2019). The global bleaching event in 2016 affected many — but not all — areas in Indonesia, and it is unclear how much coral mortality resulted from bleaching where it occurred (Wouthuyzen, Abrar, and Lorwens 2018).

Status is reported at the provincial level because the majority of the MPAs are managed under the provincial government, thus the result can inform the provincial government on the ecological condition within their management areas. Nevertheless, as many data were only from one MPA per province, care should be taken with interpretation. MPAs with monitoring data available are likely to be the better performing MPAs, as coordinating regular monitoring requires a greater level of funding and management effectiveness for MPA management authorities or support from NGO partners. For trends, because few MPAs have time-series data available, we only include MPAs matching these three criteria: (i) have more than one year monitoring data, (ii) have minimum 70% consistency in monitoring sites between monitoring repeats, and (iii) are within the 35 national priority MPAs (Chapter 3). Therefore, direct comparisons between status and trends should not be made, as the status data represent a larger MPA dataset. For details on which MPAs and years of data collection are used for each indicator, see Appendix 4.2 and Appendix 4.3.

4.2.1 Hard Coral Cover

Hard coral cover averaged 37 ± 2% across all surveyed sites. For most provinces, hard coral cover was between 28–66% during the most recent year of data collection (Figure 4.2). Across all surveyed MPAs, average hard coral cover ranged between 30–40%, a relative number for Indonesia, where the average of hard coral cover within the Sunda Banda Seascape (SBS) was 35.9% in 2017 (Setyawan et al. 2018) and within the Bird's Head Seascape (BHS) was approximately 30% in 2016 (Ahmadia et al. 2017).

Hard coral cover remained consistent across the sampled MPAs through time (Figure 4.3). Though, TWP (*Taman Wisata Perairan*; Aquatic Tourism Park) Kepulauan Anambas, TNL (*Taman Nasional Laut*; Marine National Park) Karimun Jawa, TWP

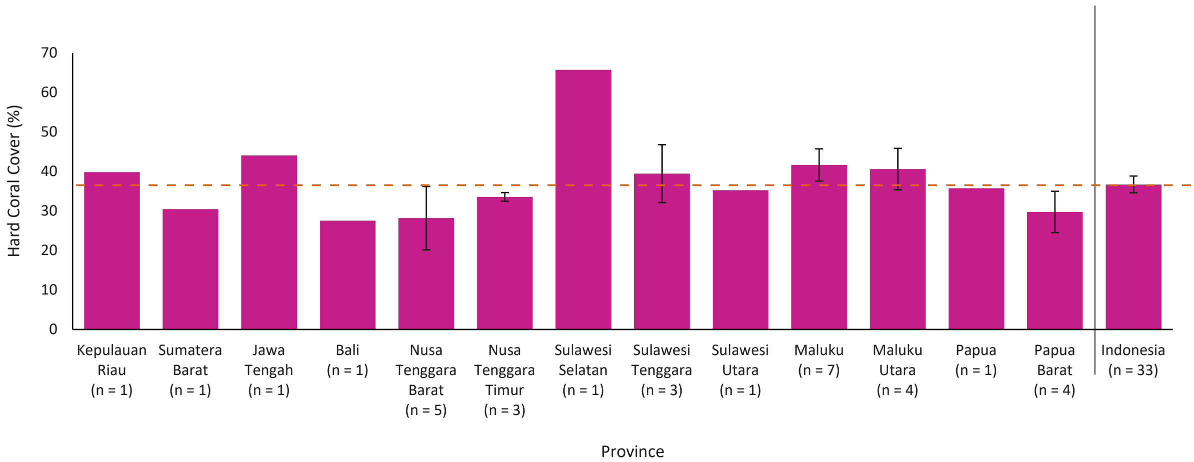

Figure 4.2. Status of hard coral cover at the provincial and national levels, using the most recent available data from each MPA that was collected during or after 2016. Note: n shows the number of MPAs evaluated in each province. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.2.

Gili Matra, and TWP Raja Ampat experienced a large decline in hard coral cover at the first repeat. The largest decline was experienced by TNL Karimun Jawa from 64 ± 12% to 27 ± 6% after one year (2013–2014), though hard coral cover was recorded in 2015 at 55 ± 5%. This suggests that the decline may be an artifact of differences in observers between years, though across this period the area experienced increasing numbers of tourists and coastal development. For example, homestay numbers increased by 60% from 2013–2014. These activities also influence the decrease of seagrass beds and mangrove forests ecosystems (Priyanto 2016; Setiawan, Rijanta, and Baiquni 2017). This shift to tourism was accompanied by shifting occupations from fishers to tour guides, resulting in reducing threats from fishing activities (Hafsaridewi et al. 2018). Destructive fishing gears such as poison fishing and blast fishing have also been reduced based on an agreement between fishers that banned these gears within the Core Zone (Hafsaridewi et al. 2018).

Indonesia has experienced several widespread coral bleaching events in the last four decades (particularly severe in 1982, 1997, 2010, and 2016). The long term hard coral cover data showed that coral cover fluctuated though time, but surprisingly did not show much change in response to the 2010 and 2016 bleaching events. During bleaching events, field observations identified that up to 70% of mostly fast-growing corals such *as Acropora, Montipora, Pocillopora,* and *Stylophora* bleached (Muttaqin et al. 2014; Rudi 2012; Setiawan et al. 2017; Wilson, Ardiwijaya, and Prasetia 2012; Yusuf and Jompa 2012). The outcomes of coral bleaching were varied, from low mortality (~5%) such as in TNL Wakatobi in 2010 (Wilson et al. 2012) or TWP Gili Matra in 2016 (Setiawan et al. 2017), moderate mortality (~10%) in the Spermonde in 2010 (Yusuf and Jompa 2012); to high mortality (up to 35%) in Aceh (Muttaqin et al. 2014). Some reports also documented high cover of dead corals and dead corals with algae in Natuna Sea after bleaching events in 2010

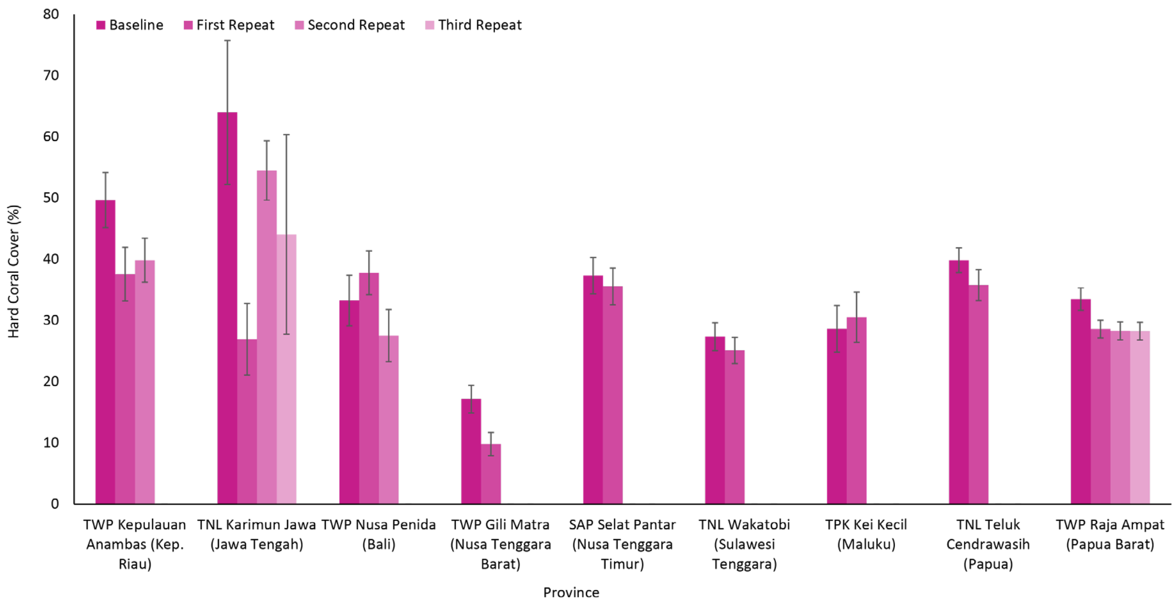

Figure 4.3. Percentage of hard coral cover in MPA level at baseline and repeat monitoring. Note: Year of baseline and repeat monitoring at each MPA. TWP Kepulauan Anambas: 2015, 2017, 2018; TNL Karimun Jawa: 2013, 2014, 2015, 2017; TWP Nusa Penida: 2016, 2017, 2018; TWP Gili Matra: 2012, 2016; SAP Selat Pantar: 2014, 2017; TNL Wakatobi: 2012, 2016; TPK Kei Kecil: 2015, 2018; TNL Teluk Cendrawasih: 2011, 2016; TWP Raja Ampat: 2009, 2010, 2014, 2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.3.

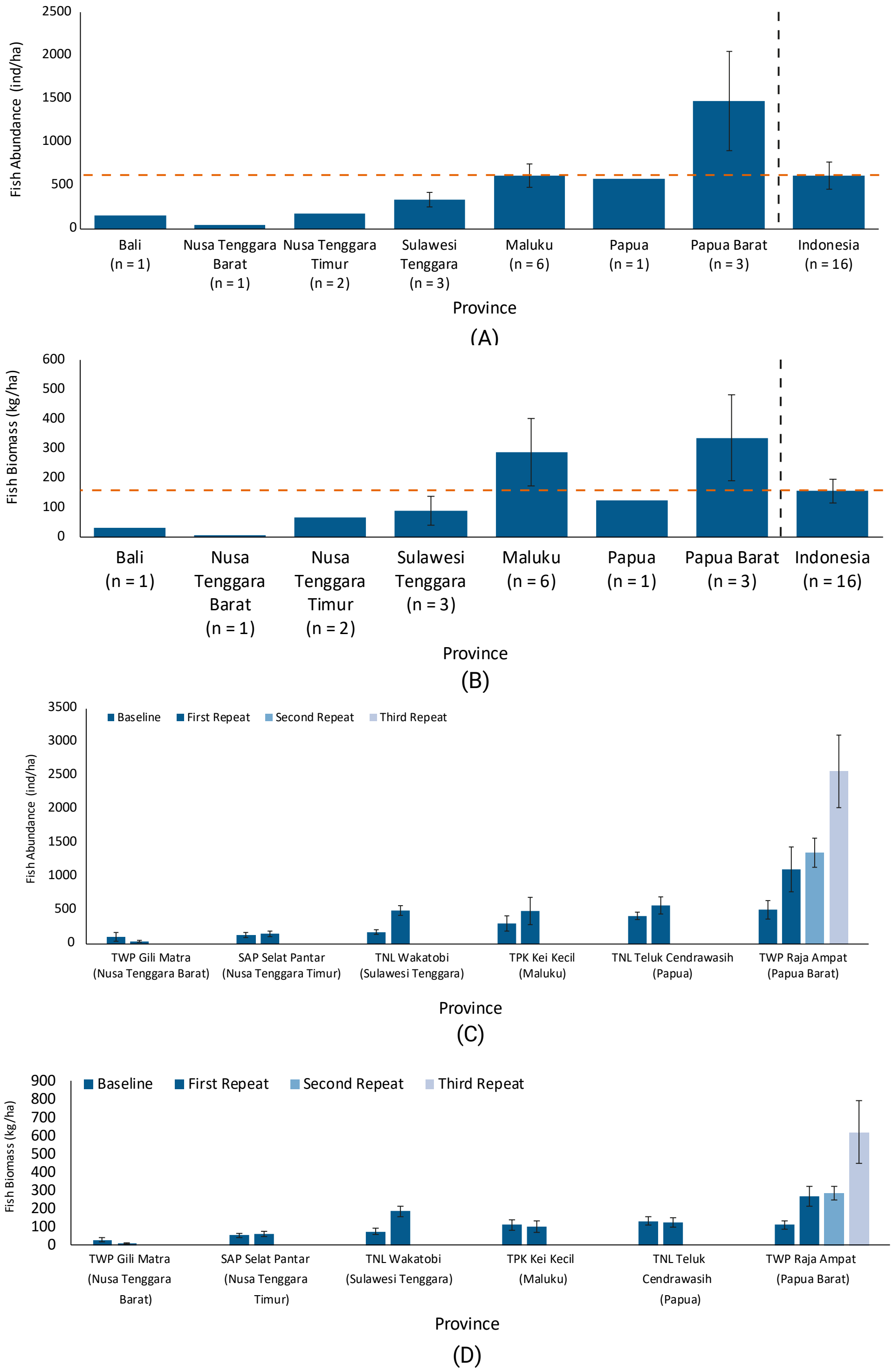

Figure 4.4. Status and trends of key fisheries species. Status of (A) abundance and (B) biomass at the provincial and national levels, using the most recently available data per MPA between 2016–2019; and trends of (C) abundance and (D) biomass at the MPA level. Note: n shows the number of MPAs evaluated in each province. Year of baseline and repeat monitoring at each MPA. TWP Gili Matra: 2012, 2016; SAP Selat Pantar: 2014, 2017; TNL Wakatobi: 2012, 2016; TPK Kei Kecil: 2015, 2018; TNL Teluk Cendrawasih: 2011, 2016; TWP Raja Ampat: 2009, 2010, 2014, 2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.2 and Appendix 4.3.

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(Rudi 2012). Nevertheless, coral bleaching events are under studied in Indonesia, thus their impacts on coral reef ecosystems remains poorly known.

4.2.2 Key Fisheries Species Abundance and Biomass

Across seven provinces, key fisheries abundance was 612 ± 257 ind/ha and key fisheries biomass averaged 157 ± 40 kg/ha. The highest key fisheries abundance and biomass respectively were 1,474 + 575 ind/ha and 336 ± 146 kg/ha in Papua Barat, while the lowest was 43 ind/ha and 8 kg/ha in Nusa Tenggara Barat (NTB; Figure 4.4A, Figure 4.4B). Average key fisheries biomass in Indonesia is generally lower in the SBS (68.8 kg/ha) (Setyawan et al. 2018) than the BHS (~300 kg/ha) (Ahmadia et al. 2017).

Trends in key fisheries family abundance and biomass were observed across six MPAs that span six provinces. Even though the data was collected in different years between MPAs, in general the patterns show that both abundance and biomass increased in eastern Indonesian MPAs, while either remained stable or slightly declined in central Indonesian MPAs (Figure 4.4C, Figure 4.4D). The western part of Indonesia has experienced high threats to coral reef habitats from fisheries — especially in Java and the Lesser Sunda Island (Burke et al. 2012). Large increases in both abundance

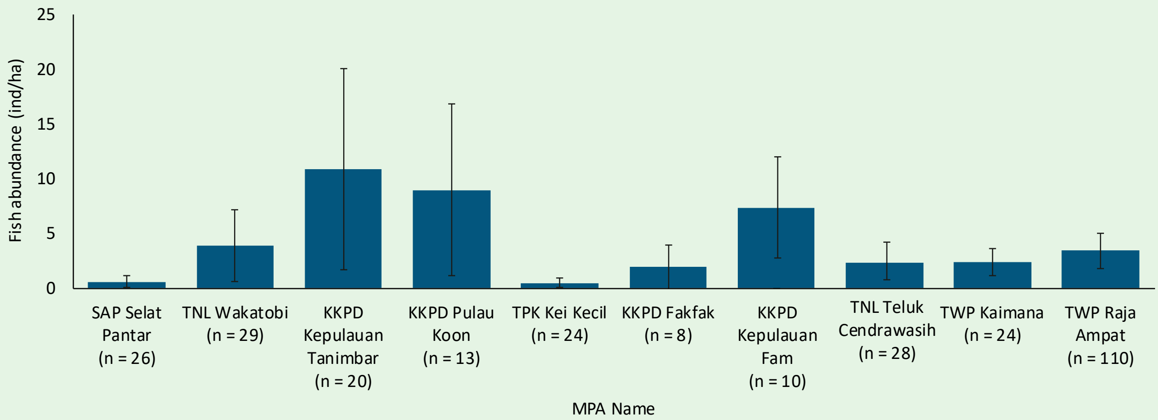
biomass of key fisheries families were observed in Papua Barat between 2009–2016 which may indicate that the key fisheries species were growing both in average number and size. The increase in fish biomass and abundance is in line with the stable trend of hard coral cover in this area. This maybe due to the decreases in fishing pressure as community awareness increases and patrols are conducted regularly. Since 2014, TWP Raja Ampat has implemented a stewardship fee (*pembayaran atas jasa lingkungan*) for tourists that entered the MPA. From this revenue, IDR 1.5 billion per year is allocated for a community fund, and the remaining fund (70% from international tourists and 85% from domestic tourists) is used for MPA management costs and community needs, which include institutional enhancement, MPA network management, community livelihood improvement, and monitoring and evaluation (Atmodjo, Lamers, and Mol 2019).

Box 4.A
Bumphead Parrotfish and Humphead Wrasse Abundance

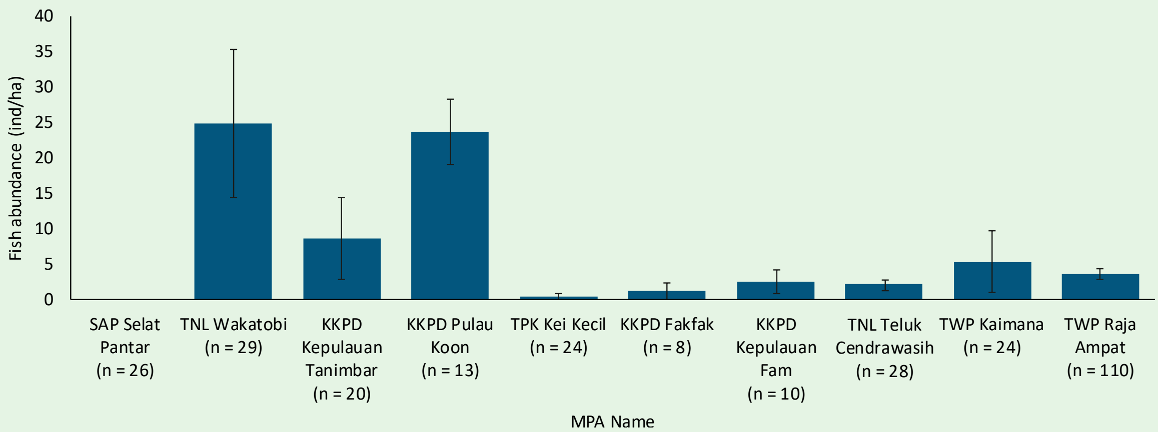
As large-bodied and slow-growing species, bumphead parrotfish (*Bolbometopon muricatum*) and humphead wrasse (*Cheilinus undulatus*) are considered highly sensitive to fishing pressure – with populations quickly disappearing when fished. Humphead wrasse are listed as endangered while bumphead parrotfish are listed as vulnerable by the IUCN Red List (Chan, Sadovy, and Donaldson 2012; Russell 2004). Both species are threatened by fisheries in Indonesia where they historically had large populations (Sadovy de Mitcheson, Suharti, and Colin 2019). Through Kepmen KP No. 37/KEPMEN-KP/2013, humphead wrasse are categorized as a nationally protected species. The GoI has issued a limited protection status for humphead wrasse which protects individuals weighing between 0.1–1 kg and >3.0 kg (Kepmen KP No. 37/KEPMEN-KP/2013). With this regulation, humphead wrasse <0.1 kg or between 1–3 kg can legally be caught in Indonesia. There is currently no national level protection for bumphead parrotfish.

Abundances (ind/ha) of bumphead parrotfish and humphead wrasse were generally low across MPAs. However, in both KKPD (*Kawasan Konservasi Perairan Daerah*; Provincial MPA) Pulau Koon (Maluku) and KKPD Kepulauan Tanimbar (Maluku), bumphead parrotfish abundances were high. KKPD Kepulauan Tanimbar had an average of 10.9 ± 9.2 ind/ha, while KKPD Pulau Koon had an average of 9 ± 7.9 ind/ha (Figure 4.A.1A). These numbers are lower than the study by Kobayashi et al. (2011) that shows the abundance of bumphead parrotfish in Indonesia is 18 ind/ha.

Humphead wrasse abundance followed similar patterns to bumphead parrotfish, with low observations across most MPAs – except for TNL (*Taman Nasional Laut*; Marine National Park) Wakatobi, KKPD Pulau Koon, and KKPD Kepulauan Tanimbar. The highest abundance was found in TNL Wakatobi reaching an average of 24.8 ± 10.5 ind/ha, while the lowest in TPK (*Taman Pulau Kecil*; Small Island Park) Kei Kecil with average of 0.5 ± 0.5 ind/ha (Figure 4.A.1B). A particularly large increase in abundance in TNL Wakatobi and KKPD Pulau Koon was observed across the survey years, increasing from 0.4 ± 0.4 ind/ha in 2012 to 24.8 ± 10.5 ind/ha in 2016 in TNL Wakatobi and from 0.2 ± 0.2 in 2016 to 23.7 ± 4.6 ind/ha in 2018 in KKPD Pulau Koon.



(A)



(B)

Figure 4.A.1. MPA level status in abundance of (A) bumphead parrotfish species (*Bolbometopon muricatum*) and (B) humphead wrasse species (*Cheilinus undulatus*).

4.2.3 Herbivorous Fish Species Abundance and Biomass

Across seven provinces, the average herbivorous fish abundance and biomass in Indonesia were 1,361 ± 208 ind/ha and 490 ± 95 kg/ha, respectively. Herbivorous fish abundance varied greatly among MPAs and provinces, with the highest values recorded in Sulawesi Tenggara (2,046 ± 1,012 ind/ha across TNL Wakatobi in 2016, TWA (*Taman Wisata Alam*; Nature Recreation Park) Teluk Lasolo in 2016, and KKPD (*Kawasan Konservasi Perairan Daerah*; Provincial MPA) Provinsi Sultra in 2016 while the lowest values were recorded in Nusa Tenggara Barat (840 ind/ha in TWP Gili Matra in 2016) (Figure 4.5A, Figure 4.5B). The highest herbivorous fish biomass was found in Papua Barat Province averaging 831 ± 207 kg/ha and the lowest in Nusa Tenggara Barat with an average of 132 kg/ha. Across Indonesia, herbivorous species biomass averaged 382 kg/ha, with the SBS lower than national average at 227 kg/ha (Setyawan et al. 2018) and the BHS above national average at ~600 kg/ha (Ahmadia et al. 2017).

Trends in herbivorous fish species abundance and biomass were recording in six MPAs spanning six provinces (Figure 4.5C, Figure 4.5D). Trends in herbivorous fish species abundance and biomass were generally positive, except for a decline in herbivorous fish species abundance and biomass in Maluku (TPK Kei Kecil) (Figure 4.5C, Figure 4.5D). The increases seen in herbivorous fish abundance were mirrored in the three MPAs that also had biomass data, with especially large increases in fish biomass between 2016 and 2018 for TNL Wakatobi (Sulawesi Tenggara) and TWP Raja Ampat (Papua Barat). Increases in herbivorous fish abundance and biomass within TNL Wakatobi and TWP Raja Ampat are likely influenced by the decreased fishing activities due to increased MPA enforcement as well as shifting livelihoods from fishing to tourism activity, which can lead to lower fishing intensity (Firmansyah et al. 2016; Glew et al. 2015; Mustofa 2016) (Chapter 8).

4.3 Trends in Human Well-Being

This section synthesizes data on five indicators representing five dimensions of human well-being commonly identified in human development policy goals — food security (health), material assets (economic well-being), marine tenure (political empowerment), school enrollment (education), and place attachment (culture). The five indicators are included in a long-term social monitoring program, based on a standardized household survey protocol (Glew, Mascia, and Pakiding 2012) that has been implemented by local university partners to document social conditions in thirteen MPAs across eastern Indonesia (Appendix 4.1). The protocol utilizes a power sampling approach to identify an adequate number and variety of settlements within each MPA to be able to statistically detect change through time, and then randomly selects households within each settlement. The local university partners conduct face-to-face interviews with the head of each selected household, collecting data on household characteristics, livelihoods, fishing characteristics, and human well-being. For those provinces displaying trend data, significant trends (detected with a Mann-Kendall monotonic trend test) are notated next to the province's name across the bottom of each figure. One asterisk (*) indicates $p<0.1$, two asterisks (**) indicate $p<0.05$, and three asterisks (***) indicate $p<0.01$.

Each indicator synthesizes household-level data from settlements within one of thirteen MPAs, spanning four provinces in Indonesia[1]. The thirteen MPAs are one MPA

[1]In the analysis, we show an average of Papua and Papua Barat combined together, because of limited data from Papua. There are only three MPAs that are legally acknowledged in Papua Province (TNL Teluk Cendrawasih, KKPD Biak Numfor, and TWP Padaido). Data is only available for TNL Teluk Cendrawasih – which spans the provinces of Papua and Papua Barat. Only four of the 21 sampled settlements for TNL Teluk Cendrawasih are within Papua, with

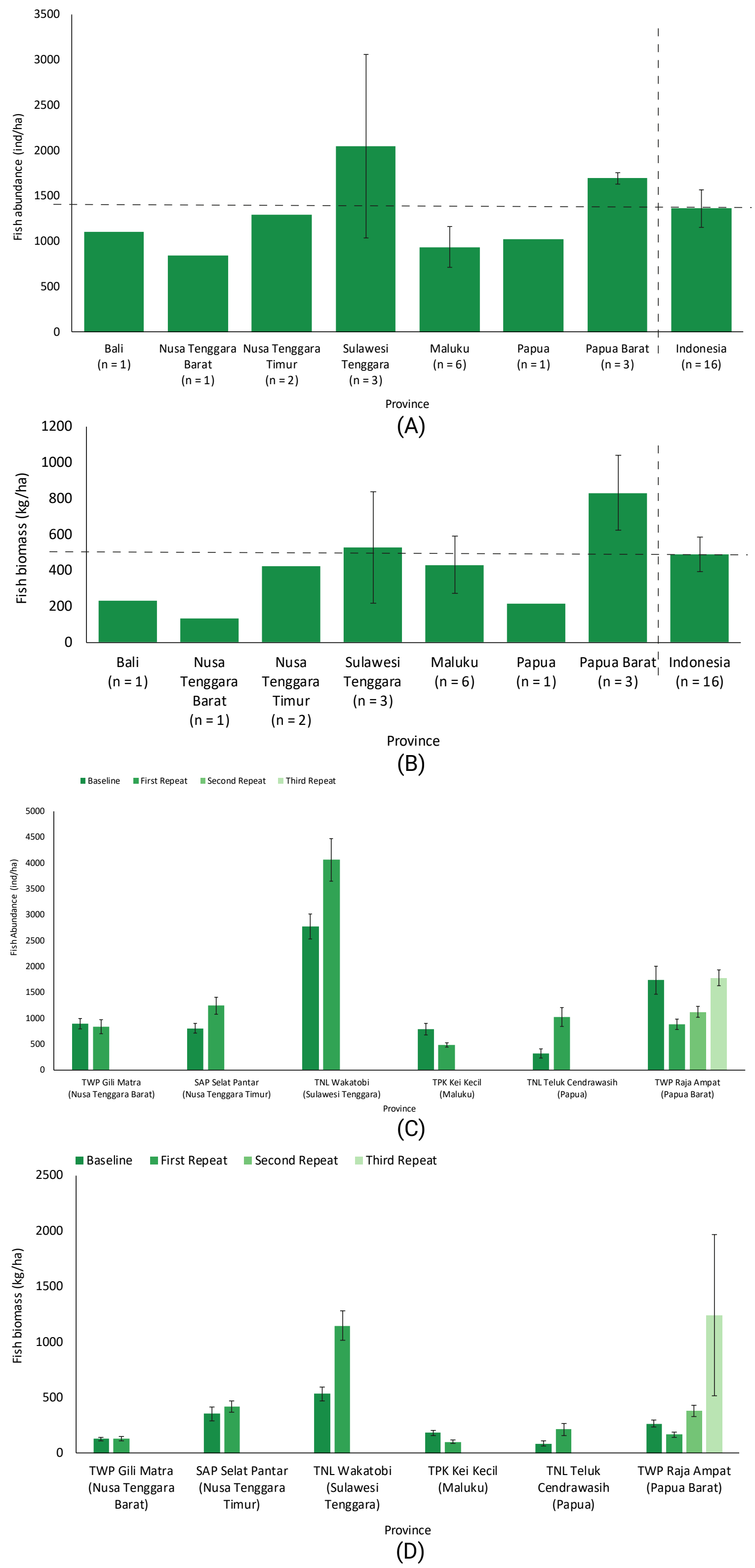


Figure 4.5. Status and trends of herbivorous fish species. Status of (A) abundance and (B) biomass at the provincial and national levels, using the most recently available data per MPA between 2016–2019. Trends of (C) abundance and (D) biomass at the MPA level. Note: Year of baseline and repeat monitoring at each MPA. TWP Gili Matra: 2012, 2016; SAP Selat Pantar: 2014, 2017; TNL Wakatobi: 2012, 2016; TPK Kei Kecil: 2015, 2018; TNL Teluk Cendrawasih: 2011, 2016; TWP Raja Ampat: 2009, 2010, 2014, 2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.2 and Appendix 4.3.

(out of 13) in Sulawesi Tenggara, two MPAs (out of 9) in Nusa Tenggara Timur (NTT), two MPAs (out of 11) in Maluku, and two MPAs (out of 12) in Papua & Papua Barat. One MPA in Papua Barat, i.e. TWP Raja Ampat has a network of smaller MPAs and in the analysis, we used data from seven sub-MPAs and treated each survey location as an individual dataset. All data are displayed as being from the "baseline", "first repeat", or "second repeat" year of monitoring (with data ranging from 2010 to 2019). Baseline data were collected shortly after the initiation of the MPA but before establishment (which varies amongst MPAs), with the first repeat 2–3 years after baseline and the second repeat four years after baseline. Only data from TNL Teluk Cendrawasih and TNL Wakatobi are collected after the MPAs had been established. For more information on what MPAs and years of data collection encompass each province's synthesized data below, please see Appendix 4.4.

4.3.1 Food Security (Health)

Food security is the ability for all people, at all times, to access nutritionally adequate and safe food for an active, healthy life, in a socially acceptable way (Bickel et al. 2000). The monitoring protocol adopts an internationally recognized standard scale that classifies households into one of three food security categories (Bickel et al. 2000):

1. *Food secure* — households show no or minimal evidence of food insecurity, meaning that they can access sufficient nutritionally adequate and safe food, in a socially acceptable way.
2. *Food insecure without hunger* — food insecurity is evident in household members' concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members' food intake is reported.
3. *Food insecure with hunger* — food intake for household members is at an extent that implies that household members have repeatedly experienced the physical sensation of hunger.

Across the four surveyed provinces, households in MPAs within Nusa Tenggara Timur had the highest average food secure score at 4.2 ± 0.07, with nearly two thirds of households "food secure" (65%). Still, 8% of households within Nusa Tenggara Timur were experiencing "food insecure with hunger" (Figure 4.6, Appendix 4.5). This result was confirmed by the Statistics Indonesia data, where the level of calorie and protein intake increased from 2014 to 2017 (BPS RI 2019). The lowest average food security scores were found within MPA households in Sulawesi Tenggara Province, at 3.6 ± 0.09, with just under half of households in the "food secure" categories (45%) and 13% of households experiencing "food insecure with hunger" (Figure 4.6, Appendix 4.5).

Repeat monitoring indicates that food security across MPA households in NTT, Maluku, and Papua & Papua Barat has increased significantly. The proportion of MPA households classified as "food secure" nearly doubled across Papua & Papua Barat (from 39% to 74%), while the proportion of households experiencing "food insecure with hunger" steeply fell (from 27% to 6%). In Maluku, the proportion of MPA households classified as "food secure" grew from 30% to 46% and the proportion experiencing "food insecure with hunger" shrank from 34% to 11%. Those positive trends were also echoed in Nusa Tenggara Timur, where the proportion of MPA households classified as "food secure" grew from 46% to 65% and the proportion experiencing "food insecure with hunger" shrank from 23% to 8% (Appendix 4.5).

Food security is strongly influenced by economic status, market access, social culture of the household, the utilization of natural resources (i.e. households that use more marine resources tend to also consume more marine-based dietary

the remaining 17 in Papua Barat. Therefore we group TNL Teluk Cendrawasih with the seven additional surveyed Papua Barat MPAs as a single group.

protein), and the existence of government programs specifically aimed at alleviating food insecurity. The GoI uses an indicator based on the Global Food Security Index (GFSI) that was adjusted to the regency levels, which are resource availability, access to resources, and resource utilization. In 2017, Indonesia ranked 69, increasing from 71 in 2016, from a total of 113 countries based on GFSI analysis (Kementerian Pertanian 2018). MPAs can support food security by maintaining the sustainability of existing fishing activities, which can be used as a source of protein directly (e.g. daily catch of essential protein) or as income contributions that can be used to purchase other food items (Kawarazuka and Béné 2010).

4.3.2 Material Assets (Economic Well-being)

Material assets are a reliable and widely used indicator of economic well-being. This metric adopts a standard "basket of goods" methodology that assesses whether or not a household owns a particular asset (e.g. car, boat, telephone, television). The eleven-item "basket" includes a range of goods, from lower cost items (e.g. mobile phones) to higher cost items (e.g. cars, boats with inboard motors). Each asset type is weighted from 1–11 according to its cost, with high value items given greater weight. Then, the assets index is a weighted sum of all the assets each household owns.

The highest average household material asset index was found within Sulawesi Tenggara (23.3 ± 0.92), with the households in this province having much higher ownership of cars, trucks, motorcycles, or bicycles (all high value items in the assets index). Asset ownership in MPA households across Papua & Papua Barat were similarly high (21 ± 0.37), likely driven by the large proportion of households owning boats (high value items) in the province. Meanwhile, the average MPA household within Nusa Tenggara Timur had the lowest material asset ownership of 14.6 ± 0.52, and those households in Maluku had only slightly higher material asset ownership (16.6 ± 0.55) (Figure 4.7).

Households across provinces experienced varying trends in average material asset ownership over the monitoring period. In Nusa Tenggara Timur, MPA households experienced a relatively small and insignificant decrease ($p=0.517$) in material asset ownership, while households in Maluku experienced a much steeper and significant decline in material asset ownership ($p<0.001$). Contrary to these declines, MPA households across Papua & Papua Barat experienced small, yet significant increases in material asset ownership ($p=0.054$) over the monitoring period (Figure 4.7).

Household asset ownership is strongly influenced by the economic activities occupied by households, access to transportation and markets, existence of supporting infrastructure (such as roads and markets), and household economic, cultural, and demographic conditions. Certain shocks to the system can also disrupt the ability for households to acquire new economic assets. One such example is the volatile and inflated fuel prices seen across Indonesia up until mid-2015 (Kementerian Energi dan Sumber Daya Mineral 2018, 2020) when a series of new fuel price policies began going into effect, such as the removal of gasoline subsidies and eventually a "one fuel price" policy in 2017 which aims to improve fuel affordability in more remote and underdeveloped areas of Indonesia with less energy infrastructure (OECD 2019). Another policy to potentially play a role in varying material assets trends through time is the Village Law UU RI No. 6/2014 signed by the Indonesian president in 2014, which redefines village governance and provides more autonomy for individual villages to receive monetary support from the national and district governments to use how they see fit (Vel, Zakaria, and Bedner 2017). This new law, while still being fully put into practice across the country, allows villages to prioritize their infrastructure and development needs according to local context and may lead to differing results across regions.

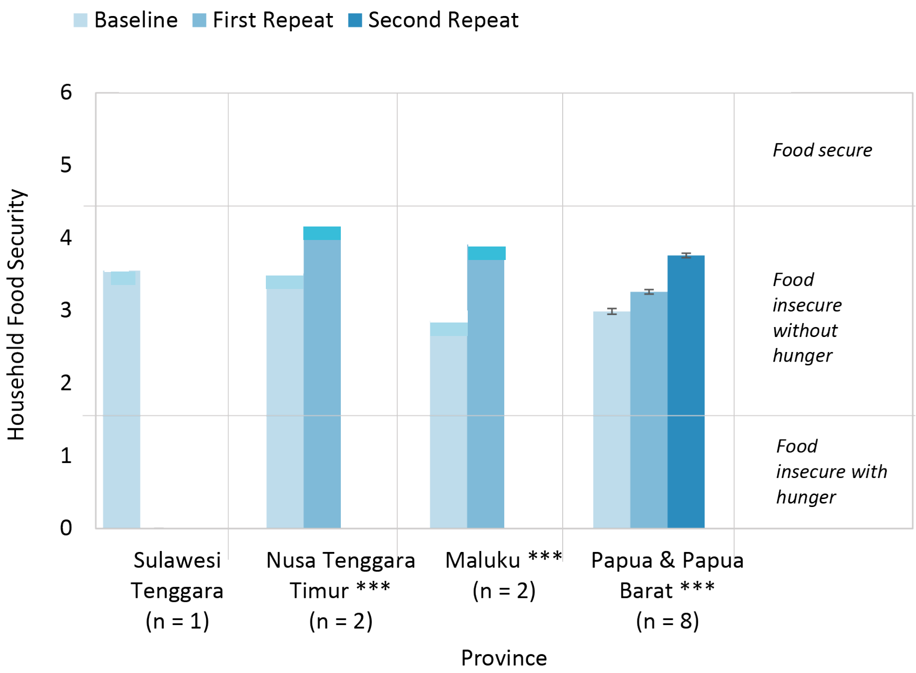


Figure 4.6. Provincial level trends in household food security. One asterisk (*) next to the province name indicates a significant trend at p<0.1; two asterisks (**) indicate p<0.05; and three asterisks (***) indicate p<0.01. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

4.3.3 Marine Tenure (Political Empowerment)

Marine tenure is the cultural and legal foundation of localized control of marine resources, which have been linked to both social and ecological benefits (Cinner 2005). Marine resource rights can be classified into five functional types (Mascia and Claus 2009), including the right to *enter* an MPA; the right to *harvest* fish or other resources from the MPA; the right to *manage* the MPA (i.e. make decisions about how resources are used); the right to *exclude* others from the MPA (i.e. make decisions about who can and cannot enter the MPA); and the right to *transfer* marine resource rights to others (i.e. the sale or lease of rights). The index, which ranges from zero to five, counts the number of distinct resource rights a household has exercised in the twelve months prior to survey.

Households in Papua & Papua Barat had the highest marine tenure scores across the four surveyed provinces of 2.1 ± 0.03, indicating that the average MPA household in Papua & Papua Barat had exercised roughly two of their marine resource rights in the previous twelve-month period (typically being the right to enter the MPA, and the right to harvest marine resources). MPA households in Nusa Tenggara Timur had an average marine tenure index of 1.5 ± 0.04; 1.1 ± 0.04 in Maluku; and 0.9 ± 0.06 in Sulawesi Tenggara. There are three main rights being frequently exercised by MPA households in these four provinces: the right to **enter** the MPA (45.7–96.9% of households), with the highest proportion of households exercising this right in Papua & Papua Barat; the right to **harvest** marine resources (43–69.1%), with the highest proportion in Nusa Tenggara Timur; the right to **manage** marine resources (2–29%), with the highest proportion in Papua & Papua Barat. One potential reason for the very high percentage (96.9%) of households entering the MPA in Papua & Papua Barat is because of the geographic layout of the

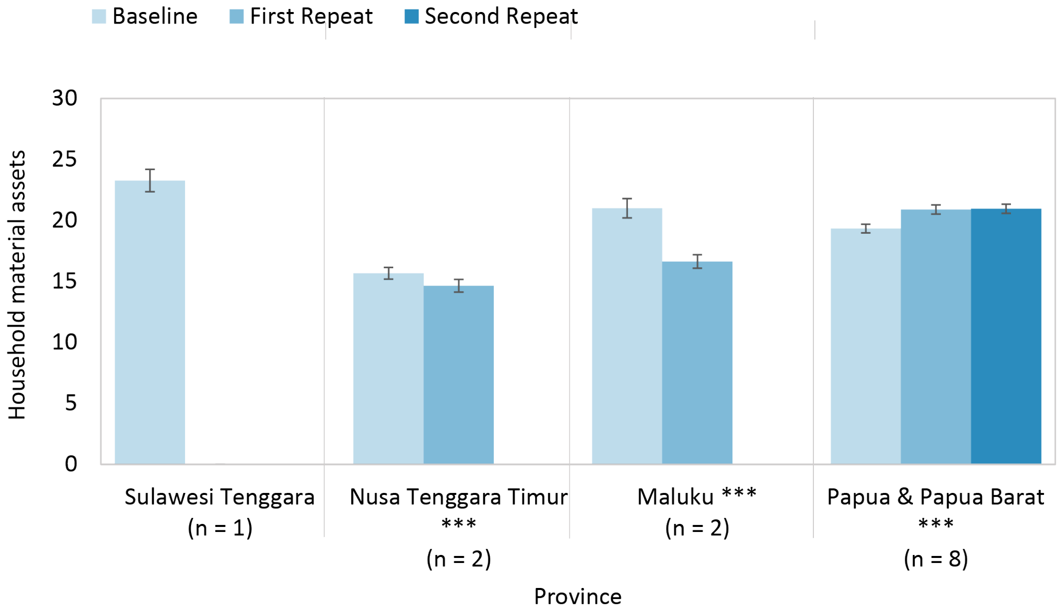


Figure 4.7. Provincial level trends in household material assets. One asterisk (*) next to the province name indicates a significant trend at $p<0.1$; two asterisks (**) inidicate $p<0.05$; and three asterisks (***) indicate $p<0.01$. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

region (Figure 4.8). Community members across most of Papua & Papua Barat must travel by boat to neighboring communities or larger markets, hence more frequently entering the MPA waters. Meanwhile, some of the other surveyed provinces tend to have more road infrastructure connecting communities.

The main factors affecting the exercising of marine tenure rights (especially those relating to *management* of the marine resources) are the strength of community empowerment in the region; local religion and culture adopted and implemented by households in each region; pattern and strength of the leadership influences that exist in an area; and the variety of main jobs occupied by households. Areas with relatively strong local traditions/cultures show a strong community empowerment that influences the management of marine utilization rights. This condition is strongly indicated by MPAs in Papua & Papua Barat, where the marine tenure scores remain much higher than in other provinces.

Overall, negative or negligible trends in marine tenure were seen across the provinces. In Nusa Tenggara Timur, there was a significant decline ($p<0.001$) in the exercising of marine resource rights from 2.2 to 1.5. Similarly, it showed a decline from 2.7 at baseline to 2.1 after the second repeat monitoring in Papua & Papua Barat (Figure 4.8). As the establishment of a MPA inevitably reallocates property and management rights, initial declines in the frequency or number of individuals exercising their marine resource rights may be seen. Long-term social monitoring efforts will be able to determine whether this is a short-term decline in marine tenure that will be followed by a rebound, or if this is a more permanent shift in marine resource rights exercised after the establishment of MPAs. More community involvement and participation in MPA management and decision making will likely yield less severe declines in marine tenure.

4.3.4 School Enrollment (Education)

The school enrollment rate measures the percentage of school age children (between the ages of five and 18 years old, inclusive) enrolled in formal education in each household. MPA households in Papua & Papua Barat showed the highest rate of school enrollment (83 ± 1%) compared to MPA households in the three other surveyed provinces. Households in Maluku and Sulawesi Tenggara had relatively similar proportions of school enrollment at 78 ± 2%, and MPA households in Nusa Tenggara Timur had a slightly lower average rate of enrollment at 77 ± 2% (Figure 4.9).

MPA households in Papua & Papua Barat showed a significant increase ($p<0.001$) in enrollment, from 78% to 83%. On the contrary, MPA households in Maluku showed a significant decline in enrollment rate ($p=0.004$) from 86% to 78%. No change was detected in Nusa Tenggara Timur across the monitoring period (Figure 4.9).

School enrollment is influenced by household access to schools (e.g. presence and average distance of the school infrastructure from communities, available teaching staff), economic condition of the households, and the desirability of schools from the school-age populations and parents. Furthermore, in Indonesia, the school enrollment rate (*Angka Partisipasi Sekolah*) is also highly influenced by the poverty rate, education budget (*Anggaran Pendidikan*) (Zahra 2019) and education quality (*Mutu Pendidikan*) (Anon n.d.) within the region.

4.3.5 Place Attachment (Culture)

Place attachment is "*a positive connection or emotional bond between a person and a particular place*" (Williams and Vaske 2003). The place attachment index measures the emotional bond that household residents in each MPA have for that MPA, with a standard scale (modified from (Gosling and Williams 2010). The index includes questions that ask specifically about the person's emotional bond to the MPA — for example, whether the MPA is the place where he feels happiest or most like himself. The scale ranges from zero to five, with higher values indicating a stronger emotional bond to the MPA.

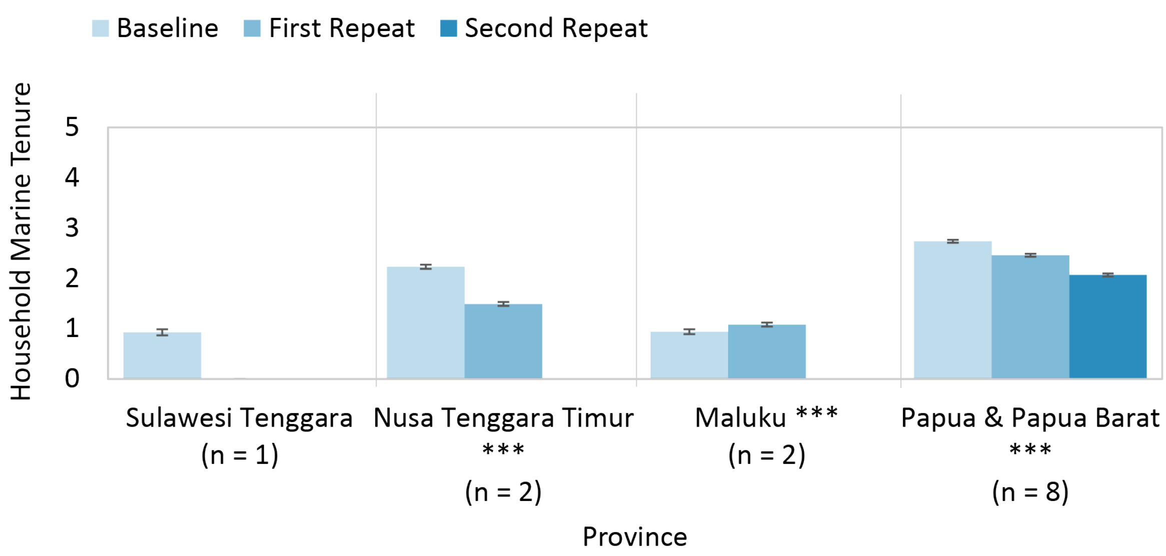


Figure 4.8. Provincial level trends in household marine tenure. One asterisk (*) next to the province name indicates a significant trend at $p<0.1$; two asterisks (**) indicate $p<0.05$; and three asterisks (***) indicate $p<0.01$. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

The average MPA household across all four provinces had a place attachment score ranging from 3.7 to 4 during the most recent monitoring period, indicating a generally strong emotional bond to the area encompassed by the MPA. The lowest average place attachment was in Sulawesi Tenggara, at 3.7 ± 0.02. Meanwhile, the other three provinces (Maluku, Nusa Tenggara Timur, and Papua & Papua Barat) showed a relatively similar average place attachment score at 4 ± 0.02 (Figure 4.10).

Place attachment in each province has decreased over time, with the steepest decline happening shortly after the MPA's initiation. This initial steep decline commonly happens due to the short-term lost effect that could be from a sense of loss of autonomy associated with the initiation of the MPA (Krueck 2016). Or, as households change their occupation or diversify their livelihoods, fishing within the area of the MPA is not as frequent and therefore the emotional bond rapidly weakens. Similarly, within Papua & Papua Barat, as land-based transportation infrastructure continues developing, the opportunity to visit new places (e.g. communities, markets, and urban areas), increases and may contribute to shifting attitudes or a reduced emotional bond toward their local waters and marine resources. It is unclear if, over the long-term, place attachment to the MPA will once again begin to increase as new opportunities (such as tourism) or more participation in decision-making and conservation efforts may bring a renewed sense of pride and belonging to the MPA.

4.4 Marine Resource Use and Dependence

This section synthesizes data on marine resource use and dependence, gathered through the same standard household survey protocol introduced in the previous section on human well-being (Glew et al. 2012) . The results presented in this section are from the most recent year of available

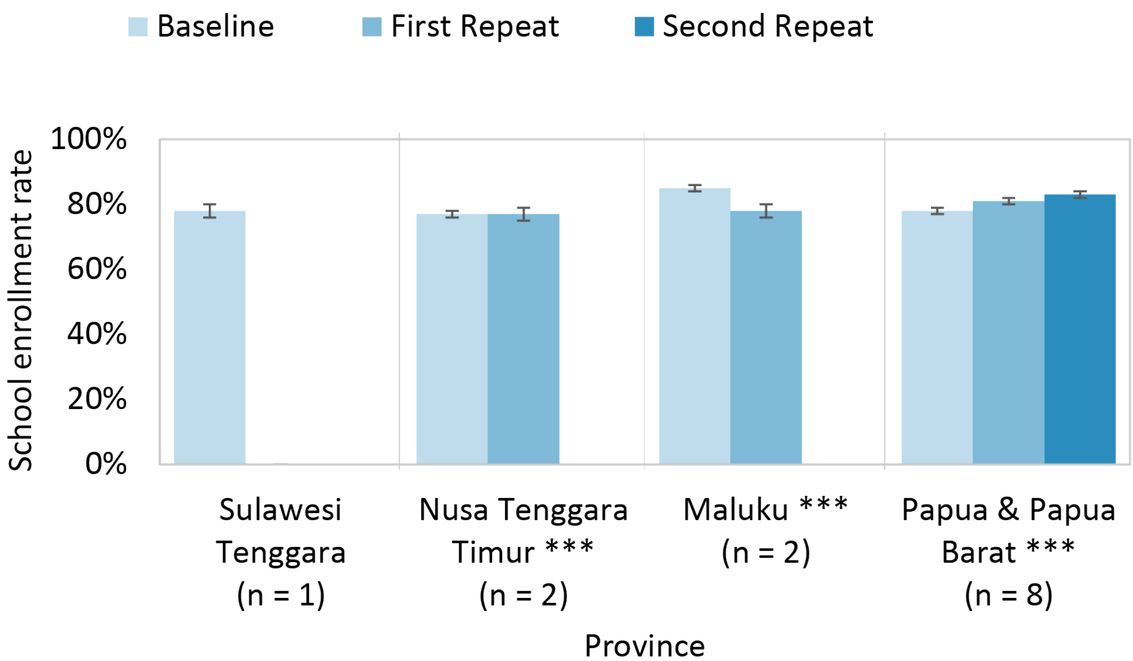


Figure 4.9. Provincial level trends in school enrollment rate. One asterisk (*) next to the province name indicates a significant trend at p<0.1; two asterisks (**) iindicate p<0.05; and three asterisks (***) indicate p<0.01. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

monitoring data for each MPA (Appendix 4.4) and include information on two MPAs that were not able to be included in the section on human well-being due to lack of trend data. Therefore, there are fifteen MPAs represented in the data below, spanning four provinces. For more information on what MPAs and years of data collection encompass each province's synthesized data below, please see Appendix 4.4.

4.4.1 Primary Occupation

The vast majority of MPA households in the four surveyed provinces identified their primary occupation as falling into one of six categories: farming, fishing, harvesting forest products, aquaculture, other wage labor (e.g. teacher, medical professional, forestry or mining concession worker), or other (e.g. salaried work such as a civil servant or teacher) — with a small subset identifying tourism (e.g. scuba, snorkel, glass-bottom boats, sailing) as their primary occupation.

Overall, nearly half of all MPA households in Nusa Tenggara Timur (49.9%) and Maluku (46.5%) identified farming as their primary occupation — much higher than the households across Papua & Papua Barat (33.8%) and Sulawesi Tenggara (25.0%). The percent of MPA households identifying fishing as their primary occupation was relatively consistent across the provinces, with Maluku having the smallest percent (22.8%), and Nusa Tenggara Timur having the largest (29.8%). Papua & Papua Barat and Sulawesi Tenggara both consist of many MPA households identifying other types of wage labor and other forms of work as their primary occupation (34.3% and 43.7%, respectively), which may indicate the presence of a more robust cash economy across communities in these provinces (Figure 4.11). It is important to note that these data represent household *primary* occupation; yet, many households in coastal communities have multiple livelihoods, greatly adding to the diversity of occupations seen across an MPA.

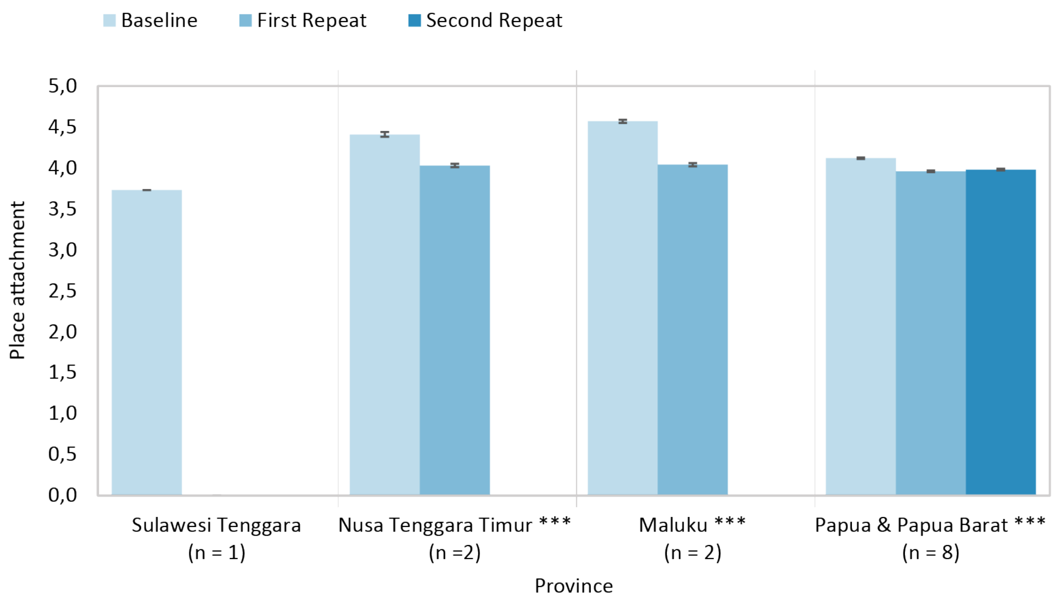


Figure 4.10. Provincial level trends in place attachment. One asterisk (*) next to the province name indicates a significant trend at p<0.1; two asterisks (**) indicate p<0.05; and three asterisks (***) indicate p<0.01. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

4.4.2 Frequency of Fishing

All households that identified fishing as either their primary, secondary, or tertiary occupation were asked about the frequency at which they fish. There is some variation across the four surveyed provinces, with over half of MPA fishing households in Papua & Papua Barat (55.6%) indicating that they fish only a few times per month or less. In contrast, around three quarters (or more) of MPA fishing households across Sulawesi Tenggara, Nusa Tenggara Timur, and Maluku fish a few times per week or more (Figure 4.12). Therefore, fishing households in MPAs across Papua & Papua Barat are not fishing as frequently as the MPA households in the other three surveyed provinces, suggesting that fishing households across Papua & Papua Barat may be more actively diversifying their livelihoods or supplementing their income with other activities. This is supported by the high proportion of MPA households in Papua & Papua Barat that identified more than one type of occupation within the household (84%).

4.4.3 Frequency of Selling Fish

Like fishing frequency, all households that identified fishing as either their primary, secondary, or tertiary occupation were also asked about the frequency at which they sell at least some of their catch. The variation seen in fishing frequency between MPA fishing households in Papua & Papua Barat and the three other provinces are mirrored and magnified in reference to the frequency of selling fish. Around three quarters of MPA fishing households indicated that they sell at least some of their catch a few times per week or more across Sulawesi Tenggara, Nusa Tenggara Timur, and Maluku, while nearly half of MPA fishing households in Papua & Papua Barat indicated that they sell their catch once every six months or never (Figure 4.13).

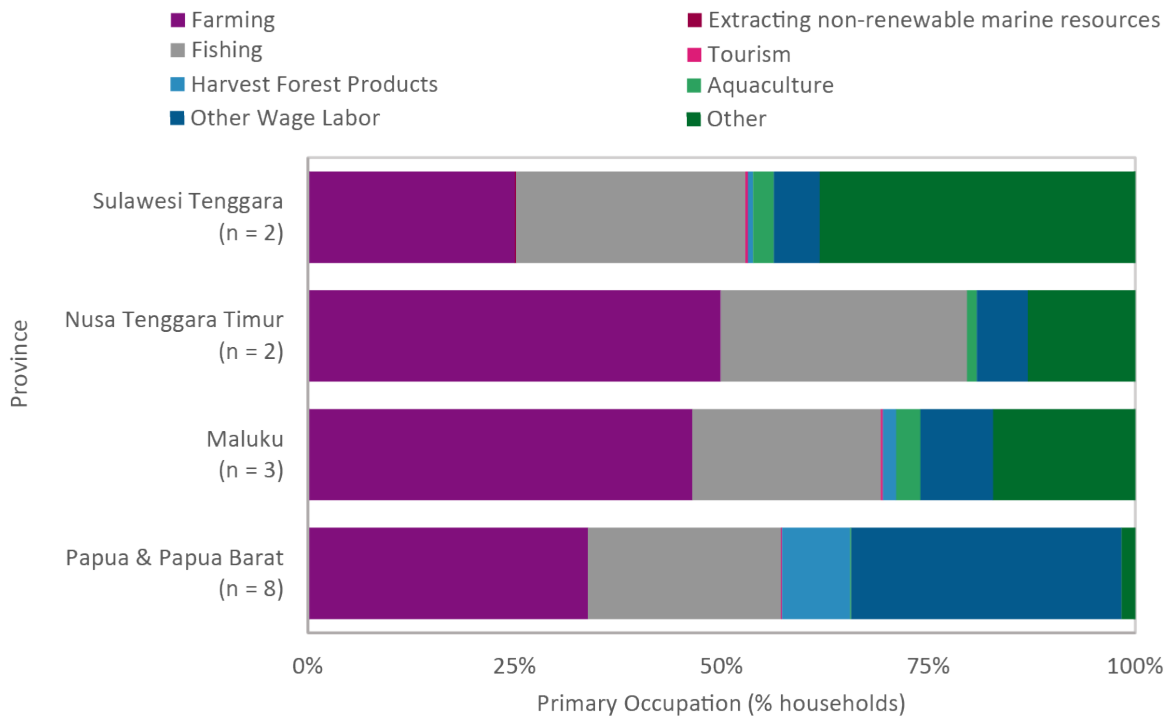


Figure 4.11. Provincial level status in primary occupation. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

This variation may suggest that many fishing households across the MPAs in Papua & Papua Barat are fishing as a means of subsistence rather than for market transactions; and/or, households in MPAs across the other three provinces may have easier access to markets to sell their fish (or less access to refrigeration to preserve their catch before selling at market). This is supported by the much longer average travel time to market identified by MPA households across Papua & Papua Barat (an average of 2.2 hours, compared to 1.6 hours in Maluku and less than 0.5 hours in Nusa Tenggara Timur and Sulawesi Tenggara).

4.4.4 Fish Protein Consumption

Again, like fishing frequency, all households that identified fishing as either their primary, secondary, or tertiary occupation were also asked about the proportion of their household's dietary protein that was derived from fish and marine resources. It is clear that MPA households across all four surveyed provinces heavily rely on marine resources for dietary protein, with over 99% of households in Sulawesi Tenggara, Nusa Tenggara Timur, and Papua & Papua Barat relying on it for at least some of their dietary protein (and 97% of households in Maluku). Furthermore, nearly 11% of households both in Sulawesi Tenggara and Nusa Tenggara Timur identified marine resources as their sole source of dietary protein (Figure 4.14).

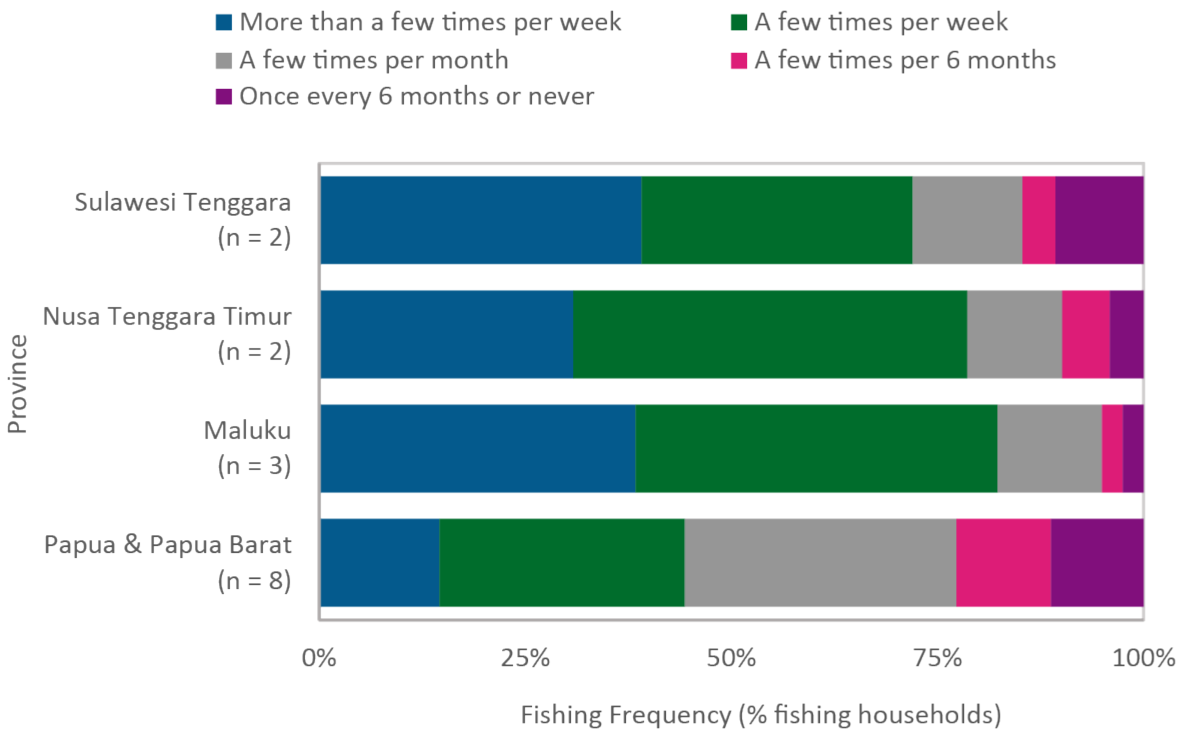


Figure 4.12. Provincial level status in fishing frequency. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

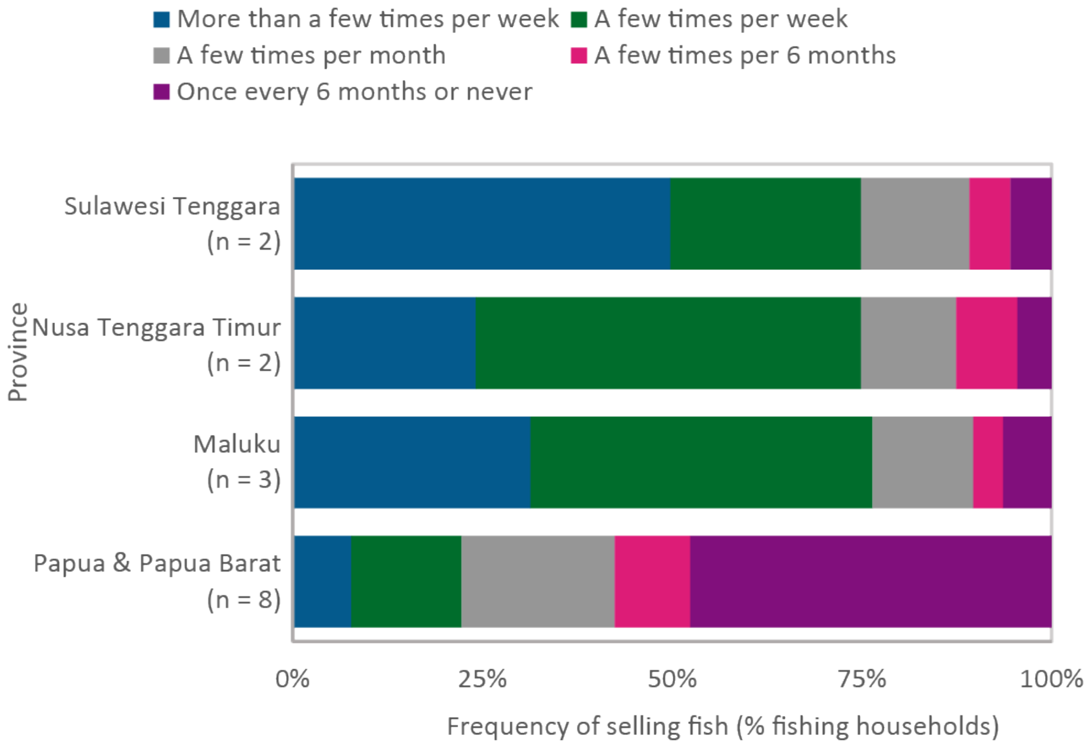


Figure 4.13. Provincial level status in frequency of selling fish. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

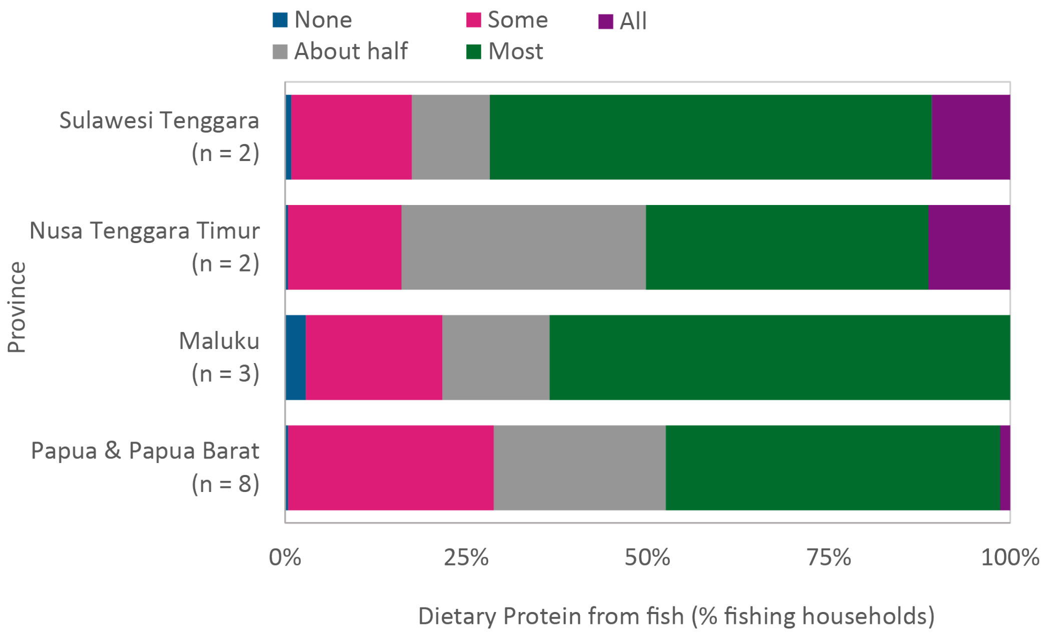


Figure 4.14. Provincial level status in fish protein consumption. Note: Year of baseline and repeat monitoring at each MPA. Sulawesi Tenggara: 2017; Nusa Tenggara Timur: 2014, 2017; Maluku: 2016, 2018, 2019; Papua & Papua Barat: 2010–2012, 2012–2014, 2014–2016. For more specific information on which MPAs/years are represented in each figure, please see Appendix 4.4.

4.5 A Final Note

This chapter provides information on the status and trends of commonly identified ecological and social indicators that are important for monitoring ecosystem health, human well-being, and marine resource use and dependence. While there are many ecological and social surveys across the nation, this is the first national-wide evaluation, using rich, robust and extensive data from 989 ecological sites and 7,579 households (403 settlements) across 33 MPAs, spanning thirteen provinces and nine years, that focuses on tracking the changes on ecological, social, economic, and cultural conditions within MPAs. This is also the first effort to combine data across key institutions and partners supporting MPA implementation in Indonesia.

Ecological condition within MPAs are varied but relatively stable in the surveyed sites with improving conditions in several MPAs through time. Hard coral cover averaged 37 ± 2% across all surveyed sites and remained generally stable within most provinces over time. Key fisheries species and herbivorous species varied greatly between MPAs, with particularly high numbers of key fisheries abundance and biomass in Papua Barat , herbivorous fish species abundance in Sulawesi Tenggara and biomass in Papua Barat. The average of key fisheries abundance throughout all MPAs was 612 ± 157 ind/ha and herbivorous fish abundance was 1,361 ± 208 ind/ha. The highest key fisheries abundance is 1,474 ± 575 ind/ha in Papua Barat and herbivorous fish abundance was 2,046 ± 1,012 ind/ha in Sulawesi Tenggara. Across all MPAs with available data, key fisheries biomass averaged 156 ± 40 kg/ha and herbivorous fish biomass averaged 490 ± 95 kg/ha. Papua Barat had the highest fish biomass both for key fisheries and herbivorous fish, reaching 336 ± 146 kg/ha and 831 ± 207 kg, respectively.

Across the four provinces with data on social conditions, many households within MPAs are experiencing increases in their food security, with a large number crossing the threshold into "food secure." Furthermore, particularly in Papua & Papua Barat, positive trends in school enrollment and household material assets are benefitting many households as well. Still, spanning the four surveyed provinces, there is a general decline in marine tenure and place attachment associated with households within MPAs. This decline could be a short-term result of the establishment of a MPA and the associated shuffling of marine resource use and rights. Increases in community engagement and participation in decision making could be one approach to reversing these trends.

After exploring these ecological and social indicators in more depth, there is no single pattern that remains constant for every MPA or province. Local context matters greatly in how marine ecosystems and surrounding local communities are affected by the establishment of MPAs, and long term ecological and social monitoring efforts contribute greatly to better understanding this relationship. There remains a high reliance on fishing and the marine environment across MPA settlements in Indonesia — as a source of income, subsistence, health, and cultural and emotional well-being. Robust, evidence-based adaptive management practices that consider both ecological and social conditions can help to ensure that benefits to the marine environment are matched by the benefits to people.

Understanding the ecological and social conditions within MPAs through time as well as their impact (Box 4.B) is crucial to evaluate the extent of MPAs in Indonesia in achieving its intended goals related to biodiversity conservation and supporting human well-being. Regular ecological and social surveys are also required by government rules to be conducted by MPA managers to track progress and MPA outcomes. This monitoring can also help inform improvements in management effectiveness of MPAs, as required by two recognized national MPA management effectiveness tracking tools, i.e. Management Effectiveness of Aquatic, Coasts and Small Islands Conservation Areas (*Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*/E-KKP3K) for MMAF regulated MPAs and the Management Effectiveness Tracking Tool for MoEF regulated MPAs. Regular ecological and social monitoring requires human, management, and funding resources; in many cases, MPA managers are unable to conduct regular monitoring due to inadequate resources and this situation hinders an MPA to increase its management effectiveness status (Chapter 5). The 33 MPAs with data as shown in this chapter, although they only represent less than 20% of MPAs in Indonesia, can give an overview that many MPAs in Indonesia are able to conduct regular monitoring with support from key stakeholders. Partnership with key stakeholders in MPA management is a strategic way to fill the gap of MPA management implementation (Chapter 2).

Box 4.B
Impact Evaluation

Monitoring social and ecological trends in Marine Protected Areas (MPAs) provides useful information to detect change in certain indicators. Still, these data cannot decipher whether the changes are caused by the establishment or management of an MPA, or if there is a broader trend being seen across the entire region (e.g. large-scale coral bleaching events, or the implementation of national government-wide human development programs). Consensus has been growing across the field of conservation monitoring and evaluation that measuring impact using a quasi-experimental counterfactual approach provides more useful, nuanced information for decision makers than simply monitoring change through time (Ahmadia et al. 2015; Ferraro and Pattanayak 2006; Ferraro and Pressey 2015; Mascia et al. 2017).

Impact evaluation can answer the questions of: what would have happened in the absence of the conservation intervention (i.e. the counterfactual)? And did this intervention *cause* the social and ecological outcomes detected?

In many cases, randomized control trials (RCTs) are considered the "gold standard" for establishing *causality* – i.e. did a certain action or treatment (e.g. a new medical treatment) *cause* a specific outcome (e.g. improvements in health)? This is partly because RCTs use a rigorous approach to establish a treatment group and a control group. Each group is randomly selected, to statistically "weed out" any variation between the groups beyond the treatment itself (i.e. each group should be representative of the larger population of interest). This way, when there are differences detected between the groups through time, researchers can be sure that the treatment is the *cause* of these differences. Yet for conservation, the interventions do not happen within a tightly controlled laboratory. They happen in the complex, messy world; and the places where they take place are not chosen at random – they may be chosen because the area is at a high risk of habitat loss, is a particularly important site for biodiversity, or because the local government is receptive and willing to participate in the new conservation approach. So, to account for these non-random biases in placement of a conservation intervention, a research program that is designed for causal inference (such as impact evaluation) must also monitor sites that are similar in characteristics to those where the intervention is taking place, but are not actively under the conservation intervention – to establish a counterfactual.

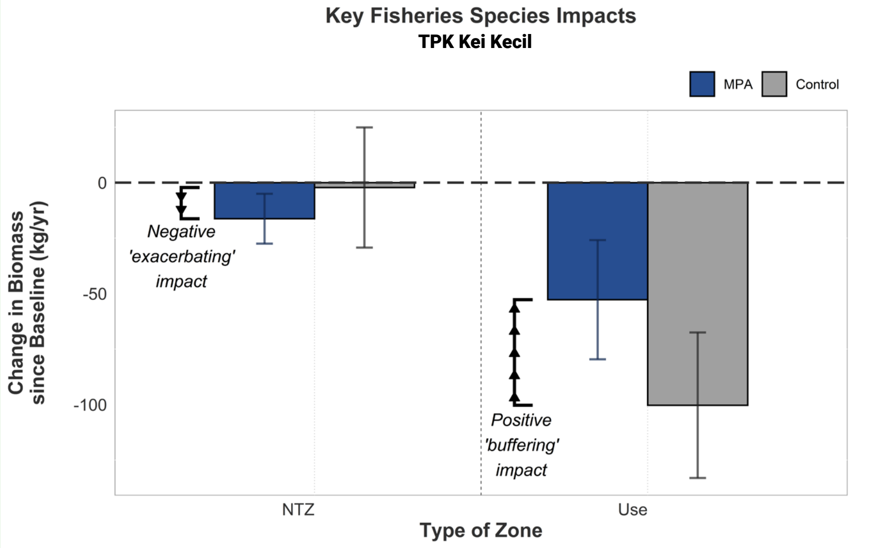


Figure 4.B.1. The results of impact analysis for key fisheries biomass in TPK Kei Kecil between 2015 and 2018

To give an example of the more nuanced information that an impact evaluation can provide to decision makers, Figure 4.B.1 illustrates the results of an impact analysis for key fisheries biomass in TPK (*Taman Pulau Kecil*; Small Island Park) Kei Kecil between 2015 and 2018 (across 24 treatment sites and 13 control sites). The blue bars represent the change in biomass since baseline across the surveyed reef sites within the MPA, and the grey bars represent the change across the "control" reef sites outside of the MPA. As can be seen in Figure 4.B.1, for both non-extractive zone (NTZs) and Use Zone, there was a negative trend across the MPA in key fisheries biomass since baseline. Without the accompanying data for control sites, a decision maker could interpret this information to mean that the MPA is contributing to a decline in fish biomass and call for changes in management to address this decline.

However, upon further analysis of the Use Zone data (on the right side of Figure 4.B.1), it becomes clear that the declines in fish biomass across the control sites were even greater than for the MPA sites. This indicates that the MPA has had a positive impact on key fisheries biomass in the Use Zones, and it is acting as a "buffer" against greater declines that would have occurred had the MPA not been established. Therefore, a decision maker may take this more nuanced information and determine that the actions in the MPA are working but could stand to be further enforced for even more positive impact.

Alternatively, for the NTZ, the decline was greater across the MPA sites compared to their control counterparts, indicating a negative impact that is "exacerbating" already negative trends in key fisheries biomass outside of the MPA. This would be a case where a decision maker or MPA manager may need to try a new approach to managing and protecting the NTZ areas of the MPA, as their current actions are not achieving the desired impact.

For more information on some of the impact evaluations being conducted across Indonesian MPAs and beyond, please visit www.marineconservationevidence.org.

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Appendix

Appendix 4.1. Survey protocols.

This report uses three different ecological monitoring protocols to collect benthic and fish data. All data has been standardized using the same unit to make them comparable: hard coral in percentage, fish abundance in individual per hectare (ind/ha), and fish biomass in kilogram per hectare (kg/ha). Detailed information on each protocol used for each MPA can be found in the table below:

Institution	MPA Name	Protocols	Notes
Ecological data			
Coral Triangle Center (CTC)	KKPD Ay-Rhun	Ahmadia et al. (2013)	
	TWP Nusa Penida	Ahmadia et al. (2013)	From MMAF database
Ministry of Marine Affairs and Fisheries (MMAF)	TWP Taman Laut Banda	Lubis et al. (2014)	
	TWP Kepulauan Anambas	Lubis et al. (2014)	
	TWP Pulau Pieh	Lubis et al. (2014)	
	TWP Kapoposang	Lubis et al. (2014)	
	SAP Kepulauan Aru Tenggara	Lubis et al. (2014)	
MMAF & The Nature Conservancy	TNP Laut Sawu	Lubis et al. (2014)	Two different datasets from MMAF database
USAID Sustainable Ecosystems Advanced (USAID SEA) Project	KKPD Fakfak	Ahmadia et al. (2013)	From MMAF database
	KKPD Kepulauan Lease	Ahmadia et al. (2013)	From MMAF database
	KKPD Pulau Widi	Yulianto et al. (2012)	From MMAF database
	KKPD Tidore Kepulauan	Yulianto et al. (2012)	From MMAF database
	KKPD Morotai	Yulianto et al. (2012)	From MMAF database
Bird's Head Seascape Consortium	TWP Raja Ampat	Ahmadia et al. (2013)	
	TWP Kaimana	Ahmadia et al. (2013)	
	KKPD Kepulauan Fam	Ahmadia et al. (2013)	
	TWP Kaimana	Ahmadia et al. (2013)	
	SAP Raja Ampat	Ahmadia et al. (2013)	
Universitas Diponegoro & Wildlife Conservation Society (WCS)	TNL Karimun Jawa	Yulianto et al. (2012)	Two different datasets from MMAF database

Institution	MPA Name	Protocols	Notes
WCS	KKPD Gili Banta	Yulianto et al. (2012)	
	TWP Gili Sulat Lawang	Yulianto et al. (2012)	From MMAF database
	TWP Gita Nada	Yulianto et al. (2012)	From MMAF database
	KKPD Teluk Bumbang	Yulianto et al. (2012)	
	KKPD Teluk Cempi	Yulianto et al. (2012)	
	KKPD Liang dan Ngali	Yulianto et al. (2012)	From MMAF database
	KKPD Minahasa Utara	Yulianto et al. (2012)	From MMAF database
WCS & MMAF	TWP Gili Matra	Yulianto et al. (2012)	Two different datasets from MMAF database
Yayasan WWF Indonesia	KKPD Flores Timur	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
	TPK Kei Kecil	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
	KKPD Kepulauan Tanimbar	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
	KKPD Pulau Koon	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
	SAP Selat Pantar	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
	KKPD Provinsi Sultra	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	

Institution	MPA Name	Protocols	Notes
Yayasan WWF Indonesia	TNL Teluk Cendrawasih	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
	TWA Teluk Lasolo	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
	TNL Wakatobi	Ahmadia et al. (2013) and Amkieltiela and Wijonarno (2015)	
Social data			
Yayasan WWF Indonesia	KKPD Provinsi Sultra	Glew et al (2012)	
	TNL Wakatobi	Glew et al (2012)	
	SAP Selat Pantar	Glew et al (2012)	
	KKPD Flores Timur	Glew et al (2012)	
	KKPD Pulau Koon	Glew et al (2012)	
	TPK Kei Kecil	Glew et al (2012)	
	KKPD Kepulauan Tanimbar	Glew et al (2012)	
Conservation International (CI), Universitas Papua (UNIPA), Yayasan WWF Indonesia	Kawasan Konservasi Perairan Daerah Teluk Mayalibit	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA
	Kawasan Konservasi Perairan Selat Dampier	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA
	Taman Pulau Kecil Kofiau	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA
	Taman Pulau Kecil Misool	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA
	Buruway	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA
	Teluk Etna	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA
	Teluk Triton	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA
	TNL Teluk Cendrawasih	Glew et al (2012)	Data from mid-2017 onwards belongs to UNIPA

Appendix 4.2. Year and number of reef sites surveyed for each MPA, included in status analysis for hard coral cover (Figure 4.2), key fisheries abundance and biomass (Figure 4.4A, Figure 4.4B), and herbivorous fish abundance and biomass (Figure 4.5A, Figure 4.5B).

Province	MPA	Year of Initiation/ Establishment	Key Fisheries Abundance and Biomass		Herbivorous Fish Abundance and Biomass		Hard Coral Cover	
			Year	# sites	Year	# sites	Year	# sites
Kepulauan Riau	TWP Kepulauan Anambas	2011/2014					2018	12
Sumatra Barat	TWP Pulau Pieh	2000/2014					2018	11
Jawa Tengah	TNL Karimun Jawa	2011/2005					2017	3
Bali	TWP Nusa Penida	2010/2014	2016	13	2016	13	2018	11
Nusa Tenggara Barat	TWP Gili Matra	2001/2014	2016	14	2016	14	2018	8
	TWP Gili Sulat Lawang	2014/2018					2017	10
	TWP Gita Nada	2014/2018					2018	13
	KKPD Teluk Bumbang	2013					2017	3
	KKPD Liang dan Ngali	2015					2018	9
Nusa Tenggara Timur	KKPD Flores Timur	2013	2017	23	2017	23	2017	23
	SAP Selat Pantar	2006/2015	2017	26	2017	26	2017	26
	TNP Laut Sawu	2009/2014					2018	11
Sulawesi Selatan	TWP Kapoposang	1996/2014					2018	4
Sulawesi Tenggara	KKPD Provinsi Sultra	2014	2016	6	2016	6	2016	6
	TWA Teluk Lasolo	1999/2016	2016	10	2016	10	2016	10
	TNL Wakatobi	2002/2007	2016	29	2016	29	2016	28
Sulawesi Utara	KKPD Minahasa Utara	2014					2016	9

Province	MPA	Year of Initiation/ Establishment	Key Fisheries Abundance and Biomass		Herbivorous Fish Abundance and Biomass		Hard Coral Cover	
			Year	# sites	Year	# sites	Year	# sites
Maluku	KKPD Ay-Rhun	2016	2017	4	2017	4	2017	4
	TPK Kei Kecil	2012/2016	2018	24	2018	24	2018	24
	KKPD Kepulauan Tanimbar	2016	2017	20	2017	20	2017	20
	KKPD Pulau Koon	2011	2018	13	2018	13	2018	13
	TWP Taman Laut Banda	1977/2014	2017	3	2017	3	2018	4
	KKPD Kepulauan Lease	2016					2018	24
	SAP Kepulauan Aru Tenggara	1991/2014					2018	3
Maluku Utara	KKPD Pulau Widi	2015					2017	11
	KKPD Kepulauan Guraici	2012					2017	13
	KKPD Tidore Kepulauan	2012					2017	6
	KKPD Morotai	2012					2017	6
Papua	TNL Teluk Cendrawasih	2002/2009	2016	28	2016	28	2016	28
Papua Barat	TWP Raja Ampat	2007/2014	2016	110	2016	110	2016	114
	TWP Kaimana	2008/2019	2016	24	2016	24	2016	25
	KKPD Kepulauan Fam	2017	2016	10	2016	10	2016	9
	KKPD Fakfak	2017					2018	17

Appendix 4.3. Year and number of reef sites surveyed for each MPA, included in trend analysis for hard coral cover (Figure 4.3), key fisheries abundance and biomass (Figure 4.4C, Figure 4.4D), herbivorous fish abundance and biomass (Figure 4.5C, Figure 4.5D).

Province	MPA	Key Fisheries Abundance and Biomass		Herbivorous Fish Abundance and Biomass		Hard Coral Cover	
		Year	# sites	Year	# sites	Year	# sites
Kepulauan Riau	TWP Kepulauan Anambas					2015	7
						2017	7
						2018	12
Jawa Tengah	TNL Karimun Jawa					2013	4
						2014	4
						2015	4
						2017	3
Bali	TWP Nusa Penida					2016	14
						2017	10
						2018	11
Nusa Tenggara Barat	TWP Gili Matra	2012	20	2012	20	2012	19
		2016	14	2016	14	2016	14
Nusa Tenggara Timur	SAP Selat Pantar	2014	26	2014	26	2014	26
		2017	26	2017	26	2017	26
Sulawesi Tenggara	TNL Wakatobi	2012	20	2012	20	2012	20
		2016	29	2016	29	2016	28
Maluku	TPK Kei Kecil	2015	24	2015	24	2015	24
		2018	24	2018	24	2018	24
Papua	TNL Teluk Cendrawasih	2011	28	2011	28	2011	28
		2016	28	2016	28	2016	28
Papua Barat	TWP Raja Ampat	2009	30	2009	30	2009	89
		2010	50	2010	50	2010	113
		2014	112	2014	112	2014	111
		2016	110	2016	110	2016	114

Appendix 4.4. Year and number of settlements surveyed within each MPA, included in trend analysis for human well-being indicators (Figure 4.6 – Figure 4.10) and marine resource use indicators (Figure 4.11 – Figure 4.14).

Province	MPA	**Human Well-Being** *(food security, material assets, marine tenure, school enrollment, place attachment)*		**Marine Resource Use & Dependence** *(primary occupation, fishing frequency, frequency of selling fish, fish protein consumption)*	
		Year	**# settlements**	**Year**	**# settlements**
Sulawesi Tenggara	KKPD Provinsi Sultra	2017	15	2017	15
	TNL Wakatobi			2019	24
Nusa Tenggara Timur	SAP Selat Pantar	2014	19	2014	19
		2017	19	2017	19
	KKPD Flores Timur	2014	21	2014	21
		2017	19	2017	19
Maluku	KKPD Pulau Koon	2016	9	2016	9
		2018	9	2018	9
	TPK Kei Kecil	2016	14	2016	14
		2019	14	2019	14
	KKPD Kepulauan Tanimbar			2017	18
Papua & Papua Barat*	Kawasan Konservasi Perairan Daerah Teluk Mayalibit**	2010	11	2010	11
		2012	11	2012	11
		2014	11	2014	11

Province	MPA	Human Well-Being (food security, material assets, marine tenure, school enrollment, place attachment)		Marine Resource Use & Dependence (primary occupation, fishing frequency, frequency of selling fish, fish protein consumption)	
		Year	# settlements	Year	# settlements
Papua & Papua Barat*	Kawasan Konservasi Perairan Selat Dampier**	2012	12	2012	12
		2014	12	2014	12
		2016	12	2016	12
	Taman Pulau Kecil Kofiau**	2011	4	2011	4
		2013	4	2013	4
		2015	4	2015	4
	Taman Pulau Kecil Misool**	2011	12	2011	12
		2013	12	2013	12
		2015	12	2015	12
	Buruway**	2012	3	2012	3
		2014	3	2014	3
		2016	3	2016	3
	Teluk Etna**	2012	4	2012	4
		2014	4	2014	4
		2016	4	2016	4
	Teluk Triton**	2012	7	2012	7
		2014	7	2014	7
		2016	7	2016	7
	TNL Teluk Cendrawasih	2010	21	2010	21
		2012	21	2012	21
		2014	21	2014	21

Note:
*In the analysis, we show an average of Papua and Papua Barat combined together, because there are only three MPAs that are legally acknowledged located in Papua Province, which are TNL Teluk Cendrawasih, KKPD Biak Numfor, and TWP Padaido. For TNL Teluk Cenderawasih, from which the social data is available, this MPA spans across the provinces of Papua and Papua Barat. However, only four out of 21 sampled settlements for TNL Teluk Cendrawasih were within Papua (and we also sampled seven other MPAs fully within Papua Barat).

** One MPA in Papua Barat, i.e. TWP Raja Ampat has a network of smaller MPAs and in the analysis; we used data from seven sub-MPAs and treated each survey location as an individual dataset.

Appendix 4.5. Percentage of provincial level trends in household food security, included in trend analysis for Health indicator (Figure 4.6).

Province	Repeat Year	Food secure (%)	Food insecure without hunger (%)	Food insecure with hunger (%)
Sulawesi Tenggara	Baseline	45	42	13
Nusa Tenggara Timur	Baseline	46	31	23
	First Repeat	65	27	7
Maluku	Baseline	31	35	34
	First Repeat	46	43	11
Papua & Papua Barat	Baseline	39	34	27
	First Repeat	50	34	16
	Second Repeat	74	20	6


fourth

Chapter 5. Marine Protected Area Management Effectiveness

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Abstract

Management effectiveness is key for Marine Protected Areas (MPAs) to deliver ambitious biodiversity conservation and sustainable fisheries objectives. In many cases, where MPA networks have limited management capacity, a focus on improving management effectiveness can result in greater biodiversity outcomes than expanding MPA coverage. Effective management is a crucial component in achieving targets set by the Government of Indonesia (GoI), which aims to establish 23.4 million ha of effectively managed MPAs by 2020 and 32.5 million ha by 2030. There are two tools applied by the GoI to measure MPA management effectiveness: Management Effectiveness of Aquatic, Coasts and Small Islands Conservation Areas (E-KKP3K) for Ministry of Marine Affairs and Fisheries (MMAF) managed MPAs, and the Management Effectiveness Tracking Tool (METT) for Ministry of Environment and Forestry (MoEF) managed protected areas. In 2019, 52 MMAF MPAs (out of 122 MPAs) assessed by E-KKP3K were at "established" or "managed minimally" levels, and the remaining 70 MMAF MPAs were still at the "initiation" level. For MoEF MPAs evaluated by METT, 11 of 18 MPAs showed overall improvements in management effectiveness in 2017 compared with 2015. Despite this evidence of improved MPA management effectiveness in Indonesia's MPAs, two-thirds of MPAs are still within the initiation phase. They do not yet have the necessary management effectiveness tools. Inadequate financial and staffing capacity, complex governance constructs, and low compliance are some of the key challenges for management effectiveness, not only in Indonesia but also worldwide. As MPA management evaluation tools, both E-KKP3K and METT can be used to drive improvements in the management of MPAs in Indonesia, with the GoI having the opportunity to create more incentives for progress. However, it is important not to lose sight that management effectiveness tracking tools should be designed and implemented to facilitate and track progress towards delivering MPA outcomes; achieving desirable scores on these tools should not be the focus.

Abstrak

Efektivitas pengelolaan merupakan kunci bagi Kawasan Konservasi Perairan (KKP) dalam mencapai tujuan utamanya, yaitu konservasi keanekaragaman hayati dan pemanfaatan perikanan berkelanjutan. Di banyak kasus, dimana jejaring KKP mempunyai kapasitas pengelolaan yang belum/kurang berkembang, fokus dalam meningkatkan efektivitas pengelolaan dapat mendorongkan pencapaian target keanekaragaman hayati yang lebih besar daripada pencapaian target untuk memperluas area KKP. Melihat target besar Pemerintah Indonesia dalam membangun 23,4 juta ha KKP yang dikelola secara efektif per tahun 2020 dan 32,5 juta ha KKP per tahun 2030, "pengelolaan efektif" merupakan komponen target yang penting untuk pencapaian ini. Terdapat dua perangkat yang digunakan oleh Pemerintah Indonesia dalam mengukur efektivitas pengelolaan KKP, yaitu Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil (E-KKP3K) untuk KKP yang dikelola oleh Kementerian Kelautan dan Perikanan (KemenKP) dan Management Effectiveness Tracking Tool *(METT) untuk KKP yang dikelola oleh Kementerian Lingkungan Hidup dan Kehutanan (KLHK). Tahun 2019, terdapat 52 KKP KemenKP (dari 122 KKP) yang dievaluasi dengan E-KKP3K memiliki peringkat "Kawasan Konservasi didirikan" atau "Kawasan Konservasi dikelola minimum", sementara 70 KKP lainnya masih dalam level "Kawasan Konservasi diinisiasi". Untuk KKP KLHK yang dievaluasi dengan METT, terdapat 11 dari 18 KKP memperlihatkan peningkatan keseluruhan nilai efektivitas pengelolaan dari tahun 2015 ke tahun 2017. Meski terjadi peningkatan efektivitas pengelolaan di beberapa KKP Indonesia, dua per tiga KKP masih dalam tahap inisasi dan belum memiliki perangkat pengelolaan yang memadai. Kapasitas keuangan dan*

kepegawaian yang kurang memadai, tata kelola yang kompleks, dan kepatuhan yang rendah merupakan sebagian tantangan untuk mendorong pengelolaan yang efektif, tidak hanya di Indonesia, tapi juga di dunia. Hasil evaluasi berkala dari E-KKP3K dan METT penting digunakan untuk mendorong perbaikan dan peningkatan pengelolaan KKP di Indonesia, dan pemerintah memiliki peluang untuk menciptakan lebih banyak insentif untuk capaian kemajuan yang dihasilkan. Namun, penting untuk diperhatikan bahwa alat pemantauan efektivitas pengelolaan KKP seperti E-KKP3K dan METT harus didesain dan diimplementasikan untuk memfasilitasi dan memantau kemajuan dalam mencapai tujuan KKP, dan tidak semata terfokus pada pencapaian skor yang diinginkan.

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5.1 Introduction

The Convention on Biological Diversity's Aichi Biodiversity Target 11 specifies that by 2020 *"…10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas…"* (Convention on Biological Diversity 2010). The Coral Triangle Initiative's Regional Plan of Action (CTI-CFF 2009) also committed to several goals, including *"priority seascapes designated and effectively managed"* and "*Marine Protected Areas* (MPAs) *established and effectively managed."* Indonesia has its own ambitious targets, aiming to establish 23.4 million ha of effectively managed MPAs by 2020 and 32.5 million ha by 2030. For all management targets, the word *effectively* is key, yet management effectiveness is often assumed, poorly defined, and infrequently measured. Many of the world's MPAs are known to be underperforming when measured against their objectives, with some referred to as "paper parks" – meaning that while they exist on paper, this does not translate to management actions or increased biodiversity protection on the water (Di Minin and Toivonen 2015). Much of this protected area underperformance is likely attributable to management being inadequate for an area to achieve desired outcomes (Coad et al. 2019; Gill et al. 2017). Concerns that area-based targets drive area expansion over effectiveness have resulted in calls for management effectiveness to be considered more explicitly in future targets in a way that is quantifiable (Campbell and Gray 2019). This is crucial, as management is often a better first investment for biodiversity conservation than protected area expansion (Adams, Iacona, and Possingham 2019; Kuempel et al. 2018), and a sole focus on area expansion may actually drive perverse outcomes for protected areas (Barnes et al. 2018).

MPA effectiveness and MPA management effectiveness are not one and the same (Mascia et al. 2014). MPA effectiveness is based on the MPA's initial goals and objectives – an MPA that delivers its target objectives could be considered effective (Pendleton et al. 2018; Wells et al. 2016). MPA effectiveness can also be referred to as performance measurement (Mascia et al. 2014). Objectives can range from supporting biodiversity, increasing abundance of target species, or reducing threats, and should be explicitly defined from the onset in a way that facilitates measurable progress, as indicators of success can vary accordingly. MPA management effectiveness is a measure of the capacity of the management body to support the MPA in achieving the desired objectives – i.e. requirements are in place to operate effectively (Hockings, Stolton, and Leverington 2006; Pressey, Visconti, and Ferraro 2015). It is influenced by multiple aspects including but not limited to financing, staff capacity and training, enforcement capacity, infrastructure, governance, communication, and community relations (Gill et al. 2017; Leverington et al. 2010).

5.2 Tools to Measure Management Effectiveness

There are several tools available to evaluate protected area management effectiveness (PAME), or in other words, to assess how well protected areas are being managed (e.g. Coad et al. 2015; Leverington et al. 2010; Hockings et al. 2006). The UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) has built a database to sit alongside the World Database of Protected Areas (protectedplanet.net) that tracks management effectiveness assessments for protected areas (Coad et al. 2015). There is a high diversity of tools used internationally, and the database currently includes over 40 different methodologies applied in over 100 countries.

In an attempt to provide guidance and standards for PAME assessments, the World Bank and WWF developed the Management Effectiveness Tracking Tool

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(METT) in 2003, and it has become one of the longest-serving and most widely used tools (applied over 4,000 times across 2,045 protected areas – Coad et al. 2015). It was originally designed for terrestrial protected areas and later adjusted for MPAs (Staub and Hatziolos 2004). This evaluation tool is based on the idea that good protected area management progresses through six distinct elements: (i) understanding the **context** of existing values and threats, (ii) progression through **planning**, (iii) allocation of resources (**inputs**), and (iv) as a result of management actions (**processes**), (v) the MPA eventually produces products and services (**outputs**) that result in (vi) impacts or **outcomes** (Stolton et al. 2007); Table 5.1). The assessment comprises 30 questions for terrestrial protected area evaluation and 34 questions for MPA evaluation with multiple choice answers scored between 0 (poor) and 3 (excellent), and some additional bonus points available for certain questions.

Table 5.1. METT assessment derived from Stolton et al. (2007).

Elements of evaluation	Explanation	Criteria that are assessed	Focus of evaluation
i - CONTEXT	*Where are we now?* Assessment of importance, threats, and environmental policy	• Significance • Threats • Vulnerability • National context • Partners	**STATUS**
ii - PLANNING	*Where do we want to be?* Assessment of protected area design and planning	• Protected area legislation and policy • Protected area system design • Reserve design • Management planning	**APPROPRIATENESS**
iii - INPUTS	*What do we need?* Assessment of resources needed to carry out management	• Resourcing of agency • Resourcing of site	**RESOURCES**
iv - PROCESSES	*How do we go about it?* Assessment of the way in which management is conducted	• Suitability of management processes	**EFFICIENCY AND APPROPRIATENESS**
v - OUTPUTS	*What are the results?* Assessment of the implementation of management programs and actions; delivery of products and services	• Results of management actions • Services and products	**EFFECTIVENESS**
vi - OUTCOMES	*What did we achieve?* Assessment of the outcomes and the extent to which they achieved objectives	• Impacts: effects of management in relation to objectives	**EFFECTIVENESS AND APPROPRIATENESS**

In Indonesia, there are two management authorities for MPAs: the Ministry of Marine Affairs and Fisheries (MMAF) and the Ministry of Environment and Forestry (MoEF). All MPAs managed by the Government of Indonesia are required long-term to implement management effectiveness assessments. MMAF uses its own assessment tool – the Management Effectiveness of Aquatic, Coasts, and Small Islands Conservation Areas (*Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*/E-KKP3K) (KKJI 2012b) – while MoEF uses METT to evaluate MPAs under its authority (KSDAE 2015a).

The E-KKP3K was developed by MMAF over a series of workshops that involved acquiring stakeholder input and feedback. Following the IUCN Management Effectiveness principles (Pomeroy, Parks, and Watson 2004), E-KKP3K applies three main principles: governance (institutional), natural resources, and socio-economic and culture (KKJI 2012b). The assessment has been used as an evaluation tool for MPAs under MMAF's authority since 2013. The guidelines classify the effectiveness of protected area management into five levels according to scores after answering 74 questions related to 17 criteria: **1** - "conservation area initiated" (**Red level**), **2** - "conservation area established" (**Yellow level**), **3** - "conservation area managed minimally" (**Green level**), **4** - "conservation area managed optimally" (**Blue level**), and **5** - "self-reliant conservation area" (**Gold level**) (Table 5.2). The questions determine the level of management effectiveness by scoping management plans, infrastructure and resources, and socioeconomic-cultural aspects that are pertinent to managing protected areas. Answers are either "yes" or "no", and the score is determined at each level by calculating the percentage of "yes" answers (scores are evenly weighted). The evaluation is based on the principle of building blocks (i.e. the next level cannot be reached unless all elements in the previous level have been attained – Susanto, Suraji, and Tokeshi 2015), and to be recognized as achieving a certain level, the score for the respective level must be 100%. For example, if an MPA scores 100% on the Red level, 100% on the Yellow level, and 90% on the Green level, it has only attained the Yellow level.

Both the E-KKP3K and METT tools have been designed to help track progress towards improved MPA management effectiveness. They evaluate MPA management effectiveness based on data and information gathered from a process that involves key representatives from internal and/or external stakeholders. Ideally, evaluations are conducted regularly (every 1–2 years). The evaluation results are transparent and can be accessed at the MMAF website (http://kkji.kp3k.kkp.go.id/) and the METT website (http://mett.ksdae.menlhk.go.id/). Both tools are designed to be used by managers to understand the status of their MPA management, and to reflect what worked, what did not, and how to improve it in the future. The assessment improves knowledge sharing among different related stakeholders involved in MPA management.

Table 5.2. E-KKP3K evaluation tool: level, criteria, and the number of questions related to each level.

Level		Criteria	Number of Questions
1 – Red	**Conservation area initiated**	1. Initiative proposal 2. Area identification and inventory 3. Reservation of conservation area	8
2 – Yellow	**Conservation area established**	4. Management organizational unit and personnel 5. Management and zoning plans 6. Facilities and infrastructure to support management 7. Management funding support	11
3 – Green	**Conservation area managed minimally**	8. Approval of management and zoning plans 9. Management standard operating procedures (SOPs) 10. Implementation of management and zoning plans 11. Designation of Aquatic Conservation Area	21
4 – Blue	**Conservation area managed optimally**	12. Setting area markers 13. Institutionalization 14. Resource management 15. Socio-economic and cultural management	28
5 – Gold	**Self-reliant conservation area**	16. Improving community welfare 17. Sustainable financing	6

Note: Adapted from (Keputusan Dirjen KP3K No. KEP.44/KP3K/2012) concerning Technical Guidelines for Evaluating Management Effectiveness of Aquatic, Coast, and Small Islands Conservation Areas (E-KKP3K).

5.3 Status and Trends of MPA Management Effectiveness in Indonesia

E-KKP3K evaluation of MMAF MPAs was first carried out in 2013 and repeated annually to measure trends of 35 priority MMAF MPAs. Evaluation has also been conducted bi-annually at other MMAF MPAs. In 2019, MMAF carried out a management effectiveness evaluation at 122 out of 166 of its MPAs (Figure 5.1). In parallel, based on the latest publicly available data on the MoEF METT website, the latest MoEF METT evaluation was carried out at 26 MoEF MPAs (out of 30 MPAs) in 2017, and 18 MoEF MPAs in 2015 (Figure 5.1, Table 5.3). Based on the E-KKP3K and METT evaluations that have been reported over recent years, one can observe status and trends in management effectiveness over time.

There are two management groupings of MMAF MPAs; those that are managed centrally by the national MMAF office (i.e. national MPAs [*Kawasan Konservasi Perairan Nasional/KKPN*]; n=10), and those that are managed by provincial governments with MMAF support (i.e. provincial MPAs [*Kawasan Konservasi Perairan Daerah/KKPD*]; n=156). Of the 122 MMAF MPAs in Indonesia that were evaluated in 2019 by E-KKP3K, 28 MPAs were "established" (Yellow level), 24 MPAs were "managed minimally" (Green level), and the remaining 70 MPAs were still "initiated" (Red level) (Figure 5.2A). These "initiated" MPAs (Red level) were all provincial MPAs and still lacked basic MPA management implementation (e.g. zoning systems, management plans, management bodies). The western region of Indonesia has the majority of "initiated" MPAs (Red level). All national MPAs were classified at the "managed minimally" (Green level) in evaluations in 2019. No MMAF MPA fulfilled 100% of the Blue ("managed minimally") or Gold levels ("self-reliant") in 2019.

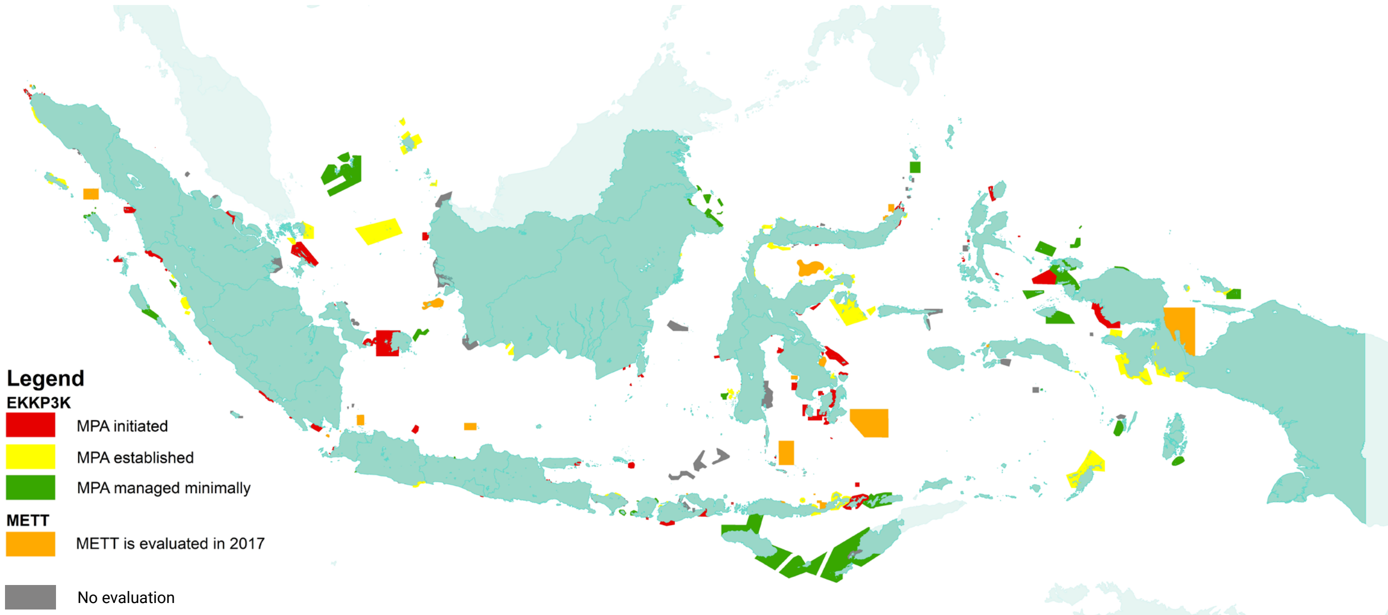
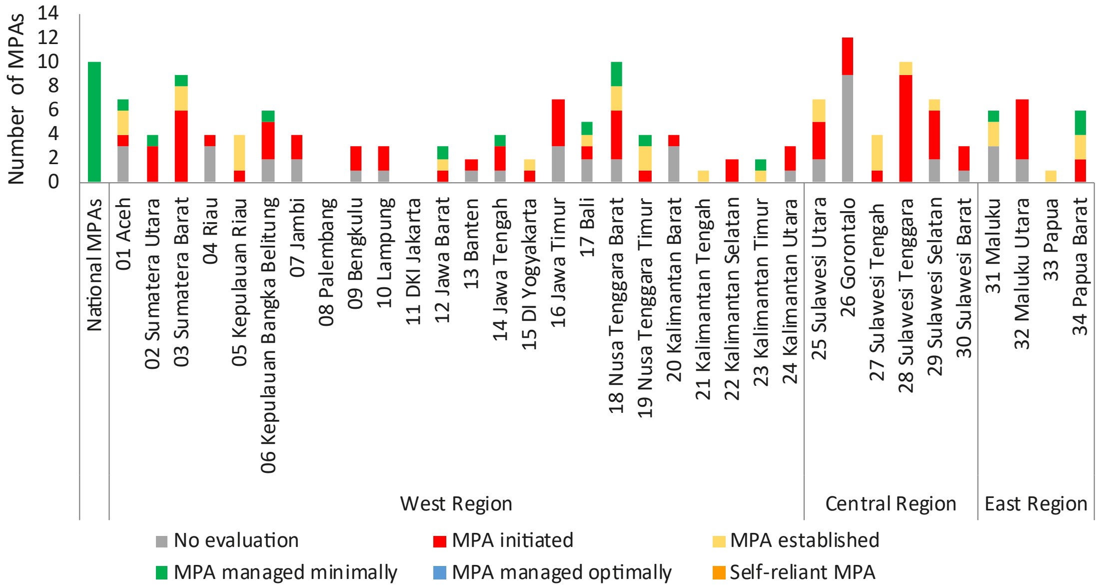
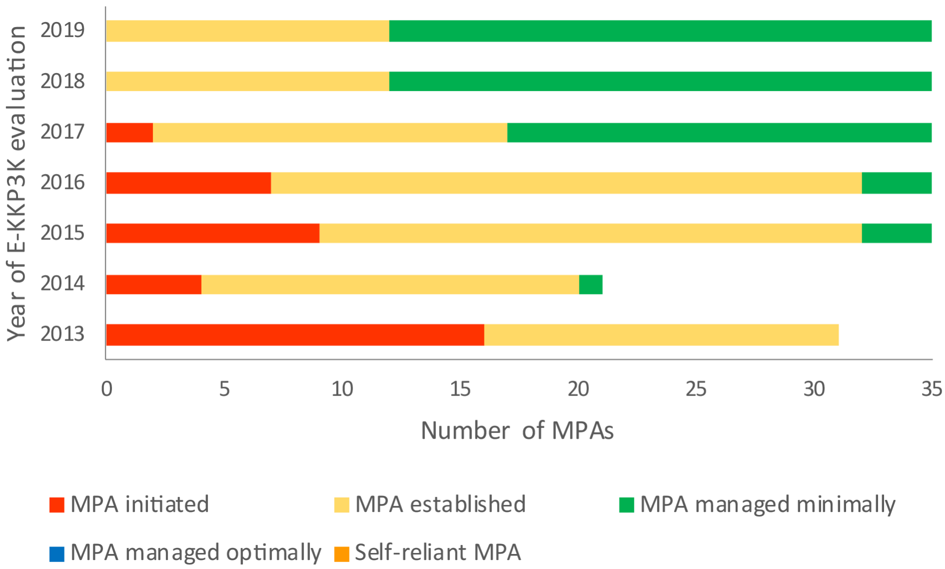


Figure 5.1. Status and distributions of MPA management effectiveness in 148 MPAs in Indonesia. Management effectiveness for all 148 MPAs was evaluated by either E-KKP3K in 2019 or METT in 2017.



(A)



(B)

Figure 5.2. (A) 2019 E-KKP3K status for national and provincial MMAF MPAs, and (B) changes in E-KKP3K levels from 35 priority MPAs (2013-2019). The 35 priority MPAs are 10 National MPAs (TWP Pulau Pieh, TWP Kepulauan Anambas, TWP Gili Matra, TNP Laut Sawu, TWP Kapoposang, SAP Kepulauan Aru Tenggara, TWP Taman Laut Banda, TWP Padaido, SAP Kepulauan Raja Ampat, and SAP Kepulauan Waigeo Sebelah Barat) and 25 Provincial MPAs (SAP Pesisir Timur Pulau Weh, TWP Sawo Lahewa, TWP Selat Bunga Laut, KKPD Bintan, KKPD Batam, KKPD Natuna, TWP Momparang, TP Pantai Penyu Pangumbahan, TP Ujungnegoro Roban, TWP Nusa Penida, TWP Gili Sulat Lawang, TWP Gita Nada, KKPD Gili Balu, KKPD Kabete, SAP Selat Pantar, KKPD Sikka, TP dan TPK Kepulauan Derawan, TPK Tatoareng, TP dan TPK Banggai Dalaka, KKPD Liukang Tupabiring, TPK Kei Kecil, KKPD Kepulauan Tanimbar, TWP Raja Ampat, TP Jeen Womom, and KKPD Biak Numfor). Four MPAs were initiated in 2015, thus E-KKP3K evaluation was not conducted for those four MPAs in 2013–2014. In 2014, eleven MPAs were not evaluated (KKJI 2012a).

Of the 166 MMAF MPAs, 35 are selected as priority MPAs (Kementerian Kelautan dan Perikanan 2019, unpublished) and their management effectiveness performances are evaluated yearly. Figure 5.2B shows the changes of E-KKP3K levels from 35 priority MPAs from 2013 to 2019. In 2013 when E-KKP3K was first conducted, all MPAs were at either the "initiated" or "established" levels. The number of MPAs at the "managed minimally" level gradually increased from 2014. Based on these data, we also calculated the average time (in years) for an MPA from its initiation to reach the Yellow and Green levels (Figure 5.2B). For an in-depth description of the MPA establishment process, see Chapter 1. Following their formal initiation by provincial or ministerial decree, MMAF MPAs took on average 3.1 years (± 2.5; n=18 MPAs) and 6.2 years (± 2.5; n=24 MPAs) to attain the Yellow and Green levels, respectively. Notably, some MPAs progressed very quickly (e.g. TP [*Taman Perairan*; Aquatic Park] Jeen Womom was evaluated as being at the Yellow level after just one year and attained the Green level after three years), and others at a slower rate (e.g. KKPD Liukang Tupabiring took eight years from initiation to attain the Yellow level).

Table 5.3. METT scores and changes in management effectiveness elements for MoEF MPAs for 2015 and 2017.

MoEF MPAs	METT score		Changes in METT element scores (2015–2017)						Allocated budget for management		Changes in total staff per 1,000 ha (2015–2017)
	2015	2017	Context	Planning	Input	Process	Output	Outcome	Year 2017 allocated budget (IDR per ha)	Changes in allocated budget (2015–2017)	
CAL Kepulauan Karimata		57							288,402		
CAL Pananjung Pangandaran	54	54	=	=	↓	↑	=	↑	176,828	↑ 100%	↓
CA Pulau Anak Krakatau	57	75	=	↑	↑	↑	↓	↑	0	=	↓
CA Riung	35	28	=	↓	=	↓	=	=	0	=	=
SM Pulau Rambut dan Perairan	49	67	=	↑	=	↑	↑	↑	0	=	↓
SM Pulau Semamab		58							969,097		
TL Pulau Moyo	55	57	=	↑	↑	↓	↓	↑	11,197	↑ 100%	↑
TNL Bunaken	66	71	=	↓	↓	↑	↑	↑	229,472	↑ 89%	↓
TNL Kepulauan Karimun Jawa	77	73	↓	↓	↑	↑	↑	↑	152,608	↑ 31%	↓
TNL Kepulauan Seribu	71	70	↓	↑	↓	↑	↑	↑	54,205	=	=

TNL Kepulauan Togean	46	61	↑	↑	↑	↑	↑	↑	51,635	↑ 302%	↓
TNL Taka Bone Rate	69	74	↑	↑	↑	↑	↑	↑	13,950	=	=
TNL Teluk Cendrawasih	64	73	↑	↑	↑	↑	↑	↑	8,154	↑ 33%	↓
TNL Wakatobi	74	79	=	↑	↑	↑	↑	↑	20,415	↑ 333%	↓
TWAL Teluk Maumere		38							479		
TWA Kepulauan Banyak	47	65	=	↑	↑	↑	↑	↑	0	↓ 100%	↓
TWAL Padamarang		49							0		
TW Pulau Kasa	44	28	↓	↓	↓	↓	↑	↑	0	=	=
TWA Pulau Marsegu	46	33	↓	↓	↓	↓	↑	↑	0	=	=
TW Pulau Pombo	52	36	↓	↓	↓	↓	↑	↑	0	=	=
TL Pulau Samama Sangalaki		65							1,235,327		
TWA Pulau Sangiang		49							831,527		
TWA Pulau Satonda	52	58	=	↑	↑	↓	↓	↑	89,136	↑ 4,535%	↑
TL Pulau Weh Sabang	53	73	=	↑	↑	↑	↑	↑	139,485	↑ 83%	↓
TWA Teluk Lasolo		43							0		
TWA Tujuh Belas Pulau		53							0		

Note: "METT score" is the overall mean score across the six METT elements (context, planning, input, process, output, outcome – Table 5.1). Allocated budget by MoEF was calculated by dividing the total budget by the size of the MPA, resulting in allocated budget per ha, to accommodate changes in the size of some MPAs between 2015 and 2017. The same method was used to calculate the total staff per 1,000 ha. Changes in the six METT elements, allocated budget per ha, and number of staff per ha were calculated by subtracting the 2015 data from the 2017 data within each MPA: ↑ reflects an increase; = indicates no changes; ↓ reflects a reduction. The percentage in the budget column was calculated for 2017 relative to the baseline data in 2015. Blank cells reflect there being no data from 2015 to compare with 2017 values (KSDAE 2015b).

METT evaluations from 26 MoEF MPAs in 2017 and 18 MoEF MPAs in 2015 are shown in Table 5.3. In 2017, the overall METT scores from 26 MoEF MPAs ranged from 28 to 79. Eleven out of 18 MoEF MPAs revealed an improvement in total METT score from 2015 to 2017, meaning that these MPAs had better management effectiveness performance within a two-year period. Nine of the MPAs had higher budgets allocated for MPA management in 2017 compared with 2015, and only one MPA had a lower budget in 2017 than 2015. However, ten MPAs had less staff per 1,000 ha in 2017 compared with 2015, six remained unchanged, and only two MPAs had more staff. Four MPAs that scored lower in METT assessments in 2017 than 2015 (CA [*Cagar Alam*; Nature Reserve] Riung, TW [*Taman Wisata;* Recreation Park] Pulau Kasa, TWA [*Taman Wisata Alam*; Nature Recreational Park] Pulau Marsegu, and TW Pulau Pombo) had no national budget allocated in 2017 and no changes in staff numbers. One MPA (TWA Kepulauan Banyak) still improved its score considerably despite 100% reduction in budget and reduced staffing capacity, potentially due to intensified patrols (despite lacking facilities) and strengthened *Panglima Laôt* (local customary management system) as identified in comments from MoEF staff. Improvements in METT scores were seen at six of the seven national parks (*Taman Nasional*/TN) in 2017, and of these four also had higher budget allocations.

5.4 Challenges

Measuring MPA management effectiveness and addressing limitations and weaknesses is key for MPA success. A global study of 3,184 management effectiveness assessments (covering 54 different methodologies) found that a large proportion of protected areas and MPAs globally have substantial scope to improve their management (Leverington et al. 2010). In Indonesia, by 2019, 24 MMAF MPAs had achieved E-KKP3K's Green level ("conservation area managed minimally"), representing the best performing MMAF MPAs in Indonesia. In contrast, the METT scores in 2017 ranged from 28 to 79 (out of 100). Whilst there are many new MPAs have been initiated by MMAF in the past decade, there are also some inherent management challenges to improve the management effectiveness of these MPAs. Inadequate sustainable financial and staffing capacity, complex governance constructs (Chapter 1), and low compliance are some of the key challenges for management effectiveness worldwide (Bennett and Dearden 2014; Gill et al. 2017). Importantly, as a result of poor management, the failure to achieve MPA objectives can lead to an erosion of credibility and a loss of trust in management and conservation (Agardy 2017).

Evaluation assessments provide a useful tool to identify strengths and weaknesses in management. Nevertheless, carrying out MPA management effectiveness on a regular basis is a challenge. Only 29% of the area of the world's nationally designated protected areas had PAME evaluations conducted by 2013 (Jones et al. 2019), indicating the existence of large spatial gaps in evaluation data. In principle, data should be regularly collected, transparent, and made available in order to facilitate improvements. However, where evaluations have been conducted, higher management effectiveness scores are not always correlated with better outcomes (e.g. Carranza et al. 2014). One reason for this may be that managers feel pressured to provide positive results (e.g. to ensure funding continuation - Eklund et al. 2019), and can significantly overestimate how effective their MPAs are compared to other stakeholders involved in the management process (Giglio et al. 2019). Another challenge is that management assessments do not cover aspects related to the broader context of governance that can be a primary obstacle to management effectiveness (Eklund et al. 2019). Tracking the progression of MPA management over time can be made challenging by alterations to the scoring criteria. Without maintaining existing questions, trust may be eroded, as the evaluation tool may no longer be viewed as an objective and consistent assessment.

Over the last decade, a legal amendment in Indonesia led to challenges for MPA management. In 2014, the law concerning governance systems changed (UU RI No. 23/2014) whereby the authority for managing the marine waters within 12 nautical miles from land (and any associated MPAs) was transferred to the provincial government; previously, it had been divided between district and provincial governments. The transition process faced challenges and experienced some disruptions as a result of inadequate human and financial resources as well as the lack of management plans at the provincial level (Case Study 5.A). Moreover, the provincial governments were required to prepare an MPA management authority, which took time to put in place, and at the same time had to manage a number of MPAs within their jurisdiction (Case Study 5.B).

Case Study 5.A
Lessons from National Policy Changes

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Over 20,000 ha of ocean around the Penida islands (Bali) have been recognized as a Marine Protected Area (MPA) under the type TWP (*Taman Wisata Perairan*; Aquatic Tourism Park) since 2010. TWP Nusa Penida's initiation was based on scientific survey data and over 60 public consultations with around 1,600 key stakeholders. TWP Nusa Penida have productive coastal ecosystems including coral reefs (1,400 ha), seagrass beds (108 ha), and mangrove forests (230 ha) that have exceptionally high levels of biodiversity (POKJA KKP Nusa Penida 2012). The area is also a habitat for marine megafauna such as manta rays, sunfish, turtles, and sharks.

TWP Nusa Penida was stipulated through an MMAF decree (Kepmen KP No. 24/KEPMEN-KP/2014) with external borders, a zoning system, management plan documents, and a management unit under the Klungkung Regency's authority. Based on E-KKP3K, the MPA met 100% of the Green status criteria (Level 3 – "conservation area managed minimally") and 75% of the Blue status criteria (Level 4 – "conservation area managed optimally") in 2014. Monitoring data indicated that the protected ecosystems were in relatively good condition, with live hard coral cover averaging 37% and reef fish biomass averaging over 1,000 kg/ha (CTC 2013, unpublished data; Lazuardi, Sanjaya, and Welly 2014).

Later in 2014, the Indonesian government passed a new National Law (UU RI No. 23/2014) whereby authority over the coastal ocean within 12 nautical miles was transferred from the regency to the provincial level. This new law meant that the authority to manage TWP Nusa Penida changed from the Klungkung Regency to Bali's provincial government, which was not prepared. Lacking a provincial-level legal framework and budget, the MPA management unit was left in limbo. The MPA consequently lost its Green status under E-KKP3K, falling back to Red (Level 1 – "conservation area initiated").

Operationally, however, the MPA management unit continued to function, supported with assistance and funding from the Klungkung Regency Government and other long-term, non-governmental partners. This arrangement continued through a period of transition until 2018, when Bali's Provincial Government established a legal framework and allocated funding for the management unit. This was validated by a revision (Kepmen KP No. 90/KEPMEN-KP/2018) to the original MMAF decree under which the MPA was established.

Following this change, the MPA's status under E-KKP3K jumped back to Green, with 50% of criteria met for Blue status.

Despite the legislative changes and subsequent fluctuations in E-KKP3K status, from an ecological standpoint the MPA remained relatively stable. Coral cover and fish biomass showed no clear positive nor negative trend during the 2014–2018 transition period (CTC 2014-2018, unpublished data). From a socio-economic standpoint, tourist visits to the MPA increased an average of 10% each year from 2014–2017, from 220,751 to 292,734, dropping only in 2018 to 133,848 (BPS RI 2019).

TWP Nusa Penida's experience made two lessons clear. First, the E-KKP3K framework is sensitive to legislative changes and may not accurately reflect on-the-ground management activities nor ecological and socio-economic outcomes. MPA management effectiveness can be evaluated via different dimensions (e.g. ecological, socio-economic, legal) though recognizing when these dimensions become decoupled is important. Second, management that is collaborative (i.e. involves partnerships between government and non-government stakeholders), and adaptive (i.e. constantly evaluated and revised as conditions change), can help ensure functional continuity in the face of unanticipated challenges, legislative or otherwise.

The information provided by the E-KKP3K and METT focuses primarily on activities and processes associated with management, leaving the question open as to the effectiveness of MPAs in achieving societal and ecological impacts (considering impacts as the difference the MPA makes relative to estimates expected without protection – Pressey, Visconti and Ferraro, 2015). Such evaluations provide important information, but the value comes when they are combined with outcome measures (Mascia et al. 2014; Weeks et al. 2014). In most E-KKP3K assessments in 2019, only a few MPA managers conducted regular monitoring, and of those, many have not yet shown an increase in social or ecological benefits (Chapter 4). This lack of monitoring data hinders many MMAF MPAs from advancing to E-KKP3K's Blue level ("conservation area managed optimally"). Some MoEF MPAs, many of which have been long established, have carried out regular monitoring to track the changes in coral reef condition within the MPA. One of the examples is from TNL (*Taman Nasional Laut*; Marine National Park) Kepulauan Seribu, that showed a steady increase in live coral cover in the last decade (Case Study 5.C).

Conducting long-term regular evaluation with standard methodology and improving the MPA management effectiveness in Indonesia will require adequate human resources and institutional capacity as well as sustainable financing – components that are commonly still lacking from many MPAs worldwide (Bennett and Dearden 2014; Gill et al. 2017). Specifically, in Indonesia, while MPAs are formally managed by either MMAF, MoEF or provincial governments, in practice, MPA implementation requires extensive support from other government offices, stakeholders, and community groups under a co-management scheme. Therefore, the success or failure of MPA management effectiveness improvement should not be seen as the responsibility of a single entity, but as a shared responsibility and investment among different entities.

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Case Study 5.B
Management Effectiveness of Marine, Coastal, and Small Island Protected Areas: Lessons Learned from Nusa Tenggara Barat

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The waters of Nusa Tenggara Barat have abundant fisheries, with an average capture fisheries production of 189,000 tons per year. To ensure the sustainability of production and maintain the resilience of aquatic ecosystems, the Nusa Tenggara Barat Provincial Government allocated part of its water space for protected areas through the issuance of Regional Regulation No. 12/2017 (Perda Provinsi NTB No. 12/2017) concerning the Zoning Plan for Coastal and Small Island Protected Areas (*Rencana Zonasi Wilayah Pesisir dan Pulau-pulau Kecil*/RZWP3K) of Nusa Tenggara Barat Province. The policy marked the local government's commitment to reserving 341,641 ha, or 11.7% of its waters, as marine, coastal, and small island protected areas, of which there are 17. Of these, 14 were established in 2015 and 2017 and are currently managed by the provincial government through three management units; one was established in 2009 and managed by MMAF through the National MPA Authority (BKKPN), and the other two were designated in 1986 and 1998 and are managed by MoEF through the Nusa Tenggara Barat Natural Resources Conservation Center.

The NTB Nusa Tenggara Barat Government's commitment to MPAs was demonstrated through various efforts to improve the effectiveness of MPA management from 2017 to 2019. Efforts included developing zoning and management plans for ten protected areas; preparing standard operating procedures for management; completing management

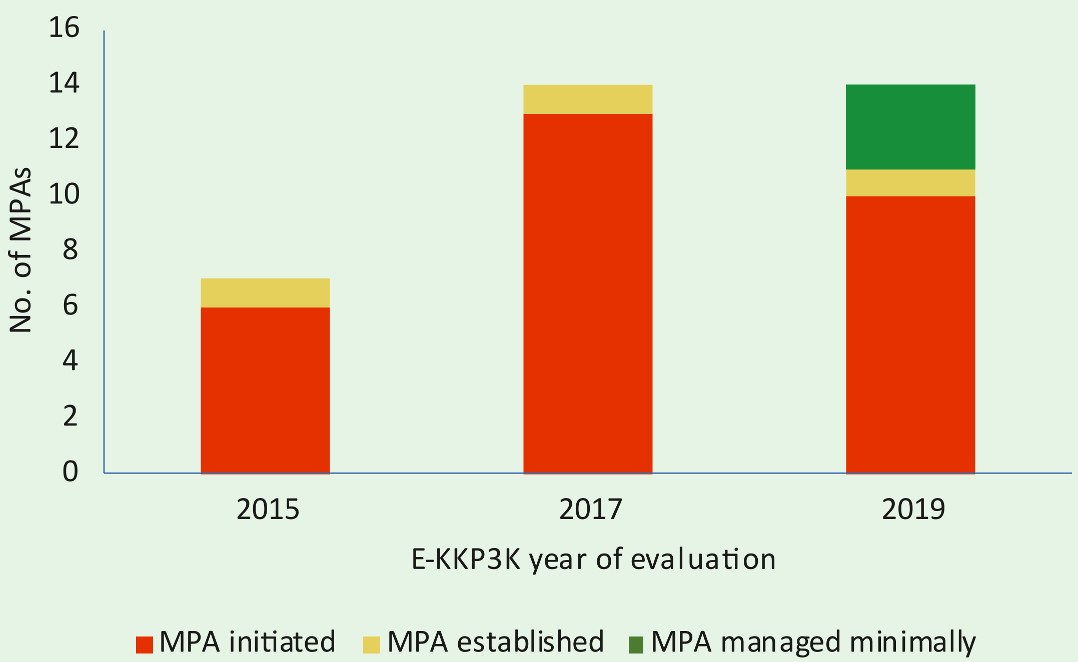

Figure 5.B.1. E-KKP3K Status for 14 MPAs in Nusa Tenggara Barat Province in 2015, 2017, and 2019.

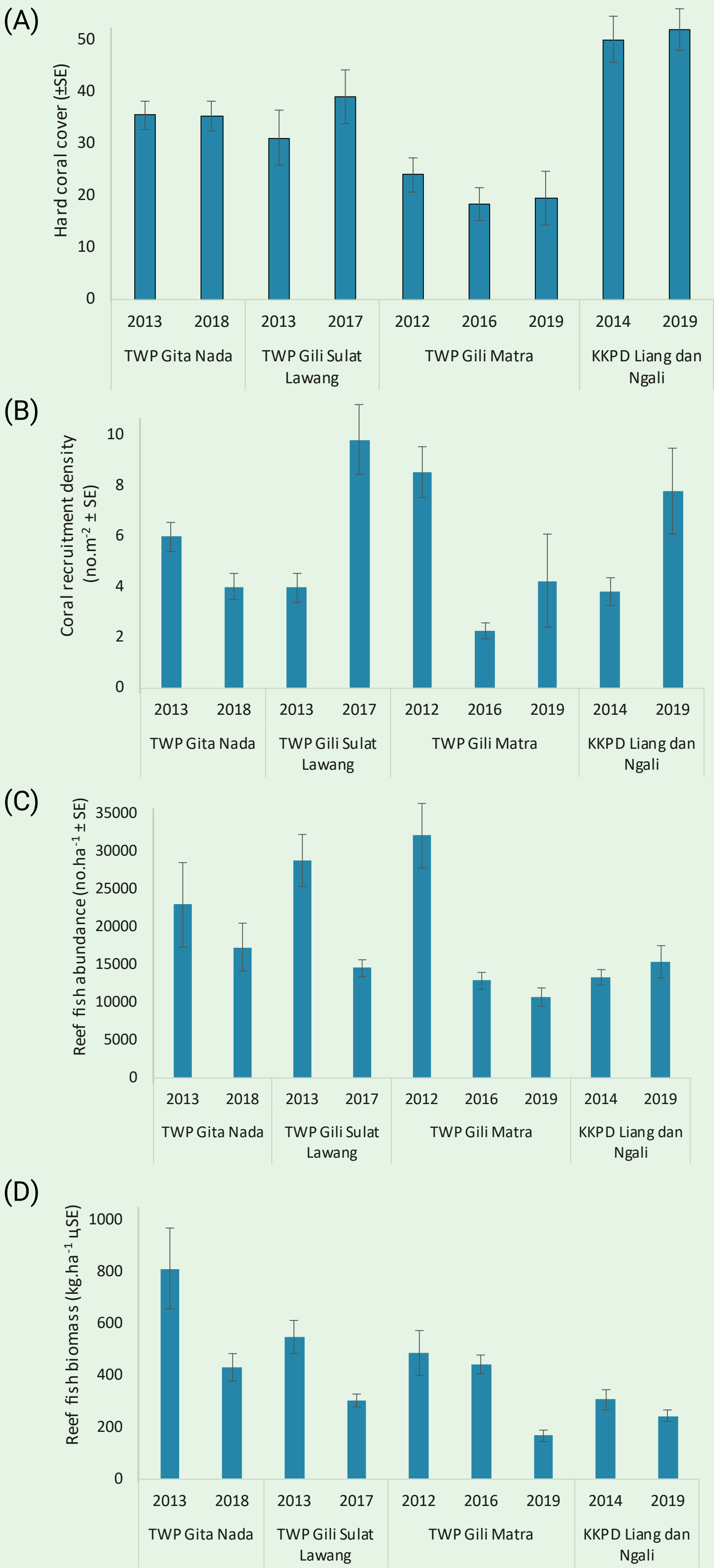

Figure 5.B.2. Biophysical indicators: (A) hard coral cover, (B) coral recruitment density, (C) reef fish abundance, and (D) reef fish biomass at TWP Gita Nada, TWP Gili Sulat Lawang, TWP Gili Matra, and KKPD Liang dan Ngali.

supporting facilities and infrastructure; proposing the designation of five protected areas; consistently implementing management activities such as surveillance, outreach, and biophysical and socioeconomic monitoring, and building partnerships with community-based surveillance groups (Pokmaswas). The Nusa Tenggara Barat Provincial Government has so far guided 22 Pokmaswas throughout the MPAs managed by the Nusa Tenggara Barat Provincial Marine and Fisheries Agency (DKP Nusa Tenggara Barat).

As part of efforts to build transparent and accountable governance, Nusa Tenggara Barat NTB, together with district/city governments, community groups, and Wildlife Conservation Society Indonesia Program (WCS-IP), evaluated the management of MPAs using E-KKP3K in 2019. The evaluation of fifteen protected areas indicated that three areas reached Green level ("conservation area managed minimally"), two reached Yellow level ("conservation area established"), and ten were at the Red level ("conservation area initiated") (Figure 5.B.1). The two other areas were not evaluated due to differences in measurement tools used for the protected areas under MoEF. The three protected areas with the highest scores were the TWP (*Taman Wisata Perairan*; Aquatic Tourism Park) Gita Nada (Tarigan et al. 2019), TWP Gili Sulat Lawang (Tarigan et al. 2018), and TWP Liang Ngali (Tarigan et al. 2019). The coral reef ecosystem study showed the improved condition of the coral reef ecosystems demonstrated by an increase in hard coral cover in the three protected areas (Figure 5.B.2B). Despite a decrease in condition found for fish resources, herbivorous fish condition improved. The improvement in hard coral cover and the herbivorous fish was presumably due to a decrease in destructive fishing activities using bombs and anesthetics as well as better public knowledge of the protected area management system.

Through the implementation of a participatory and open E-KKP3K evaluation system, the Nusa Tenggara Barat Government and its partners have successfully identified five factors to improve the effectiveness of protected area management: 1) allocation of human resources with adequate numbers and competencies; 2) provision of management facilities and infrastructure to include the area's resources, surveillance, and monitoring tools; 3) boundary delineation and publication of the area on the sea map; 4) development of new regulations derived from regional regulations, such as governor's regulations on the utilization of protected area resources, partnerships, services, and protected area networks; and 5) synergy of development policy directions on land and sea. These factors support not only the improvement of protected area governance but also a better ecosystem condition to enable the protected areas to achieve the purpose of their establishment.

5.5 Opportunities

The management effectiveness of MPAs in Indonesia has been regularly monitored and tracked since 2013 with E-KKP3K and METT tools. A suite of tools has been identified to improve management effectiveness that can be integrated in Indonesia over the coming decade. Weeks et al. (2014) provides a clear overview of "ten things to get right for marine conservation planning in the Coral Triangle", highlighting key areas including building local capacity and planning across governance boundaries. Furthermore, Carter, Soemodinoto, and White (2010) produced a guide for improving MPA management effectiveness in Indonesia, focusing on five main steps that facilitate MPA management and conservation effect ratings and then utilize the results to improve MPA development. A global analysis of MPA performance revealed staff and budget capacity to be the strongest predictors of conservation impact, with the authors emphasizing that continued area expansion to meet global targets without increased financial investment risks diluting already scarce resources, leading to further reductions in effectiveness (Gill et al. 2017). The

Indonesian government must thus inject more money into marine management or promote further co-management schemes in order to improve the capacity to manage MPAs (Chapter 2).

Management evaluation tools can be used to focus on improvements in management to achieve national and international recognition, with governments having the opportunity to create more incentives for achieving high scores. If evaluations identify shortcomings in staff capacity, then capacity development (e.g. manager/staff training, for which there are several regional and international initiatives) is one tool that can address this gap. Where issues with insufficient financing are identified, then managers can focus their efforts on sustainable financing mechanisms. Furthermore, where evaluations identify weaknesses in management or compliance, building cross-scale and cross-sectoral linkages to promote knowledge exchange could offer a useful tool. Fortunately, evidence of links between staff and budget capacity and MPA outcomes (Geldmann et al. 2018; Gill et al. 2017) suggests that evaluation tools such as E-KKP3K and METT that capture these facets can give a strong indication of overall management success. However, the methodology to evaluate the effectiveness of MPA management in Indonesia can be improved by involving a range of stakeholders in the evaluation process to offer their perspectives (e.g. resource users, community representatives) (Giglio et al. 2019) and to overcome issues with self-reporting and subjectivity inherent to such assessments (Carranza et al. 2014; Coad et al. 2015). This involvement of local stakeholders can build on focus groups conducted during MPA zonation and management plan development (Chapter 6), thereby treating local communities as "allies not aliens" (Ferse et al. 2010) and ensuring both effective and equitable management (Jones et al. 2019). The agreement and support of resource users will promote compliance and communication, which will in turn increase management effectiveness.

For new and existing MPAs, managers should set realistic expectations for social-ecological outcomes, should measure key indicators that reflect MPA performance, and should integrate feedback from key local stakeholders (Pendleton et al. 2018). Evaluations should incorporate these indicators for social and ecological impacts (i.e. measurable outcomes) in addition to verifying the status of management activities and processes. Ultimately, these two evaluations (assessments of impacts and management effectiveness) can complement each other by exposing different facets of protected area performance (Eklund et al. 2019). Evaluations should continue to be conducted regularly and transparently, with results made publicly available for all government MPAs in Indonesia. This should help facilitate reflection and introspection on current MPA progress. Reductions in the processing time for official verification of evaluation documents would be beneficial in outlining where weaknesses are, allowing them to be addressed rapidly before management and credibility are eroded. There are currently discussions about revising E-KKP3K. While revisions to address the needs of Indonesian MPA managers and the MMAF are welcome, as a long-term tracker of MPA progress and effectiveness, it is crucial to maintain the ability for direct and robust comparisons through time by maintaining existing questions.

With regard to METT, Gill et al. (2017) indicates there is a "score threshold" that can be used to predict positive outcomes from the evaluation. As an example, instead of individually scoring a question on staff capacity (0 – there are no staff; 1 – staff numbers are inadequate; 2 – staff numbers are below optimum; 3 – staff numbers are adequate), setting a threshold that only differentiates whether there are enough staff or not (i.e. no distinction between scores 0–2) may be more powerful in predicting success. These binary thresholds may make this assessment more similar and comparable to the E-KKP3K tool (i.e. is there sufficient staff capacity – yes/

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no), and so could be used in the future to standardize management effectiveness assessments between MMAF and MoEF.

Finally, to promote quality of management over quantity, the International Union for the Conservation of Nature (IUCN) established the IUCN Green List of Protected and Conserved Areas (GLPCA) in 2013. This tool provides an accredited verification process to identify areas that meet a defined global standard of management that includes meeting their conservation goals, achieving *effective management*, and facilitating equitable governance (Wells et al. 2016). The Coral Triangle MPA System (CTMPAS) Framework and Action Plan (CTI-CFF 2013) is another incentivized MPA management effectiveness initiative that classifies MPAs into four categories depending of their level of effectiveness. This evaluation framework recognizes TNL (*Taman Nasional Laut*; Marine National Park) Wakatobi in Indonesia as a Flagship Site (being a "large, effectively managed MPA of regional importance" – Wells et al. 2016). More Indonesian MPAs should aim to be recognized as effectively managed by CTMPAS and the GLPCA over the coming decade to achieve international recognition and to be rewarded with associated benefits, including increased financial and political support.

Case Study 5.C
Improving the Management Effectiveness of TNL Kepulauan Seribu

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Faced with increasing threats to ocean health, the Government of Indonesia has implemented MPAs as a primary tool to protect biodiversity and manage marine resources sustainably. Although Indonesia has a high number of MPAs as of 2020, 69% of these were recently initiated in the last decade, and less than 20% of these MPAs are older than fifteen years. Maintaining the management effectiveness of old MPAs poses a different set of challenges than the challenges in improving the management effectiveness of new or small MPAs.

TNL (*Taman Nasional Laut*; Marine National Park) Kepulauan Seribu is one of the few old MPAs (>15 years old) in Indonesia and managed by MoEF. Located in the northern part of Jakarta, the capital city of Indonesia, TNL Kepulauan Seribu was designated to protect marine biodiversity, especially coral reefs, giant clams, hawksbill turtles, and mangrove forests. It was first designated as a Marine Reserve in 1982 by the Minister of Agriculture (SK MenTan No. 527/Kpts/Um/7/1982), then appointed as a national park in 1995 by the Minister of Forestry (SK MenTan Ab 161/Kpts-II/1995). Due to its proximity to mainland Jakarta, TNL Kepulauan Seribu experiences both local and global threats to its marine ecosystem and inhabitants. Marine ecosystems are continuously threatened by destructive fishing practices, including the use of cyanide fishing, trawling, *muro ami* (drive-in net), and a high amount of water pollutants and waste discharged from a dozen rivers in Jakarta. Conflicts on spatial use, mass marine tourism, offshore oil rigs, and intense large vessel shipping activities, amongst others, are other typical threats to marine ecosystems in and surrounding TNL Kepulauan Seribu. Besides these, the park's coral reefs are also threatened by frequent ENSO-related mass coral bleaching events (1997, 2010, 2016).

Of 26 MoEF MPAs that were evaluated by METT in 2017, TNL Kepulauan Seribu has one of the highest scores (overall score >70). This high METT score was attained through continuous management measures taken by the 206 TNL Kepulauan Seribu rangers (in 2017). Besides regular MPA management measures such as patrols and monitoring, TNL Kepulauan Seribu also refined its zoning system in 2016 (SK Dirjen KSDAE No. SK.386/KSDAE/SET/KSA.0/9/2016) to resolve spatial conflicts over marine resources within the park, working closely with the district and provincial governments to develop the Jakarta Marine Spatial Plan, Jakarta Spatial Plan (UU RI No. 1/2014a), and Jakarta Forestry Map (Kepmen LHK No. SK.6021/MENLHK-PKTL/KUH/PLA.2/11/2017) to manage marine resource use in surrounding Jakarta and TNL Kepulauan Seribu. Together with partners, the park rangers promoted the implementation of environmentally friendly fishing practices, rights-based fisheries for small fishers, and banned the distribution of destructive fishing gears. As marine tourism is a potential source of income for local communities and thereby is further promoted, the tourism sector has supported MPA management by increasing community, public, and private sector participation in conservation and sustainable financing. Aside from the government budget, TNL Kepulauan Seribu has multi-year financial support from the private sector through corporate social responsibility programs, and NGOs.

Based on an environmental evaluation study by MoEF in 2019, TNL Kepulauan Seribu has successfully maintained its ecosystems and species biodiversity over the years, except for giant clams, which were last spotted in 2009. In the last 15 years, coral cover remained stable (Figure 5.C.1), and mangrove forest cover increased as a result of successful mangrove rehabilitation programs (Muhidin 2017). Indeed, with adequate management capacity and sustainable financing, TNL Kepulauan Seribu has reached many milestones in improving its management effectiveness. Nevertheless, further improvement, or at least maintaining the METT management effectiveness score, is still a challenge because most of the main threats to marine ecosystems are from outside the park, beyond its jurisdiction. This highlights the importance of co-management with wider partners and strengthens the provincial management plan to reduce threats from mainland Jakarta to TNL Kepulauan Seribu.

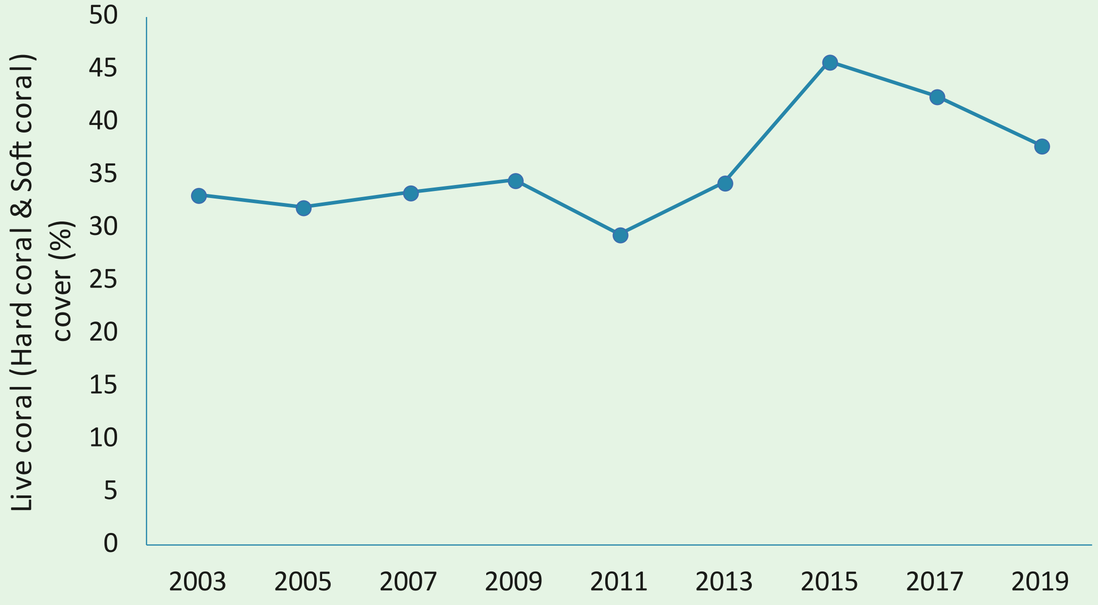

Figure 5.C.1. Live coral (hard and soft coral) cover of TNL Kepulauan Seribu from 2003–2019.

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Section III.
Balancing Biodiversity Conservation and Sustainable Use in Marine Protected Areas

Chapter 6. Marine Protected Area Zoning

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Abstract

To balance multiple objectives — such as biodiversity conservation and sustainable fisheries — Marine Protected Areas (MPAs) often spatially divide their area into distinct zones with different permitted/allowed activities. Here we provide an overview of MPA zonation in Indonesia, reviewing the different types of zones implemented and the process by which zonation is implemented and revised. Based on available zonation plans, we find that 4% of the overall Indonesian MPA area is designated as a "Core Zone" where fishing is restricted. However, the extent of non-extractive area for these MPAs increases to approximately 11% after accounting for all non-extractive zones (e.g. Core Zones, Protection Zones, and Tourism Zones). We discuss challenges in the MPA zonation process for Indonesia and MPAs more generally, including recommended targets for non-extractive area, compliance, balancing the need of local communities, and considerations around power dynamics when conducting zonation. With MPAs used as a tool to increase sustainable fisheries management, addressing these challenges is key to securing the future of MPAs in Indonesia and globally.

Abstrak

Untuk menyeimbangkan berbagai tujuan — seperti konservasi keanekaragaman hayati dan perikanan berkelanjutan — Kawasan Konservasi Perairan (KKP) diimplementasikan dengan sistem zonasi yang membagi kawasan dalam beberapa area berdasarkan jenis kegiatan yang diperbolehkan/diijinkan. Dalam bab ini, kami menyediakan gambaran umum mengenai zonasi KKP di Indonesia, meninjau berbagai jenis tipe zonasi, serta proses implementasi dan revisi zonasi. Berdasarkan data rencana zonasi yang tersedia, sebanyak 4% dari seluruh area KKP di Indonesia ditetapkan sebagai Zona Inti, dimana kegiatan penangkapan ikan tidak diperbolehkan. Luas area non-eksraktif mencapai 11% dengan menggabungkan luasan zona-zona non-ekstraktif seperti Zona Inti, Zona Perlindungan, dan Zona Wisata. Kami juga membahas berbagai tantangan dalam proses zonasi KKP di Indonesia, termasuk target-target yang direkomendasikan untuk wilayah non-ekstraktif, kepatuhan, penyeimbangan antara berbagai kebutuhan masyarakat lokal, serta pertimbangan mengenai dinamika kekuasaan ketika mengimplementasikan zonasi. Dengan penggunaan KKP sebagai perangkat untuk meningkatkan pengelolaan perikanan secara lestari, mengatasi tantangan-tantangan ini merupakan kunci untuk mengamankan masa depan KKP di Indonesia dan di dunia.

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6.1 Introduction

Marine protected areas (MPAs) often have to balance multiple objectives including biodiversity outcomes with local community needs. Depending on the size, scale, objectives, and governance frameworks supporting MPA establishment, MPAs can either apply a single set of regulations across the whole area (e.g. a no-take/non-extractive MPA) or break the MPA into delineated management areas (zones) within which finer-scale spatial planning allocates and permits different activities. These "zoned MPAs" can result in a wide range of social, economic, and environmental benefits, as found in Australia's Great Barrier Reef Marine Park (McCook et al. 2010). Whilst effective in the delivery of biodiversity outcomes (Lester et al. 2009; Sala and Giakoumi 2018), exclusively non-extractive MPAs prohibit fishing activities within their boundaries and thus present a socio-economic challenge where extractive marine resource dependence is high in countries such as Indonesia (White et al. 2014).

There are many zone types that can be implemented by governments and communities. These range from highly restricted zones where entry is only granted by permits for very limited non-extractive activities (e.g. strict conservation zones in Blue Bay Marine Park, Mauritius (UNDP/GEF 2012) to regulated industrial or recreational fishing zones (e.g. general use zones in the Great Barrier Reef Marine Park/GBRMPA 2003). In simple terms, where zoning is used to address biodiversity threats from fishing or harvesting, MPA zones can be grouped into two overarching groups: the no-take/non-extractive zone (where extractive activities are prohibited) and the Use Zone (where all other maritime activities occur with varying degrees of regulation). When zoning an MPA, consideration must be given to the spatial distribution of biodiversity within the MPA, threats, and impacts to biodiversity from different human activities, as well as community food security, livelihoods, and cultural identity. Costs and feasibility are additional considerations. Zonation – especially when restricting access to resources – should be conducted following the principle of free, prior, and informed consent to achieve equitable outcomes for biodiversity and local peoples (FAO 2014).

6.2 Approach to Zonation

It is a complex and lengthy process to design MPA zoning plans, but this step is an important precursor for successful management. Zoning plans should have clearly defined objectives. In Indonesia, the two government ministries that oversee management implementation have similar objectives in terms of maintaining biodiversity, but the Ministry of Marine Affairs and Fisheries (MMAF) has an additional focus on managing fisheries sustainably. These objectives help determine the different zone types and what activities are allowed. Best practice principles can help guide the placement of MPA zoning plans to ensure biodiversity objectives are achieved; for example, the CARE (Connected, Adequate, Representative, Efficient) principles (Moilanen, Wilson, and Possingham 2009):

- **CONNECTED**: recognizing that all features of the conservation system are interconnected. This can be in terms of areas acting as sources or sinks of fish and coral larvae or mangrove and seagrass propagules, or that different habitats play a role in the ontogenetic habitat shifts (the movement of an organism between habitats at different life stages).

- **ADEQUATE**: ensuring that sufficient amounts of habitat and species (achieved by setting a minimum target amount) are protected in order to maximize their persistence through time.

- **REPRESENTATIVE**: protecting an adequate amount of the full range of different habitats and species present in the area (i.e. ensuring representation of all facets of biodiversity).

- **EFFICIENT**: a plan that meets conservation objectives (i.e. connected, adequate, representative) while avoiding conflicts with local livelihoods. Planners should work with local communities during planning to avoid conflicts between areas that are important for community use or cultural value and conservation.

Operationalizing these principles to develop robust planning processes that include stakeholders can be complex. Thus, there are several common decision support tools that can be used to facilitate transparent spatial planning. These tools include the conservation planning software Marxan (https://marxansolutions.org) and Zonation (Di Minin et al. 2014), which help to identify locations for single zones, such as a conservation zone. However, more advanced planning tools also exist, such as Marxan with Zones (Watts et al. 2009), which can facilitate multi-objective spatial planning and accommodate planning for multiple zones simultaneously. These tools have been used to plan MPA networks in Indonesia (i.e., Raja Ampat; Grantham et al. 2013) and the broader Coral Triangle (Beger et al. 2015).

6.3 MPA Types and Zoning in Indonesia

In Indonesia, MPA management has dual objectives: supporting (i) biodiversity conservation and (ii) the sustainable management of traditional and small-scale fisheries. Excluding large industrial fishing fleets is a primary task for meeting both these objectives, with all vessels >10 GT prohibited from fishing within MPA boundaries in Indonesia. Furthermore, management in Indonesia also aims to facilitate other sustainable uses such as responsible tourism (Chapter 8). Consequently, both ministries that implement and manage MPAs in Indonesia – MMAF and the Ministry of Environment and Forestry (MoEF) – manage multi-use MPAs with zoning systems with different approaches.

6.3.1 MMAF

According to Indonesia's Laws (UU RI No. 27/2007 juncto No. 1/2014a), *"The zoning system is a form of spatial use engineering through the establishment of functional boundaries following the potential of resources, carrying capacity, and ecological processes in a coastal ecosystem."* MMAF manages three categories of MPAs: Marine, Coasts, and Small Islands Conservation Areas (*Kawasan Konservasi Pesisir dan Pulau-Pulau Kecil*/KKP3K); Maritime Conservation Areas (*Kawasan Konservasi Maritim*/KKM); and Marine Conservation Areas (*Kawasan Konservasi Perairan*/KKP). Under each MPA category are several types of MPAs (Chapter 1). In regards to zoning, KKP3K and KKM MPAs have three zone types: Core Zone (*Zona Inti*), Limited-Use Zone (*Zona Pemanfaatan Terbatas*), and Other Zone (*Zona Lainnya*) (Permen KP No.17/2008). For KKP3K and KKM MPAs, the activities allowed within the Limited-Use Zone can include varying combinations of fishing, aquaculture, and tourism. KKP MPAs have four zone types: Core Zone (*Zona Inti*), Sustainable Fisheries Zone (*Zona Perikanan Berkelanjutan*), Use Zone (*Zona Pemanfaatan*), and Other Zone (*Zona Lainnya*) (PP RI No. 60/2007). Information on the objectives and regulations in specific zones of MMAF MPAs is detailed in Table 6.1.

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Table 6.1. Zonation types and objectives for MMAF regulated MPAs.

Objective	KKP Zone Types				KKP3K and KKM Zone Types		
	Core	Sustain-able fisheries	Use	Other	Core	Limited use	Other
(Absolute) protection of fish habitats and populations	(x)		x		(x)	x	
Protection of unique and/ or vulnerable coastal ecosystems					x		
Protection of traditional cultural sites					x		
Research (and development)	x		(x)		x	x	
Education	x		x		x	x	
Sustainable fishing activities		x				x	
Sustainable aquaculture		x				x	
Tourism and recreation		x	x			x	
Habitat rehabilitation				x			x

Note: Activities shown for KKP MPAs following (PP RI No. 60/2007), and for KKP3K and KKM MPAs following Article 35, (Permen KP No. 17/2008). Parentheses on check marks '(x)' reflect aspects of the objectives that are also in parentheses, to distinguish flexibility within levels of protection for each zone type. One such example is the fourth objective: (development) would be included for the Use zone, as evidenced by (x).

The Core Zone is designated for absolute protection of fish habitats and populations, for research, and education. The Sustainable Fisheries Zone/Subzone is intended for traditional fishing activities (to meet daily basic needs), and/or small-scale fisheries with a maximum size of fishing vessels not exceeding 10 GT. The use of traditional fishing gears, including lift nets, gillnets, traps, fishing lines, and clamping and wounding tools, are allowed in the Sustainable Fisheries Zone (Article 5, Permen KP No. 47/2016) subject to local MPA-specific regulations. Limited impact aquaculture (e.g. seaweed farming) can also occur within the Sustainable Fisheries Zone. In MMAF MPAs, the Use Zone (KKP) and in some cases the Limited-Use Zone (KKP3K and KKM) is intended for the protection and preservation of fish habitats and populations, tourism and recreation (without extraction), research and development, and education. The Other Zone is a zone with a defined separate purpose (e.g. habitat rehabilitation) and may have variable protection levels (Permen KP No. 17/2008; PP RI No. 60/2007). Zone types can be designated accordingly based on physical characteristics, bioecology, and socioeconomic factors such as sacred/ cultural areas or shipping needs. MPAs under MMAF authority require a minimum of 2% of their total area to be allocated as a Core Zone. In reality, the Core Zone area is often greater, which when combined with the non-extractive tourism focus Limited-Use Zone (KKP3K or KKM) or Use Zone (KKP) substantially increases the non-extractive area within MPAs.

6.3.2 MoEF

MoEF has issued regulations on zoning criteria for the management of their MPAs (Permen Hut No. P.56/Menhut-II/2006; Permen LHK No. P.76/Menlhk-Setjen/2015). MoEF MPAs are grouped into two types: (i) Nature Reserve Areas (*Kawasan Suaka Alam*/KSA) which includes nature reserves and wildlife reserves, and (ii) Nature Conservation Areas (*Kawasan Pelestarian Alam*/KPA) which includes national parks, nature recreational parks, and grand forest parks. The overall objective of KSA/KPA areas is to preserve the contribution of wild plants and animals in order to prevent the extinction of species, protect life support systems, and utilize biodiversity (PP RI No. 28/2011). By definition and function, KSAs and KPAs are almost identical, but a KPA has an additional function where natural resources can be extracted by sustainable and environmentally-friendly methods. For the zoning system, MoEF has two different name systems: national parks use the terminology “Zone”, whereas all other KSA/KPA areas use “Block”. All MoEF protected areas can contain a Use Zone/Block (*Zona Pemanfaatan*), Marine Protected Zone/Block (*Zona Perlindungan Bahari*), Traditional Zone/Block (*Zona Tradisional*), Rehabilitation Zone/Block (*Zona Rehabilitasi*), Religious, Cultural, and Historical Zone/Block (*Zona Religi, Budaya, dan Sejarah*), and Special Zone/Block (*Zona Khusus*); national parks additionally have a Core Zone (*Zona Inti*) and a Wilderness Zone (*Zona Rimba*). Further information on the objectives and regulations in specific zones of MoEF MPAs is detailed in Table 6.2.

Table 6.2. Zonation types and objectives for MoEF regulated MPAs.

Objectives	Zone							
			Block					
	Core	Wilderness	Use	Protected (marine)	Traditional	Rehabilitation	Religious, cultural, and historical	Special
Protection and security*	x	x	x	x	x	x	x	x
Inventory and monitoring of natural resources	x	x	x	x	x	x	x	x
Supporting habitats and populations to maintain wildlife (or marine biota) populations	x	x	x	(x)	x			
Scientific research and development	x	x	x	x	x	x	x	x
Education and raising awareness for nature conservation	x	x	x				x	
Utilization of genetic resources and germplasm to support cultivation	x	x	x	x	x	x	x	x
Limited nature tourism		x		x	x	x	x	

Carbon storage and/or sequestration	x	x	x	x				
Development of (limited) infrastructure for nature tourism, research, and education		(x)	x	(x)	(x)		(x)	
Enabling nature tourism, carbon storage and/or absorption, water storage, or water, heat, and wind energy			x					
Ecosystem recovery (rehabilitation and/ or restoration)			x			x	x	(x)
Traditional usage of natural resources					x			
Absorption and storage of carbon environmental services						x		
Release and/or reintroduction of native species						x		
Organizing cultural, traditional, and/or religious ceremonies							x	
Maintenance of religious, cultural, and/or historical sites							x	
Limited construction of management facilities, and infrastructure to support activities within zone/block	x	x	x	x	x	x		
Construction and maintenance infrastructure for telecommunications, electrical facilities, transportation, defence and security facilities and others that are strategic and unavoidable								x

Note: Parentheses on check marks '(x)' reflect aspects of the objectives that are also in parentheses, to account for protected area objectives with a terrestrial focus, mostly under MoEF. One such example is the third objective: (marine biota) would be included for the Protected (marine) zone, as evidenced by (x). Asterisk (*) means that this objective is more relevant to the terrestrial protected areas because it intends to (1) prevent and limit the destruction of forests, forest areas, and forest products, (2) protect the rights of the right holders for forest management, and (3) protect the forest and its functions (Article 5, (PP RI No. 45/2004).

There are no minimum Core Zone size requirements for MPAs under MoEF authority, but non-extractive MoEF areas also include the Wilderness, Protected (marine) and Rehabilitation Zones/Blocks. Sustainable fishing is not specified as an objective of MoEF MPAs nationally, though it can be allowed in the Use Zone/Block, e.g. in the case of TNL (*Taman Nasional Laut*; Marine National Park) Wakatobi, and in the Traditional Zone/Block, with decisions made at the MPA level. The objectives of MoEF zones/blocks give greater emphasis to carbon storage and renewable energy than MMAF MPA zones.

6.4 Designation of MPA Zonation

So how does an MPA in Indonesia proceed from defining an outer boundary to having multiple recognized internal zones? For MMAF MPAs, the first step following MPA initiation is to formally define the outer boundaries (under the jurisdiction of the regency governments prior to 2014, and provincial governments after 2014, following the changes of management authority based on UU RI No. 23/2014). The outer boundaries of the proposed MPAs, along with outer boundaries of initiated MPAs and established MPAs, need to be integrated within the provincial Zoning Plan for Coastal Areas and Small Islands (*Rencana Zonasi Wilayah Pesisir dan Pulau-pulau Kecil*/RZWP3K). The RZWP3K is a formal and legal document for marine spatial planning implementation in each province in Indonesia. Defining outer boundaries of an MPA typically takes 2–4 years and proposed outer boundaries can undergo multiple revisions during this time (e.g. changes to overall MPA area and locations included). Outer boundary establishment is guided by a working group led by the provincial government that can also include partner non-governmental agencies.

Ecological and socioeconomic surveys are required to be conducted within the MPA to identify the potential conservation targets/priorities of the MPA, which is crucial to assist the formal initiation of an MPA and to help inform zoning plan development (Green et al. 2020). These surveys include mapping the biodiversity and habitat conditions, exact boundaries of any customary managed areas, or areas with other purposes (e.g. tourism, fisheries, aquaculture) located within the MPA. Zone allocations are developed by the working group based on ministerial regulations and the MPA's agreed objectives. Objectives can vary between MPAs, but commonly each MPA manager will find the balance between protecting coastal marine habitats and particularly vulnerable or unique biodiversity, and the needs and desires of local communities for tourism-focused, fisheries-focused, or cultural (to recognize customary management) zones.

Once the working group has initial zoning plans, the plans undergo a series of public consultations to obtain input, responses, and suggestions, often facilitated by partners within the working group who have relations with local communities. As per Management Effectiveness of Aquatic, Coasts and Small Islands Conservation Areas (*Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*/E-KKP3K) guidelines (KKJI 2012), the first consultations should be in the form of focus group discussions in communities throughout the affected area and should avoid an imbalance of power relations, meaning they are conducted for groups of participants from the same background within each community. Following this initial consultation, the zoning plans will be revised based on the received input. The E-KKP3K guidelines then require at a minimum a second round of focus group consultations to ensure changes to plans are acceptable to all parties. Further rounds of changes followed by consultation may be necessary if there are still concerns expressed. Sub-districts adjacent to proposed Core Zone receive particular focus during the consultation process, with more public consultations and greater influence on zoning plan adjustments. Social, economic, and political factors, as well as priority biodiversity areas identified by the working group and concerns expressed by local communities, have a large influence on where Core Zones are ultimately implemented. Once plans are ready, the working group formalizes the zoning plans with the provincial government into the MPA Management Plan document. See Case Study 6.A for an example of the implementation of MPA zoning in TNP (*Taman Nasional Perairan;* Aquatic National Park) Laut Sawu.

Case Study 6.A
Zoning Implementation in TNP Laut Sawu, Nusa Tenggara Timur

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In 2001, MMAF, under the coordination of the National Marine Protected Areas Office (*Balai Kawasan Konservasi Perairan Nasional*/BKKPN) in Kupang carried out a feasibility analysis for the TNP (*Taman Nasional Perairan;* Aquatic National Park) Laut Sawu that led to the decision to develop a network of MPAs. In 2005, MMAF and partners began designing TNP Laut Sawu as part of the Resilience MPA Network Design in the Lesser Sunda Ecoregion (Wilson et al. 2011) by considering connectivity, adequacy, representation, and efficiency factors.

In 2006, a working group was initiated to develop TNP Laut Sawu's management and zoning plans. A team was then established by the Governor of Nusa Tenggara Timur in 2009 as the "Savu Sea Marine Conservation Area Assessment and Determination and Management Team" (*Pengkajian Penetapan dan Perencanaan Pengelolaan Kawasan Konservasi Perairan*/P4KKP). P4KKP recommended the Savu Sea for Reserved Status as an MPA, which was endorsed by the Nusa Tenggara Timur Governor Ordinance in 2009 (Surat Gubernur Nusa Tenggara Timur No. 6K.523/199/IV/2009). Through the process of developing the Conservation Action Plan (a strategic planning tool used by some NGOs), the team identified conservation targets for TNP Laut Sawu that incorporated: 1) coral reefs, associated ecosystems (mangrove forests, seagrass beds) and species (targeted fish, turtles, dugongs); 2) cetaceans and pelagic fish; and 3) human welfare. During the World Ocean Conference in Manado, TNP Laut Sawu (covering 3.52 million ha) was formally initiated through Kepmen KP No. Kep.38/MEN/2009.

In preparation for MPA establishment, scientific surveys were conducted in TNP Laut Sawu to consider key biodiversity, social, economy, and cultural features, and their main threats. The analysis was used to inform management actions such as the finalization of the zoning plan, and the identification of priority areas and patrolling seasons. Public consultations on TNP Laut Sawu's zoning plan were conducted with regional apparatus working units (*Satuan Kerja Perangkat Daerah*/SKPD) in ten districts during 2010 and 2011, followed by public consultations with local communities in 137 villages and subdistricts within TNP Laut Sawu during 2011–2013. Marxan was used to analyze spatial data on the distribution of conservation targets, cost layers, and assigned goals. TNP Laut Sawu's zoning emphasized the safeguarding of migratory and resident marine mammals.

In 2013, the working group and local partners consulted with MMAF regarding plans to incorporate the Indonesia Archipelagic Sea Lane in TNP Laut Sawu. To avoid the shipping lane overlapping with the MPA, MMAF decided to remove certain areas, reducing the MPA to 3.35 million ha. In January 2014, TNP Laut Sawu was established through Kepmen KP No. 5/Kepmen-KP/2014a, and the management plan document was formalized through Kepmen KP No. 6/Kepmen-KP/2014b.

Lessons learned over the long process of TNP Laut Sawu establishment revealed that 1) a collaborative approach is key to designing management that provides important benefits in supporting development programs; 2) community involvement and public consultation throughout planning, reviewing, and data collection during preparation of zoning and management plans is essential to gain input, agreement, and compliance; 3) local cultural approaches should be recognized and implemented in plans where possible; 4) local leaders and facilitators should be engaged; and 5) zoning and management plans should be aligned with spatial planning documents and policies at national, provincial, and district levels.

MPAs under MMAF have to be formally established by the Minister (UU RI No. 45/2009; UU RI No. 01/2014). Documents related to Permen KP No. PER.02/MEN/2009 and Permen KP No. PER.17/MEN/2008 will first undergo an administrative completion check by the national MMAF office in Jakarta: does a (regency, provincial, or national) decree for the MPA already exist, has the management unit been established and is it operational, and has the MPA management plan document been approved by the head of the district? Once the administrative checks are complete, the provincial government submits the initiated MPA designation, along with its long-term management plan that includes the zoning system, to the Minister of MMAF, who ultimately approves or rejects the MPA.

MoEF MPAs follow a very similar process to MMAF MPAs. MoEF management plans, which include zoning plans, follow law Peraturan Dirjen KSDAE No. P.14/KSDAE/SET/KSA.1/12/2017 and are developed by a working group. The working group sets the management objectives, followed by formulating the Strategies and Action Plans and preparing the monitoring and evaluation plan. At this point, MoEF undertakes public consultations with local stakeholders and finally prepares the Management Plan documents with the management zone/block. Following administrative checks, the evaluation of the management plan and management zone/block documents is governed by the Director General's regulations. Ultimately, the Director General produces an approval decree once the documents meet the assessment elements. MPAs are required by both MMAF and MoEF regulations to have a management unit to implement the MPA, including to cover enforcement and routine resource use monitoring activities inside MPAs.

6.5 Implementation of MPA Zoning

Indonesian MPAs must develop a management plan that includes a zoning plan as part of their development. For MMAF MPAs, the completion of a zoning plan is required to reach "conservation area established", (Yellow level) status under MMAF's MPA management effectiveness tracker tool (Chapter 5). As of 2019, MMAF regulates 166 MPAs, of which 33 have a decree for zoning management plans (Kementerian Kelautan dan Perikanan Republik Indonesia 2019). Meanwhile, MoEF regulates 30 MPAs, and 17 of these have established zones.

An overview of 2019 MPA zoning in Indonesia (both MMAF and MoEF MPAs) is provided in Figure 6.1. Zoning data from all MMAF MPAs (33 MPAs) and nine out of 17 MoEF MPAs that have accessible online spatial zoning information were used in this analysis. For MMAF MPAs that have zones, the Core Zone size of MPAs is on average 3.3%, which is higher than the minimum 2% of Core Zones required by MMAF regulation (Permen KP No. PER.30/MEN/2010). Overall, MMAF MPA non-extractive zone includes Core Zones, Tourism Zones, and Other Zones with no extractive activities except for research; these reached an average of around 11% across all MPAs. Sustainable Fisheries Zones have the highest average percentage coverage (i.e. 76.5%) and these areas are intended to support the local communities' needs in utilizing marine resources. To ensure fisheries implementation within MPAs applies the sustainability principles, MPA managers need to strictly apply the Fisheries Management Area's (*Wilayah Pengelolaan Perikanan*/WPP) fisheries utilization strategy (*strategi pemanfaatan*

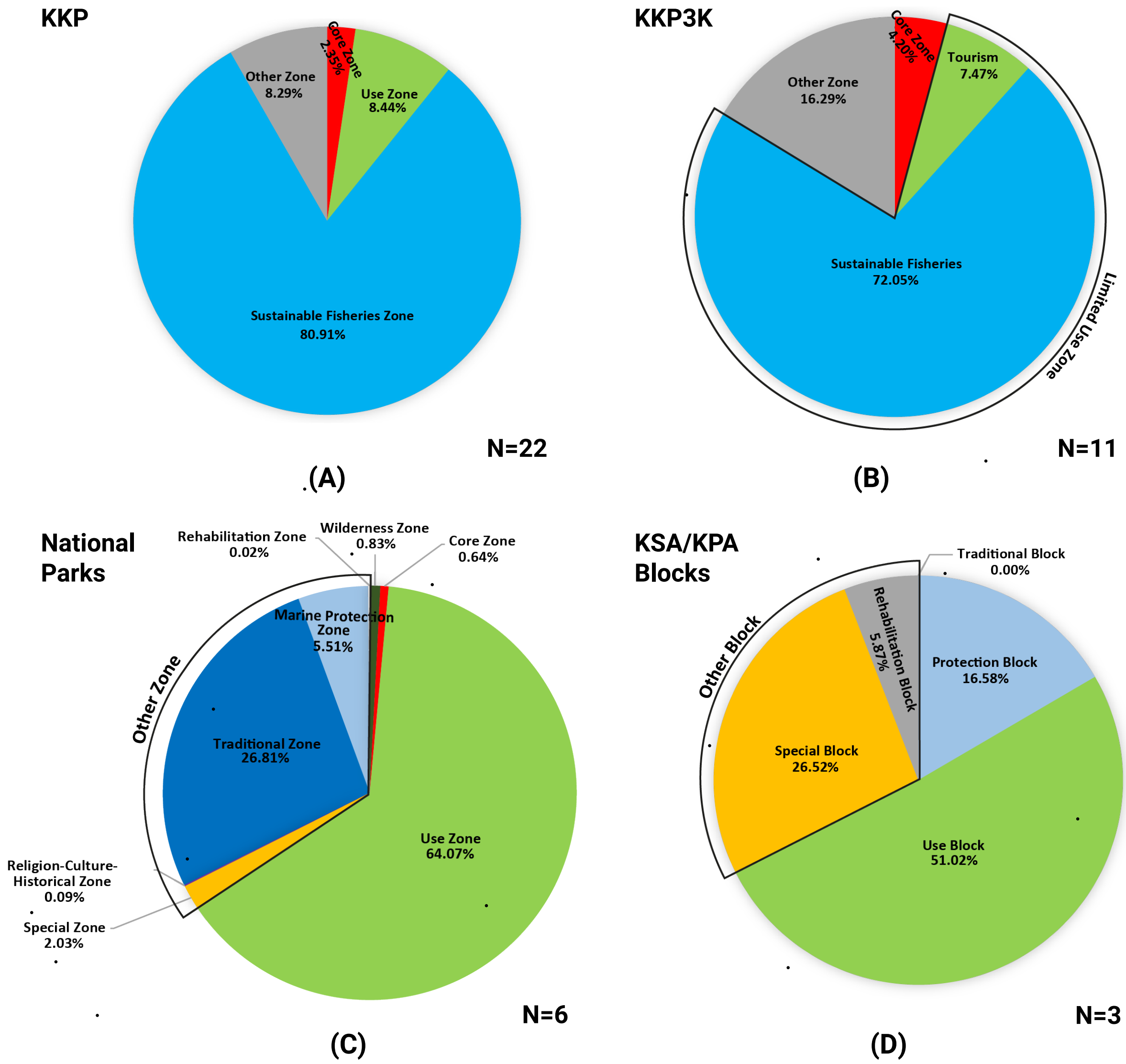

Figure 6.1. Proportion of zoning within MMAF (A) KKP (*Kawasan Konservasi Perairan*; Aquatic Conservation Area) MPAs, (B) KKP3K (*Kawasan Konservasi Pesisir dan Pulau-Pulau Kecil*; Coast and Small Islands Conservation Area) MPAs, and MoEF (C) TN (*Taman Nasional*; National Park) (as zones) and (D) KSA/KPA (*Kawasan Suaka Alam/Kawasan Pelestarian Alam*; Sanctuary Reserve Area/Nature Conservation Area) (as blocks). National parks and nature reserves under MoEF included are those that have marine ecosystems within their area. Area=Projection from WGS1984 World Mercator. MPAs included in each grouping: (A) TWP Pulau Pieh, TWP Kepulauan Anambas, TWP Gili Matra, TNP Laut Sawu, TWP Kapoposang, SAP Kepulauan Aru Tenggara, TWP Taman Laut Banda, TWP Padaido, SAP Kepulauan Raja Ampat, SAP Kepulauan Waigeo Sebelah Barat, TWP Raja Ampat, SAP Pesisir Timur Pulau Weh, SAP Selat Pantar, TWP Gili Sulat Lawang, TWP Gita Nada, TWP Momparang, TWP Sawo Lahewa, TWP Nusa Penida, TWP Selat Bunga Laut, TWP Kotawaringin Barat, TWP Teluk Kiluan, and TWP Kaimana; (B) KKM HMAS Perth, KKM Teluk Benoa, TP dan TPK Kepulauan Derawan, TP Pantai Penyu Pangumbahan, TPK Kei Kecil, TP dan TPK Banggai Dalaka, KKPD Doboto, TP Jeen Womom, KKPD Teluk Tomini, TP Ujungnegoro Roban, and KKPD Morowali; (C) TNL Bunaken, TNL Karimun Jawa, TNL Kepulauan Seribu, TNL Taka Bone Rate, TNL Teluk Cendrawasih, TNL Wakatobi; and (D) TL Pulau Weh Sabang, TWA Teluk Lasolo, TWAL Padamarang. Besides these, there are eight MoEF MPAs that have management and zoning plans but were not included in the analysis due to inaccessibility of the spatial data: TL Pulau Samama Sangalaki, TWAL Teluk Maumere, TWA Pulau Sangiang, TWA Tujuh Belas Pulau, TWA Kepulauan Banyak, TWA Pulau Satonda, CAL Pananjung Pangandaran, and SM Pulau Rambut dan Perairan.

perikanan) that regulates the allowable fish catch, fishing gears, and fishing vessels, especially within their MPAs.

For MoEF MPAs, the Core Zone and Wilderness Zone, which are only established within national parks, are on average 1.5%. The Use Zone/Block has the highest average coverage for all MoEF MPAs, with an average of 57.5%. The Use Zone/Block is commonly allocated in areas that have natural beauty or have cultural/historical values with good accessibility and therefore is often used for nature tourism activities.

The implementation of zoning systems in MPAs of Indonesia is in theory adaptive and flexible, and changes can be made following thorough reviews of performance and needs in the field, conforming with the concept of adaptive management (Walters 1986). Long-term plans for MPA management are valid for 20 years from the date of establishment and can be reviewed at least every five years. In practice, however, MPAs are often rezoned more frequently than this. Zonation reviews are conducted at least every five years in both MMAF and MoEF MPAs. If biodiversity outcomes, resource access, or use concerns are raised, these reviews can lead to rezonation. For example, TNL Wakatobi was initially zoned in 2002 and was rezoned in 2007 (Adimu et al. 2018), while TNL Karimun Jawa was zoned in 1999 and rezoned in 2005 and 2012 (Case Study 6.B). An evaluation tool provided by Green et al. (2019) can be used to refine the zoning plan for adaptive management.

Case Study 6.B
Rezonation of TNL Karimun Jawa (1999–2016), Jawa Tengah

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While the number of MPAs in Indonesia has increased threefold in the last decade, there are less than 30% of MPAs in Indonesia that have a zoning system in place. Zoned MPAs are important to allocate rights and responsibilities for use and entry to areas as well as to minimize conflicts between incompatible uses (Agardy 2010). In a rapidly changing world, regular evaluation of the effectiveness of a zoning system within an MPA needs to be done so the MPA can continuously meet its objectives.

TNL (*Taman Nasional Laut;* Marine National Park) Karimun Jawa, located in the northern part of Jepara, Central Java, is considered by many as one of Indonesia's better working examples of MPA rezonation. TNL Karimun Jawa was established in 1999 with a total size of 111,625 ha and covers 22 islands. Zoning has become a key component in managing TNL Karimun Jawa by allocating specific areas for biodiversity conservation and sustainable marine resource use for communities living within the national park. Over the last two decades, TNL Karimun Jawa has undergone the rezonation process twice, in 2005 and 2012 (Table 6.B.1), including additional new zones and an increase in non-extractive area size; however, the extent of TNL Karimun Jawa remained the same. These changes were mainly due to the diversification of stakeholders' needs for implementation. For example, an increased number of tourists visiting TNL Karimun Jawa has created a source of economic income for coastal communities. Therefore, to avoid a high concentration of tourism in some sites, the tourism partners proposed to increase the size of the Marine Tourism Zone. Thus, this has increased the proportion of non-extractive areas within TNL Karimun Jawa.

Table 6.B.1. Changes in zones in TNL Karimun Jawa (1999, 2005, and 2012).

Zones	Zones in 1999		Zones in 2005		Zones in 2012	
	Size (ha)	Percent-age (%)	Size (ha)	Percent-age (%)	Size (ha)	Percent-age (%)
Core	-	-	445	<1	445	<1
Wilderness	-	-	-	-	1,452	1.3
Marine protected	-	-	2,588	2.3	2,600	2.3
Land use	-	-	-	-	56	<1
Marine tourism	-	-	1,227	1.1	2,734	2.5
Marine aquaculture	-	-	788	<1	1,371	1.2
Religious, cultural and historical	-	-	-	-	<1	<1
Rehabilitation	-	-	123	<1	68	<1
Traditional fishing	-	-	103,884	93	102,899	92.2
Settlements	-	-	2,572	2.3	-	
Terrestrial Land Pulau Karimun Jawa	1,286	1.1				
Terrestrial Land Pulau Kemujan	222	<1				
Marine areas	110,117	98.6				
Total	**111,625**		**111,625**		**111,625**	

Sources: SK Menhutbun No. 78/Kpts-II/1999; SK Dirjen PHKA No. 79/IV/Set-3/2005, SK Dirjen PHKA No. 28/IV-SET/2012.

In each rezonation process, TNL Karimun Jawa managers followed a series of steps: (1) evaluate the existing zoning system, (2) carry on ecological and social studies to identify the new zoning system, (3) develop a draft of a revised zoning plan, (4) carry out public consultation, (5) conduct revision/modification of proposed zoning based on public consultation results, if necessary, and (6) legalize the zoning revision in the management plan (Sulisyati, Prihatinningsih, and Mulyadi 2019). The rezonation process took 1-2 years and directly involved several partners (academics, NGOs, the private sector, and community representatives) in each step as part of the co-management mechanism.

In order for an MPA to achieve its intended goals, MPA managers should apply adaptive management in order to accommodate changes and needs within their MPA. Although rezonation is part of adaptive management, the rezonation process can also be seen as a way to increase communities' and partners' awareness and involvement in MPA management. In TNL Karimun Jawa, more than half of Karimun Jawa communities have a high or very high knowledge level (50%) and obedience level (70%) to the new zonation system (Wibowo, Aditomo, and Prihantoko 2018), although social conflicts over marine resources are still high (Yuliana et al. 2016). The benefits of rezonation within an MPA should also be tracked regularly to ensure that the new zoning plan can continuously support MPA objectives.

6.6 Challenges and Opportunities

The number of MPAs with approved, well-designed zoning plans that incorporate local stakeholder input should be increased over the next decade. Currently, only 50 out of 196 regulated MPAs in Indonesia contain zones, and many of these MPAs are not new. There are common challenges for the implementation of MPAs and MPA zoning systems which are not limited to MPAs in Indonesia and are applicable to MPAs worldwide. These challenges include but are not limited to inadequate funding and lack of management capacity. Some provincial governments can overcome these challenges by strengthening and improving the co-management system with key stakeholders, including other government offices, academics, NGOs, and the private sector, to facilitate in filling the gaps needed for designing and implementing MPA zoning plans.

Of the 50 MPAs that have zones in Indonesia, the Core Zone is currently limited to <4% of the total MPA area (non-extractive area in MMAF MPAs increases to 11% when including the non-extractive Tourism/Use Zones), as per the data we present (Figure 6.1). Though exceeding minimum recommendations in Indonesia, these Core Zone sizes deem it challenging to achieve sufficient habitat and species protection, particularly within small MPAs. In 2014, the IUCN World Parks Congress recommended 20–30% of the oceans to be designated non-extractive areas by 2030 (Resolution 50, IUCN 2016; O'Leary et al. 2016). These numbers reveal a large gap between global targets and current management in Indonesia, the wider Coral Triangle Region (White et al. 2014), and the rest of the world (i.e. only 2% of the ocean is strongly or fully protected – Sala et al. 2018). Importantly, in coastal areas with high resource dependence, these large-scale targets are unlikely to be *"subject to the rights of indigenous peoples and local communities"* as the IUCN motion calls for. One key issue is the assumption that non-extractive areas remove fishing grounds and reduce income generation. However, studies commonly have demonstrated that their long-term value offsets short-term losses, highlighting the importance of MPA outreach and education (Brown, Abdullah, and Mumby 2015; Leisher et al. 2012; Sala et al. 2016).

Ensuring the protection of irreplaceable sites is one critical consideration during the development of MPA zoning plans. The chance of success can be increased by selecting priority areas based on the presence of coastal marine habitats and endangered, threatened, and protected species, protecting up to 30% of fished habitats depending on local levels of overfishing (Krueck, Ahmadia, Possingham, et al. 2017), and applying non-extractive zones of at least 1–20 km^2 in size depending on the scale of home range movements of local fishery target species (Krueck et al. 2018). In Indonesia, currently 25–38% of coastal marine habitats (coral reefs, mangrove forests, seagrass beds) lie within MPA outer boundaries (Chapter 3), in theory meeting these recommendations, though the level of effective protection is likely much lower (White et al. 2014).

Enforcing regulations within different MPA zones is challenging. Enforcing non-extractive restrictions in the Core Zone is dependent on sufficient human and financial capacity and is difficult given the financial incentives for illegal gains, e.g. in TN (*Taman Nasional*; National Park) Komodo (Mangubhai et al. 2011). However, enforcing non-extractive regulations in Other Zone (for example in the Tourism Zone) and ensuring conformation with fishing regulations in Sustainable Fisheries Zone pose an even greater challenge. One main driver of weak compliance with zoning plans, in addition to low penalties and enforcement capacity, may be insufficient communication about the functions and benefits of MPA zones (Yuliana et al. 2016), resulting in weak support from local communities.

With the high dependency of local communities on marine resources, most MPAs in Indonesia have dual objectives, i.e.

biodiversity conservation and sustainable fisheries. These objectives are intended to protect areas with high conservation value so that they can deliver fisheries outcomes to nearby areas through larval connectivity and fish spill-over mechanisms, so that the local communities living within and outside MPAs can enjoy higher fish biomass and fish catch (Estradivari et al. 2017; Krueck, Ahmadia, Green, et al. 2017). Good MPA zoning designation and implementation are some of the critical components to achieve these objectives. Krueck, Ahmadia, Green, et al. (2017) suggests that 20–30% non-extractive reserve coverage of fished habitat could serve as a generic target for rebuilding depleted fisheries while at the same time minimizing potentially negative impacts on more productive fisheries. The fact that only one quarter of MPAs in Indonesia have zones, and of these, the average of non-extractive zone, i.e. zones where fishing are not allowed, within MPAs is less than 11%, demonstrates it is crucial for the Government of Indonesia to further designate zones and expand the size of non-extractive zone in order to improve both biodiversity protection and the fisheries potential of MPAs. In 2019, both MMAF and MoEF also agreed to have a joint National Plan of Actions on Integrated Management (*Rencana Aksi Nasional Pengelolaan Terpadu*) between national parks and national MPAs (2018 – 2025) (Perpres RI No. 56/2019). One of the key components of the plan is to promote and standardize sustainable fisheries management within MPAs. With this joint plan, both MMAF and MoEF can improve the zoning system of existing MPAs and designate the zoning system for new MPAs, as well as apply the standard fisheries management in their MPAs for the coming decade.

Being wary of the power dynamics in the MPA zoning planning process is an important consideration for management over the next ten years. Sufficient involvement of local stakeholders (with the representation of different groups) affected by zoning regulations is a challenge for developing MPA zoning plans. Focusing on ecological data alone for zoning plans is insufficient because establishing non-extractive zones in areas that represent important fishing grounds to local fishers will likely cause conflict and low levels of compliance, particularly if local stakeholders are not involved in planning. While the E-KKP3K guidelines provide a good framework from which public consultations can be conducted, in practice this component often falls short of the desired targets. Effectiveness and successful implementation of MPA zoning plans improve with elevated integration of local stakeholders (Krueck et al. 2019; Kusumawati and Huang 2015). Focus groups and individual consultations should allow local resource owners to remain central in decision-making processes and revising and adjusting zoning plans accordingly can facilitate the fair and equitable distribution of costs and benefits between affected communities (Mangubhai et al. 2015). Furthermore, investments in MPA education and outreach have been shown to improve attitudes towards MPA regulations in such a way that can contribute to compliance (Leisher et al. 2012).

MPAs in Raja Ampat provide examples of where pre-existing zoning proposals, shaped by negotiations with local communities, can be integrated into systematic planning (Grantham et al. 2013; Mangubhai et al. 2015). Zoning plans for over one million ha of MPAs underwent multiple revisions during public consultations, generating a strong feeling of ownership of the plans among local stakeholders. Furthermore, efforts were made to incorporate traditional management forms and to include all community groups (e.g. women, youth, religious leaders) to ensure maximum compliance with the final plan (Mangubhai et al. 2015). The MPA implementation process can thus be optimized by increasing the number of public consultations in subdistricts (in settings conducive to negotiations) until a point at which local stakeholders agree and commit to the management plans. Optimally, the process of designing MPAs should be viewed as a value-based process, where the objectives are determined by stakeholder values, informed by science, and operationalized in an inclusive, structured, and transparent process (Margules and Pressey 2000).

In summary, only 50 out of 196 MPAs in Indonesia have zoning plans, and many MPAs are still in the process of development. These plans should consider how to increase the amount of area that prohibits extraction while complying with the needs and wishes of local communities. Increasing the size of non-extractive areas and optimizing their placement, while also considering habitat quality, local threats to species, as well as the needs of local stakeholders, is expected to improve MPA performance for both biodiversity conservation and fisheries management. Amongst others, this can be achieved by facilitating higher amounts of spill-over to nearby fishing grounds Krueck, Ahmadia, Green, et al. 2017. Ultimately, in addition to their known benefits for habitat and species protection, the long-term value of non-extractive zone offsets short-term losses for fishers (Brown et al. 2015; Sala et al. 2016).

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Chapter 7. Fisheries and Marine Protected Areas

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Abstract

An important objective to be considered in designing a Marine Protected Area (MPA) is to ensure that MPAs provide sustainable benefits to the community from fishery resources. It should also be known that MPAs can provide fisheries stock to surrounding area through the spill-over of larvae. The current total area of MPAs in Indonesia covers only 3.64% of the total area of Fisheries Management Areas (FMAs), despite the former currently protecting 44% of coral reef cover located in FMAs. However, lack of data on fisheries stock and catch effort in MPAs is one of the challenges to be addressed for providing proof of MPA benefits. Nevertheless, there are examples of the benefits of developing MPAs for fisheries such as in SAP Selat Pantar and TWP Kepulauan Anambas. This chapter discusses the role of MPAs for sustainable fisheries, as well as the relationship between MPAs and FMAs, fisheries regulations in MPAs, and fisheries management by local communities.

Abstrak

Salah satu tujuan penting yang perlu dipertimbangkan ketika merancang Kawasan Konservasi Perairan (KKP) adalah memastikan sumber daya perikanan mampu memberikan manfaat berkelanjutan bagi masyarakat. KKP juga mampu menyediakan stok perikanan bagi daerah sekitarnya melalui penyebaran larva dari dalam KKP. Total luasan KKP di Indonesia saat ini baru mencakup 3,64% dari total luas Wilayah Pengelolaan Perikanan (WPP), meskipun demikian, KKP telah melindungi 44% terumbu karang Indonesia di dalam WPP. Terbatasnya data mengenai stok perikanan dan upaya penangkapan dalam KKP merupakan salah satu tantangan dalam menyediakan bukti dari manfaat KKP dalam mendukung perikanan berkelanjutan. Namun, terdapat contoh dari SAP Selat Pantar dan TWP Kepulauan Anambas dimana pengembangan KKP bisa memberikan manfaat untuk perikanan. Bab ini membahas peran KKP bagi perikanan berkelanjutan, hubungan KKP dengan WPP, regulasi pemanfaatan perikanan dalam KKP, dan pengelolaan perikanan oleh masyarakat lokal.

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7.1 Introduction

Indonesia is recorded as the third largest global marine capture fishery producer after China and Peru (FAO 2020). In the past decade, the country has increased fisheries production from 4.37 metric tons (MT) in 2000 to 6.71 MT in 2018, and now contributes 7.9% of global production. Within Indonesia, the fishery sector contribution to national GDP ranged from 2.2–2.6% for 2013–2017, yet was worth USD 16.8 billion to the country's economy in 2017 (Indonesia Investment Coordinating Board (BKPM) 2018). Fisheries provide employment for over two million Indonesians, including those industries upstream and downstream, such as boat manufacture and marketing, in addition to fishers (BPS RI 2018a, 2018b).

About 96% of Indonesia's fishing fleet is dominated by small boats (<10 GT) — approximately 544,000 fishing boats — with only 4% of the fleet using medium sized vessels (10-30 GT) or those for industrial fishing (>30 GT) (BPS RI 2018b). According to regulations UU RI No. 45/2009 and Permen KP No. 71/PERMEN-KP/2016, fishing vessels with a maximum of 5 GT are allocated to conduct fishing activities less than 4 nautical miles (nm) from the coastline (4–12 nm of is the range allocated for 5–10 GT fishing vessels, while more than 12 nm is allocated for those >30 GT). Capture fisheries in Indonesia are often multi-species fisheries where many classes of boat size and many types of gear co-exist. Current fishery regulations are focused on managing the fishing effort of medium and industrial fishing fleets, rather than small-scale fishing activities in coastal ecosystems, such as coral reefs. Less focus on fisheries management in coastal areas (e.g. reef fish, lobster, crab) has resulted in heavy exploitation, with many fully or over-exploited populations in Indonesia (Figure 7.1).

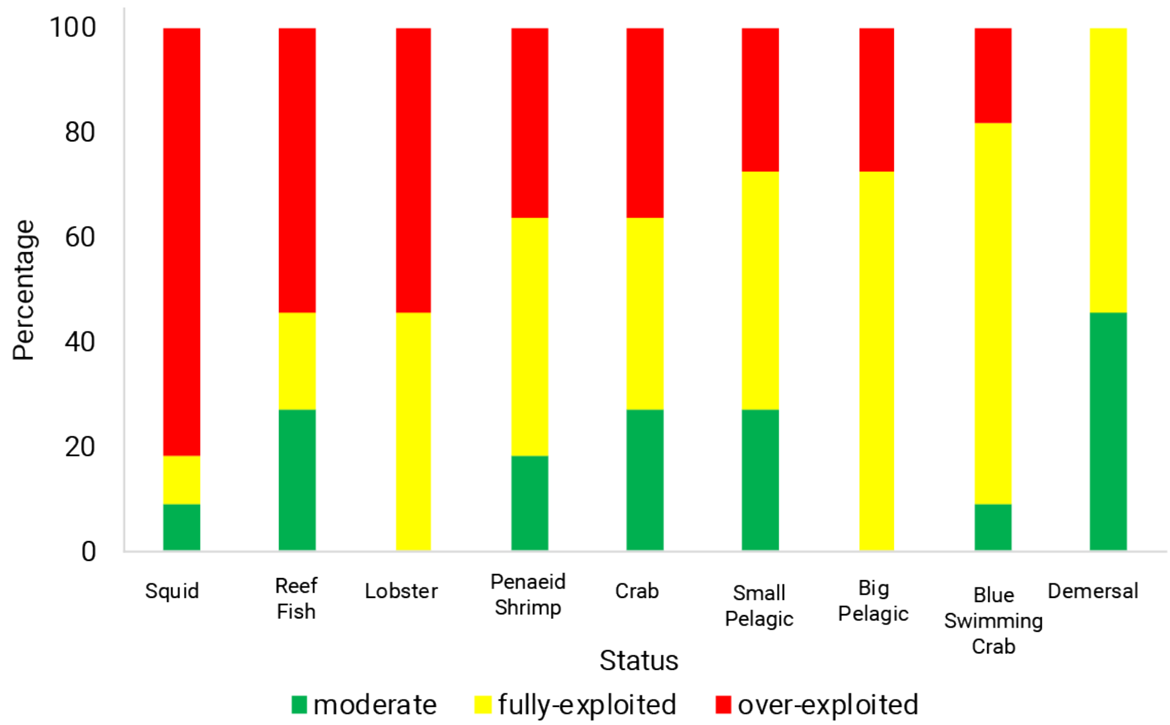

Figure 7.1. 2017 status of nine fishery resources in Indonesia (%). Data were sourced from MMAF Decree Kepmen KP No. 50/KEPMEN-KP/2017.

Increasing the sustainability of fisheries stocks to ensure the long-term prosperity of Indonesian citizens is a priority for the Government of Indonesia (GoI). For small-scale fisheries (boats <10 GT) in coastal waters, the GoI has adopted two broad area-based management strategies: (i) Marine Protected Areas (MPAs), and (ii) Ecosystem Approach to Fisheries Management (EAFM). These approaches aid fisheries management by regulating access to areas or restricting fishing gears used. In contexts where fisheries management is challenging to implement with high uncertainty and variability, enforced MPAs could contribute to maintaining the stock health (Hilborn 2018).

As an archipelagic country, Indonesia has more than 60 million inhabitants living within 10 km of coastal areas and 30 km of coral reefs (Burke et al. 2011), most of whom are highly dependent on marine resources. To sustain fisheries and conserve critical habitats, the GoI has established MPAs since the 1970s – with a current total of 196 MPAs covering 7% of the nation's waters (Chapter 3). MPAs in Indonesia have dual objectives, aiming to achieve marine conservation while also improving human well-being through fisheries productivity. MPAs in Indonesia are generally divided into distinct zones, including Core Zones and Sustainable Use Zones (Chapter 6). Sustainable Use Zones include areas dedicated to sustainable fishing, sustainable marine tourism, and sustainable aquaculture. This chapter will discuss MPA implementation to support sustainable fisheries and fisheries management in Indonesia.

7.2 Benefits of MPAs for Sustainable Fisheries

Effectively implemented MPAs are widely recognized to lead to positive outcomes for biodiversity and fisheries sustainability, though outcomes are highly dependent on local context (Gill et al. 2017). For example, non-extractive areas have been associated with doubling fish density and biomass, tripling fisheries species sizes, and increasing species richness by approximately 20–30% (Hilborn 2018). Beyond non-extractive areas, there can be many benefits to biodiversity from multiple-use protected areas — areas that continue to allow some fishing but with restrictions in place — albeit lower than in non-extractive areas (Zupan et al. 2018). Every fishing gear has different impacts, and so regulating fishing gear can shift fisheries to be more sustainable without directly prohibiting fishing (e Costa et al. 2016; Mbaru et al. 2020). Some gears are particularly problematic because they damage fish habitat. Banning such destructive gears can help rapidly increase the sustainability of fisheries. Overall, MPAs have high potential to address ecosystem effects of fishing activities (Sumaila et al. 2000).

There is also evidence to suggest that MPAs can lead to improvements in fisheries catches in adjacent waters, as well as increase the size of individual fish caught (Roberts et al. 2001) and change fish wariness to fishers – making them easier to catch (Januchowski-Hartley et al. 2014). These benefits manifest themselves through several pathways. Fisheries yields in areas outside an MPA can increase as fish densities inside the MPA increase and individuals start to move out into fished areas (Goñi et al. 2010). Mature individuals within the MPA may also spawn, leading to new fish recruits settling and growing in fished areas before being caught (Harrison et al. 2012). In this case, MPAs can act as disproportionate sources of young fish, underpinning fisheries (Krueck et al. 2017a). Fish rapidly adapt behaviorally to the presence of fishers and specific gear types. Fish moving across the boundary from an MPA to an outside area may be more naive to fishers, making them easier to catch (Januchowski-Hartley et al. 2014). This is especially true in areas where spearfishing is a dominant capture method. Therefore, while fisheries regulations may not extend beyond MPA boundaries, MPAs can play an important role in building sustainable fisheries.

7.3 Optimizing MPAs for Biodiversity and Fisheries Needs

It is important to clearly identify MPA objectives to be able to optimize MPA design. In the case of supporting fisheries, an MPA designed as a non-extractive area to spill-over fish biomass into surrounding areas for harvesting will have a very different optimal design from a zoned MPA that allows fishing within MPA boundaries. Even within fishing zones, there are diverse ways to regulate fisheries — for example, through gear restrictions, restrictions of access, or temporal restrictions. It is also important to consider the presence of and need to protect fish spawning aggregation sites and critical marine habitats. Decisions about how to regulate fisheries and how much fishing to allow will be affected by both biodiversity and socio-economic objectives.

There are several potential fisheries targets that can be used to inform MPA design and optimization. For example, ecological targets can be set based on the minimum amount of fish biomass to be retained on the reef to maintain ecosystem function. In the case of coral reefs, it has been suggested that a minimum reef fish biomass target of 500 kg/ha (Graham et al. 2017) is sufficient to maintain functional reef ecosystems, which can be fine-tuned by species and their specific ecosystem functions (Brown and Mumby 2014). More generic reference points applied for fisheries management globally include a limit of 20% of the unfished biomass before all fishing activities are closed to allow for stock rebuilding, as well as targets of 40–60% of the unfished biomass expected to allow for the highest productivity and economic returns to fisheries (Punt et al. 2014).

In addition, it is well documented that certain MPA biophysical and management attributes characterize the best performing MPAs. Key attributes identified as increasing fish biomass outcomes for MPAs include non-extractive, well enforced, old (>10 years), large (>100 km^2), and isolated by deep water or sand (Edgar et al. 2014). While these attributes increase fish biomass within MPAs, how they affect fisheries will be highly dependent on MPA objectives. Isolated MPAs will be unlikely to spill-over as much fish biomass and new fish recruits as highly connected MPAs. In Indonesia's Sunda Banda Seascape, for example, well-connected MPAs can provide 2.4 times higher fish inter-connectivity between MPAs and 1.5 times more export from MPAs (Krueck et al. 2017a). The importance of age and enforcement highlights the need for long-term commitment to active management and sustainable finance.

There has been a continued debate on the optimal size for MPAs. Studies suggests the impact of an MPA will be highly dependent on the biology and ecology of the fisheries resources being protected and the implemented management activities (Halpern and Warner 2003). However, many researchers argue that MPAs should be large enough to ensure that larvae from fish spawned within the MPA have a significant opportunity to recruit within that MPA (FAO 2010; Rodwell et al. 2003) as well as protect mobile adults over their general scale of movement (Krueck et al. 2018). As an approximate guide for situations in which information on fish and fisheries is lacking or very limited, protecting 20–30% of the fished habitat in strict non-extractive areas should help balance fisheries productivity and the protection of reef fish populations in otherwise unregulated systems (Krueck et al. 2017b). Muawanah, Shah, and Pomeroy (2014) found that economically optimal non-extractive areas cover around 38.5% of seascape area based on MPAs and integrating customary law found in Kei Islands, Maluku Tenggara. This optimal predicted reserve coverage is more ambitious than what is currently implemented in Maluku (Chapter 6).

Implicitly, the coverage targets above assume that individual MPAs are large enough to expect that resident fish species are effectively protected. In reality, decisions on local MPA sizes require careful consideration of the scale of movements of local fishery species in light of the socioeconomic impacts that larger MPAs have on communities. In most cases, considerations of socioeconomic impacts overshadow those of ecological impact, which can undermine the effectiveness of MPAs, not only for conservation but also to help improve fisheries sustainability and productivity (Krueck et al. 2017a; 2017b). For most coral reef fishes, even small non-extractive MPAs with a diameter of 1–2 km can achieve notable protection. However, protecting most resident individuals of the most important fishery species, and of species with diverse functional roles, is likely to require non-extractive MPAs that extend over 2–10 km of reef habitat (Krueck et al. 2018).

7.4 Fisheries Management Areas and MPAs

The total area of Indonesian waters (6,287,000 km^2 — BPS RI 2018b) is divided into eleven Fisheries Management Areas (FMA; *Wilayah Pengelolaan Perikanan*/WPP) (Permen KP No. 18/PERMEN-KP/2014) known as: FMA 711, 712, 713, 714, 715, 716, 717, 718, 571, 572, and 573 (Figure 7.2). These FMAs are the primary management units used by the Ministry of Marine Affairs and Fisheries (MMAF) to manage fisheries activities for medium and large fishing vessels. The FMAs begin at the shoreline and extend into offshore ocean areas. FMAs are open to all marine activities, such as fishing, fish cultivation, conservation, research, and fisheries development objectives — though MMAF may implement regulations at the FMA level targeting specific activities. MPAs are distributed across Indonesia (Chapter 3) and embedded within these 11 FMAs (Figure 7.2).

FMAs have a governance structure defined in Indonesian Regulation Permen KP No. 33/PERMEN-KP/2019, consisting of a fisheries management commission for each FMA that receives input from an advisory and scientific panel (Figure 7.3). There is an executive coordinator at MMAF that is part of each management commission and is tasked to manage the secretariat office of the FMAs including, but not limited to, convening meetings for decision-making on fisheries management. The executive coordinators manage three task forces on: (i) data and information, (ii) fisheries management and conservation, and (iii) control and compliance (Permen KP No. 33/PERMEN-KP/2019). The management commissions for FMA levels are in the early stage of development (Muawanah et al. 2018), with current fisheries measures being implemented focused on vessels bigger than 10 GT. In the future, the regional institutions will coordinate and agree on

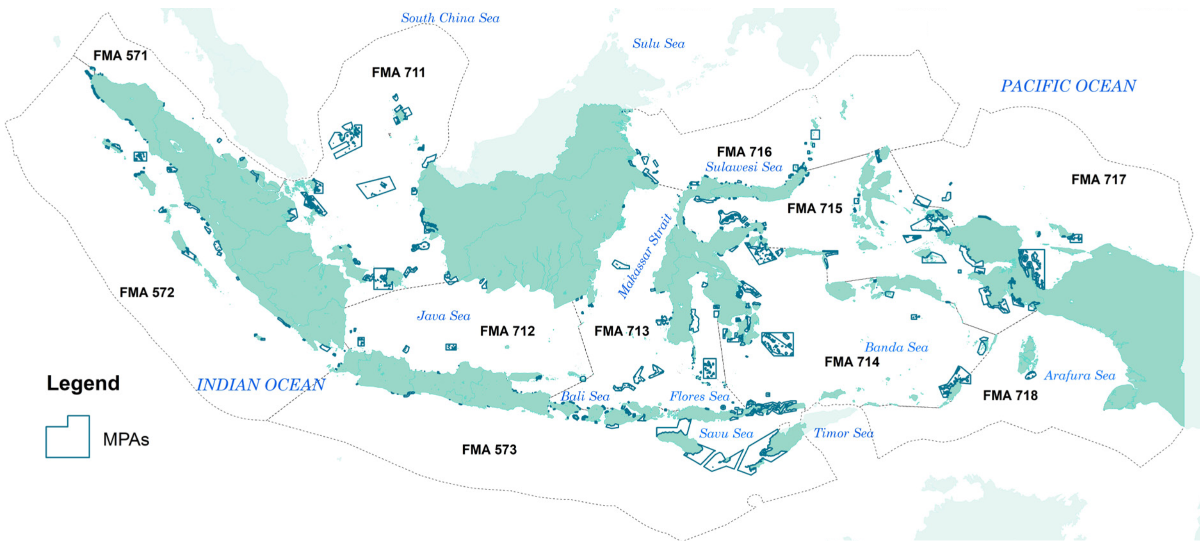

Figure 7.2. Distribution of MPAs within 11 Fisheries Management Areas in Indonesia.

catch effort or fisheries quota being formally divided between provinces within the FMA. By defining formal quotas it is hoped that their sale can provide funding to finance the fisheries management commissions in the 11 FMAs (Muawanah et al. 2018). However, this is not yet decided, and in the long run the funding may be borne by MMAF and provincial authorities. As the fisheries management commissions are further developed it will be important to connect with MPA managers and provincial MPA management offices to ensure holistic regional fisheries management decision-making. At present, the governance and management of fisheries resources in FMAs still needs to be integrated with conservation goals.

Given that MPAs in Indonesia have aims of biodiversity conservation and supporting human well-being through sustainable fisheries, it is important to consider how MPAs and their management relate to the FMAs within which they are embedded. Many MPAs in Indonesia were designated to protect important coastal marine habitats such as coral reefs, mangrove forests, and seagrass beds, while several MPAs aimed to also protect important fish spawning aggregation sites. MPAs may have been designated to conserve endangered, threatened, or protected species, such as dolphins, turtles, sharks, manta rays, sea cucumber, sea horses, or dugongs. The number of MPAs and MPA coverage per FMA is highly variable (Table 7.1). For example, FMA 713 covering the Makassar Strait, Gulf of Bone, Flores Sea, and Bali Sea contains 30 MPAs, while FMA 718 covering the Aru Sea, Arafura Sea, and East of Timor Sea only has one (Table 7.1). There is much scope for MPA expansion within FMAs, with the greatest coverage at 7.72% in FMA 715 covering the Gulf of Tomini, Maluku Sea, Halmahera Sea, Seram Sea, and South of Papua Barat (Table 7.1). The relatively small MPA coverage within FMAs is because all MPAs have so far been established in nearshore areas (within 12 nm of coastlines), while FMA waters also include open ocean and deepsea areas. In terms of critical habitat coverage, several FMAs include over 50% of coral reefs within MPAs, while others have as little as 5% of reefs in MPAs (Table 7.2). These results generally reflect the greater investment in MPA initiation and establishment in eastern Indonesia compared to western Indonesia.

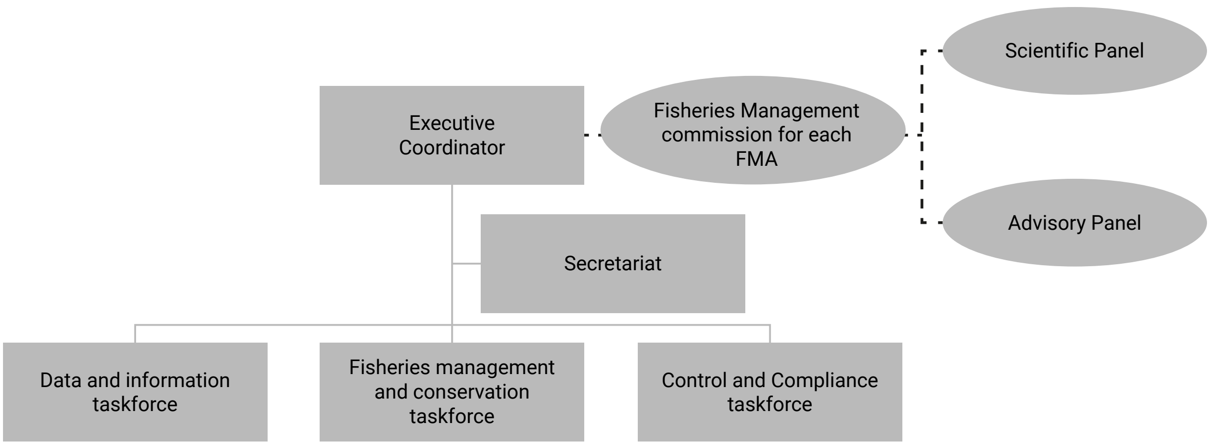

Figure 7.3. The structure of the FMA Fishery Management Council (adapted from Muawanah et al. 2018).

Table 7.1. MPA size (ha) and percentage (%) of total FMA areas.

No	Fisheries Management Area		FMA Coverage (ha)	MPA		
	Code	Name		Number	Coverage (ha)	% in FMA
1	571	Malaka Strait and Andaman Sea	14,009,132	6	87,708	0.6
2	572	Sumatra Barat and Sunda Strait	93,605,689	27	1,137,606	1.2
3	573	South of Java to Nusa Tenggara, Savu Sea, and West Timor Sea	94,306,541	23	4,106,749	4.4
4	711	Karimata Strait, Natuna Sea, South China Sea	65,821,917	18	4,735,066	7.2
5	712	Java Sea	43,432,056	15	428,773	1.0
6	713	Makassar Strait, Gulf of Bone, Flores Sea, and Bali Sea	47,719,293	30	2,300,100	4.8
7	714	Gulf of Tolo and Banda Sea	65,843,418	22	4,178,942	6.4
8	715	Gulf of Tomini, Maluku Sea, Halmahera Sea, Seram Sea and South of Papua Barat	47,569,557	22	3,673,369	7.7
9	716	Sulawesi Sea and North Halmahera Sea	52,628,860	22	728,999	1.4
10	717	North of Papua Sea includes Cendrawasih Bay	63,556,631	4	1,715,734	2.7
11	718	Aru Sea, Arafuru Sea and East of Timor Sea	47,275,657	1	114,000	0.2
		Total	**635,768,751**	**188**	**23,145,681**	**3.6**

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Table 7.2. Percentage of protected reefs within MPAs compared to total reef coverage in each FMA area.

Fisheries Management Area (FMA)	FMA Coverage	Total Reef Coverage in FMA (ha)	Protected Reef within MPA in (ha)	Percentage of reef within MPAs
FMA 571	Malaka Strait and Andaman Sea	1,443	370	26%
FMA 572	Sumatra Barat and Sunda Strait	180,716	36,209	20%
FMA 573	South of Java to Nusa Tenggara, Savu Sea, and West Timor Sea	106,270	41,931	39%
FMA 711	Karimata Strait, Natuna Sea, South China Sea	213,070	112,220	53%
FMA 712	Java Sea	86,743	21,858	25%
FMA 713	Makassar Strait, Gulf of Bone, Flores Sea, and Bali Sea	447,968	202,946	45%
FMA 714	Gulf of Tolo and Banda Sea	382,018	223,744	59%
FMA 715	Gulf of Tomini, Maluku Sea, Halmahera Sea, Seram Sea and South of Papua Barat	167,413	50,914	30%
FMA 716	Sulawesi Sea and North Halmahera Sea	134,562	89,346	66%
FMA 717	North of Papua Sea includes Cendrawasih Bay	163,865	85,081	52%
FMA 718	Aru Sea, Arafuru Sea and East of Timor Sea	69,670	3,444	5%
Total		**1,953,738**	**868,063**	**44%**

Source: Kementerian Kelautan dan Perikanan Republik Indonesia 2019. Reef spatial information was sourced from UNEP-WCMC et al. 2018.

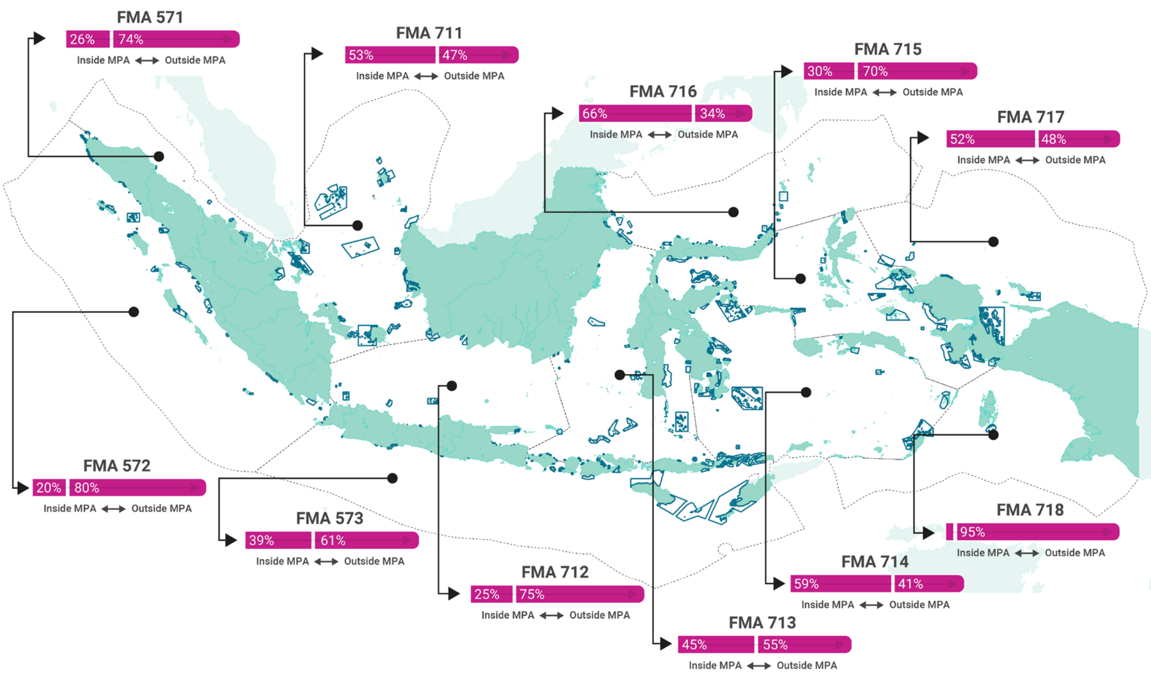

Figure 7.4. The protected reef percentage within MPAs compared to the total reef coverage in each FMA.

Despite the significant number of MPAs within FMAs—including a high proportion of coral reefs within MPAs for some FMAs (Table 7.2) — there has not been any assessment linking the contributions of MPAs to FMA reef fisheries. Conducting such assessment is important to inform regional fisheries management — especially for the nine fishery resources[1] as stipulated by the Indonesian national stock assessment. The results of this assessment could have important implications for current MPA management and future MPA designations. For example, many MPA management activities are currently focused on maintaining existing marine biodiversity or fisheries biomass within MPA boundaries. While it is crucial that MPAs improve sustainable fisheries and increase fish biomass within their boundaries, ideally MPAs should also provide fisheries benefits to areas outside their boundaries within the context of the FMA regime. MPAs in Indonesia provide limited fishing restrictions within their boundaries. A key restriction is that fishing vessels >10 GT are not allowed to fish anywhere within MPA boundaries and require permission to enter the MPA. This means that all legal fisheries within Indonesian MPAs must be conducted from vessels <10 GT, as stated in Permen No. 47/PERMEN-KP/KP 2016. Some MPAs state increasing fish biomass as an explicit objective — these are MMAF MPAs designated as Fisheries Reserves (*Suaka Perikanan*).

As mentioned previously, within MPA, zoning is used to manage areas with variable types of restrictions (Chapter 6). Within Core Zone, any type of fishing and other activities (including tourism) are banned. In Use Zone, various activities, including fishing, is allowed. Core Zone are generally selected based on baseline monitoring to identify and include important coastal marine habitats as well as fish spawning, feeding, and nursery grounds.

General fisheries Use Zone in MPAs are

[1]The nine groups of fishery resources are squid, reef fish, lobster, penaeid shrimp, crab, small pelagic, big pelagic, blue swimming crab, and demersal.

open to all fishers and most gear types – provided that nationally banned destructive fishing gears (i.e. blast and cyanide fishing) and vessels >10 GT are not used. Often for MPA sustainable fisheries zones a specific regulation is issued to help manage fisheries. For example, MMAF Regulation Permen KP No. 47/PERMEN-KP/2016 states that the allowed fishing effort is 50% of the Maximum Sustainable Yield for the particular fishery. The regulation also has guidance on management measures that aim to encourage more selective and habitat friendly gears (e.g. hand line, lift net, trap), and that boats and fishers should be registered in accordance with fisheries regulations. MPA fisheries management also recognizes local wisdom, traditional knowledge, and customary management of the area. For example, some MMAF MPAs in eastern Indonesia formally designated *sasi* (period harvest closure) zones that are under the management of the local community to decide when to restrict fishing. These *sasi* zone may have customary fisheries management methods that have been in use for centuries. Other MPAs may also designate zones in a similar way to establish new community management of fisheries in areas that did not previously have it. The implementation of fishery regulations at the MPA level should align with local context; for example, a regional ecosystem approach to fisheries management, or local harvest strategies and rights-based fisheries management.

Across Indonesia, recent studies have suggested that MPAs have positively contributed to the total fish biomass and trophic structure for Indonesia's reef fish communities (Campbell et al. 2020; Setyawan et al. 2018). These studies suggest that MPA management — within the MPA through fishing restriction and non-extractive zones — has been able to achieve the global minimum reef fish biomass target of 500 kg/ha for maintaining ecosystem function (Graham et al. 2017) in approximately 40% of Indonesian MPA sites.

7.5 Ecosystem Approach to Fishery Management Tools for Sustainable Fisheries

The EAFM extends conventional fisheries management to recognize more explicitly the interdependence between human well-being and ecosystem health and the need to maintain ecosystems' productivity for present and future generations (Ward et al. 2006). This includes conserving critical habitats, reducing pollution and degradation, minimizing waste, protecting endangered species, and the socioeconomic well-being of the fisheries stakeholders. Indonesia formally adopted the EAFM after the Directorate General for Capture Fisheries at MMAF issued Regulation Permen KP No. 18/PERMEN-KP/2014 on EAFM indicators for sustainable fisheries management. The regulation endorses the use of EAFM indicators to understand the baseline conditions, and then develop an action plan with associated monitoring and evaluation to track the performance of fisheries management. Furthermore, the fishery management plans for the eleven FMAs employ the EAFM indicators to evaluate fishery performance. The EAFM indicators are structured into six domains: (i) Fishery resource, (ii) Habitat and ecosystem, (iii) Fishing technique, (iv) Economic, (v) Social, and (vi) Governance (Adrianto et al. 2014). These indicators can also be used to inform fisheries management approaches within MPAs in Indonesia (Case Study 7.A).

Case Study 7.A
Ecosystem Approach to Fisheries Management (EAFM) Implementation in Nusa Tenggara Timur

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The provincial and district governments of Nusa Tenggara Timur Province, with support from stakeholders, has used the Ecosystem Approach to Fisheries Management (EAFM) indicators to support fisheries management in Flores Timur and Alor Regencies. These regencies include a MMAF-regulated national MPA, TNP (*Taman Nasional Perairan*; Aquatic National Park) Laut Sawu, and several MMAF provincial MPAs, including SAP (*Suaka Alam Perairan*; Aquatic Nature Reserve) Selat Pantar and KKPD (*Kawasan Konservasi Perairan Daerah*; Provincial MPA) Flores Timur. Surveys were carried out at two/three year intervals since 2012 in sustainable fishing zones within MPAs in these regencies to assess the level of fishing effort and fisheries capacity, and the role of MPAs in improving fish biomass. Assessments were conducted in collaboration with the University of Artha Wacana in Kupang. The EAFM indicator assessment in 2012 was used as the baseline condition prior to MPA establishment and regional fisheries management. Following the 2012 survey, a management plan and monitoring process was developed and implemented — with the main focus being MPA implementation to improve regency sustainable fisheries. Temporal monitoring shows that there is broadly positive progress in EAFM indicators over the period 2012–2019, suggesting that these MPAs have contributed to increased fisheries sustainability over the past eight years (Figure 7.A.1).

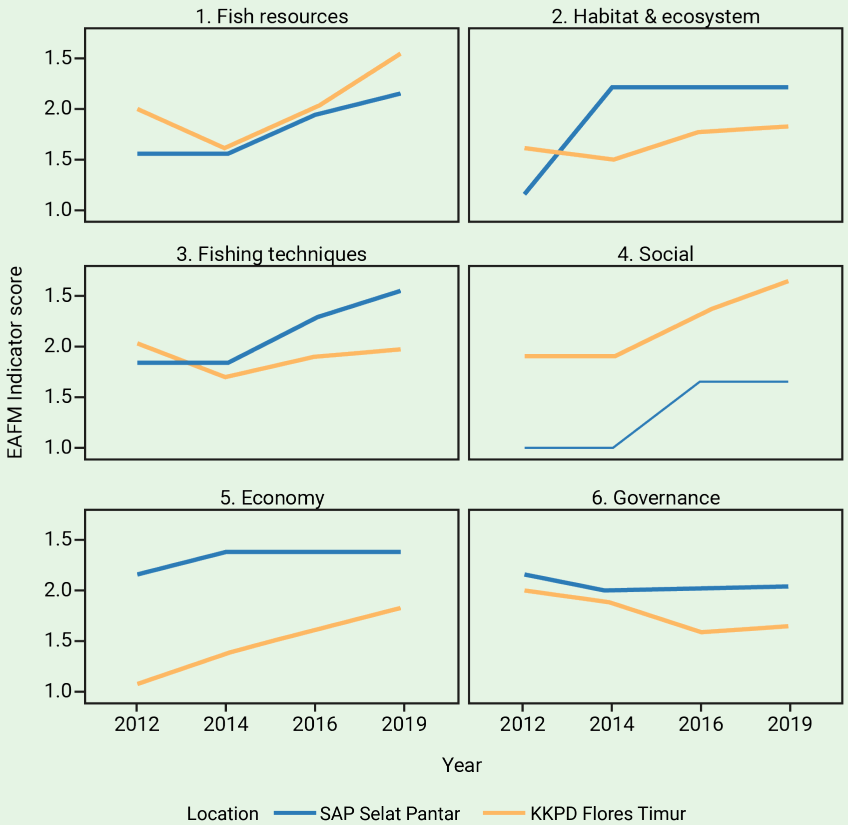

Figure 7.A.1. The EAFM indicators of sustainable fishing practices within MPAs in Alor and Flores Timur Regencies (WWF Indonesia 2012b, 2012a, 2014, 2016, 2019).

Indonesia's Fisheries Utilization Strategy (*Strategi Pemanfaatan Perikanan)*, which refers to the FAO guideline on fishery harvest strategy, is a framework which describes agreed management measures required to achieve biology, ecology, economy, and/or social objectives in fisheries (Perdirjen PT No. 17/PER-DJPT/2017). This tool can be adopted to different priority species and regions of Indonesia. For example, the Harvest Strategy toolkit has been used to increase sustainable tuna fisheries in several Indonesian FMAs (Satria and Sadiyah 2018). This tool has also been applied in several MPAs in Indonesia, often facilitated by NGOs. For example, WWF-Indonesia has supported this approach in Wakatobi and Maluku Tenggara, while Wildlife Conservation Society (WCS) has supported this approach in Sulawesi Utara and Seram Timur. The work carried out in Wakatobi and Maluku Tenggara was focused on highly targeted fisheries species. Here, there was an assessment of fisheries landings to inform the harvest control rules alongside an EAFM indicator assessment. This assessment phase was followed up by the regency governments in Wakatobi and Maluku Tenggara to develop sustainable fisheries regulations.

The design and implementation of fisheries utilization strategies in Wakatobi and Maluku Tenggara were somewhat hindered by the lack of comprehensive fishery data. To better develop the fisheries utilization strategy at local level, strong support from the national government is needed for fisheries monitoring and enforcement of the fisheries utilization regulations. The current Fishery Law, UU RI No. 45/2009, defines the national government as the authority for fisheries stock assessments and managing catch and effort. The Law also requires the protection of small-scale fisheries as a livelihood. However, there is no compiled data source on fisheries effort allocation and management of fisheries for national and provincial levels, making regional decision-making difficult. In many cases, regulations on fisheries utilization require supporting alternative livelihoods for fishers, as many stocks when assessed are found to be overexploited. Stronger linkages between MPA management, fisheries utilization strategy, and support for alternative livelihoods is needed to support a shift to more sustainable fisheries within MPAs.

7.6 Customary Fisheries Management and Rights-Based Approaches in MPAs

Traditional marine resource management practices have high potential to support conservation objectives (Cinner 2007; Jupiter et al. 2014; McLeod, Szuster, and Salm 2009). Local marine resource governance practices can strengthen MPA regulations, provided said regulations are aligned with local management approaches and there are influential traditional leaders or local community governance bodies that support the MPA. Indonesia has a rich source of traditional knowledge and customary resource governance and practices, often known as *adat*. Customary management can also incorporate rights-based fisheries management. Rights-based fisheries management allocates fisheries rights to distinct groups (Muawanah, Pomeroy, and Dealessi 2020). Rights can be in the form of catch volumes, fisheries effort, access to certain fishing grounds, or the right to manage that access. By allocating fisheries rights it is possible to address overcapacity or overfishing within an area. The use of rights-based inclusion in some MPAs in Indonesia can increase small-scale fisher well-being through privileged access to and management of the fisheries resources (Muawanah et al. 2020). For example, communities in Kei Islands, Maluku Province have traditional "kings" that hold marine tenure over coastal areas, and control community access to fisheries (Steenbergen 2012). This takes the form of periodic harvest closures for fisheries. By taking a multi-stakeholder approach and working with these communities, including the *adat* or traditional leaders, church leaders, other local leaders, youth, and government officers, it is possible to recognize this customary marine management in MPAs and build off these practices to designate co-managed MPAs or MPAs with very active community participation. For example, non-extractive zone can be decided by agreement with community members and patrolled by community members themselves. The harvest decision rules can be declared by *adat* leaders and formalized into a village decree (Muawanah et al. 2014) in addition to the formal MPA regulations. Zones can be designated within the MPA for the community to govern access to and have the right to prevent others from fishing within.

Case Study 7.B
Marine Tenure Rights of the Baranusa Kingdom in Alor Regency, Nusa Tenggara Timur

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An example of marine tenure rights being integrated into an MPA can be found in Baranusa Kingdom, Alor Regency, Nusa Tenggara Timur. The Kingdom, similar to a multilevel traditional sultanate, includes four main tribes: Umakakang, Sandiata, Wutungwala, and Haliweka. The customary marine areas of the tribes are incorporated within SAP (*Suaka Alam Perairan*; Aquatic Nature Reserve) Selat Pantar. The MPA has conservation targets of protecting reef fish, coral reefs, clams, snails, and sea cucumbers (Atapada et al. 2016). The Baranusa community, with support from an NGO, has facilitated the integration of traditional fisheries management into the MPA. Formal recognition of the marine tenure rights of the Baranusa Kingdom was stipulated through local regulation (Perda Kabupaten Alor 2018). Through this regulation, the local government of Alor Regency recognized this traditional tenure and committed to support empowerment of traditional institutions including allocating funding for traditional institution strengthening programs. In response, as part of the MPA design, the tenure scheme has been integrated into the zonation and management of SAP Selat Pantar.

Around Lapang Island within SAP Selat Pantar, the Kingdom's territorial right covers 146.2 ha (Figure 7.B.1), and communities manage their marine resources through the "Mulung" system (open-close system). *Hading Mulung* and *Hoba Mulung* is a combined system to open or close the fishery to harvesting. *Hading Mulung* is the closed season, while *Hoba Mulung* is the open season. Baranusa customary law also supports local MPA regulations such as restricting gear use to traditional fishing gears. Through a communal agreement, the last closed season (*Hading Mulung*) was implemented from November 2016–May 2018 (Plaimo and Timung 2018). During the closed season, fishers usually fish outside the closed areas or focus on seaweed farming.

A community perception study found that fishers believe that the implementation of *Hading Mulung* and *Hoba Mulung* increase their fisheries income and catch (23% strongly agree; 73% agree). An ecological survey conducted in the Baranusa Kingdom shows that high value invertebrate species density increased from 231 individuals/ha in 2015 to 277 individuals/ha in 2017 inside the *Hading Mulung* area. Over the same period, outside the *Hading Mulung*, the invertebrate density decreased from 520 to 100 individuals per ha. The key fisheries species (grouper, snapper, sweetlips) increased from 329 to 507 ind/ha in *Hading Mulung* Area and from 245 to 460 ind/ha in *Hoba Mulung* Areas (Khaifin 2017).

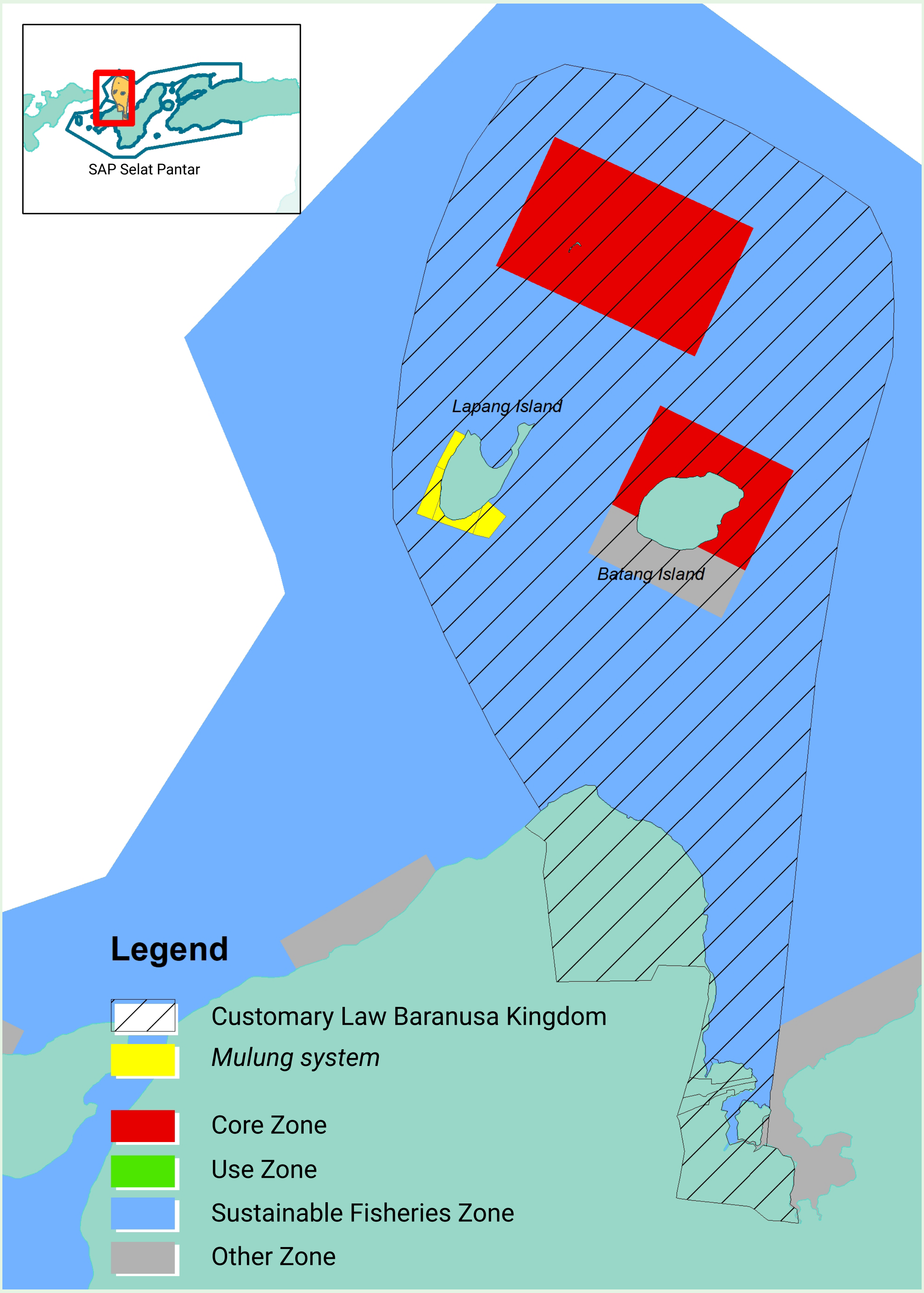

Figure 7.B.1. Map of Baranusa Kingdom within SAP Selat Pantar of Alor Regency, Nusa Tenggara Timur Province.

There are several laws and decrees that govern how community access rights to Sustainable Fisheries Zone within larger MPAs can be granted. The principle laws are UU RI No. 27/2007 juncto UU RI No. 1/2014, and the derived decree of the Directorate General of Marine Spatial Management, Perdirjen PRL No. 03/PER-DJPRL/2016. These state that access rights can be granted to communities living within or adjacent to an MPA that are involved in the management of the area. In other words, the manager of an MPA can delegate the authority to use and manage the Sustainable Fisheries Zones to eligible communities. Conditions of eligibility are provided by the guidelines of Territorial Use Rights in Fisheries (TURF; *Pengelolaan Akses Area Perikanan*/PAAP) in MPAs. This decree explains how the adjacent community or communities of the MPA will have privileges to a Sustainable Fisheries Zone within an MPA to fish. With this privilege, other fishers with no granted access to the area may not catch fish there but must still be allowed passive transit access through the area. However, communities requesting privileged access to a Sustainable Fisheries Zone in an MPA are required to demonstrate that they can manage the fisheries resources within that area. Therefore, community groups normally must develop a localized fishery management plan that states any proposed harvest rules and management measures to be implemented in the area. If privileged access for the community is granted, ideally these harvest rules and management measures can be co-implemented with the MPA management authority. For example, a widely adopted restriction is restricting fishing gears on reefs to traditional gears such as hand lines (Case Study 7.C for an example).

Some provinces have further implemented regulations for privileged community access to fishing zones within MPAs, beyond broad national laws and decrees. For example, the Governor of Sulawesi Tenggara Province issued Pergub Sulawesi Tenggara No. 36/2019 on Fishing Access Rights of Fishing in Conservation Areas locally. The regulation provides guidelines and detailed step-by-step instructions for communities to establish their own rights based on fisheries management and exercise privilege access rights within the Sustainable Fisheries Zone in MPAs in Sulawesi. Similar initiatives are also underway in Raja Ampat facilitated by Rare. These approaches to rights-based fisheries management within MPAs are still limited in their uptake across Indonesia's MPA network. Therefore, more work is needed to understand broadly how effective these areas are functioning.

Case Study 7.C
Territorial Use Rights in Fisheries (TURF) Implementation in TWP Kepulauan Anambas, Kepulauan Riau

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One example of Territorial Use Rights in Fisheries (TURF) practices in MPAs can be found in the MMAF-managed national MPA in Anambas Island — TWP (*Taman Wisata Perairan*; Aquatic Tourism Park) Kepulauan Anambas (Figure 7.C.1). This approach is being implemented around Mesabang Island to increase fisheries sustainability and produce higher quality catches (Loka KKPN Pekanbaru 2017). This has led to community agreement and implementation to maintain fishery resources within the MPA's fisheries zones. Rules include:

- Lift nets are not allowed to operate six days in a month, on the 13th until 18th of each lunar calendar.
- Minimum body diameter of 10 cm for target species being caught within the MPA.

Control and monitoring of those agreed rules are carried out both by the MPA management authority and village communities. Anyone found violating rules is warned formally by the MPA management authority, and repeated violation could lead to further action.

As a result of TURF implementation in Mesabang Island, ecological monitoring in 2015 and 2016 showed an increase of live coral cover by 4.5%, mangrove forests cover by 5.8%, and seagrass beds cover by 7% (Yanuar 2017).

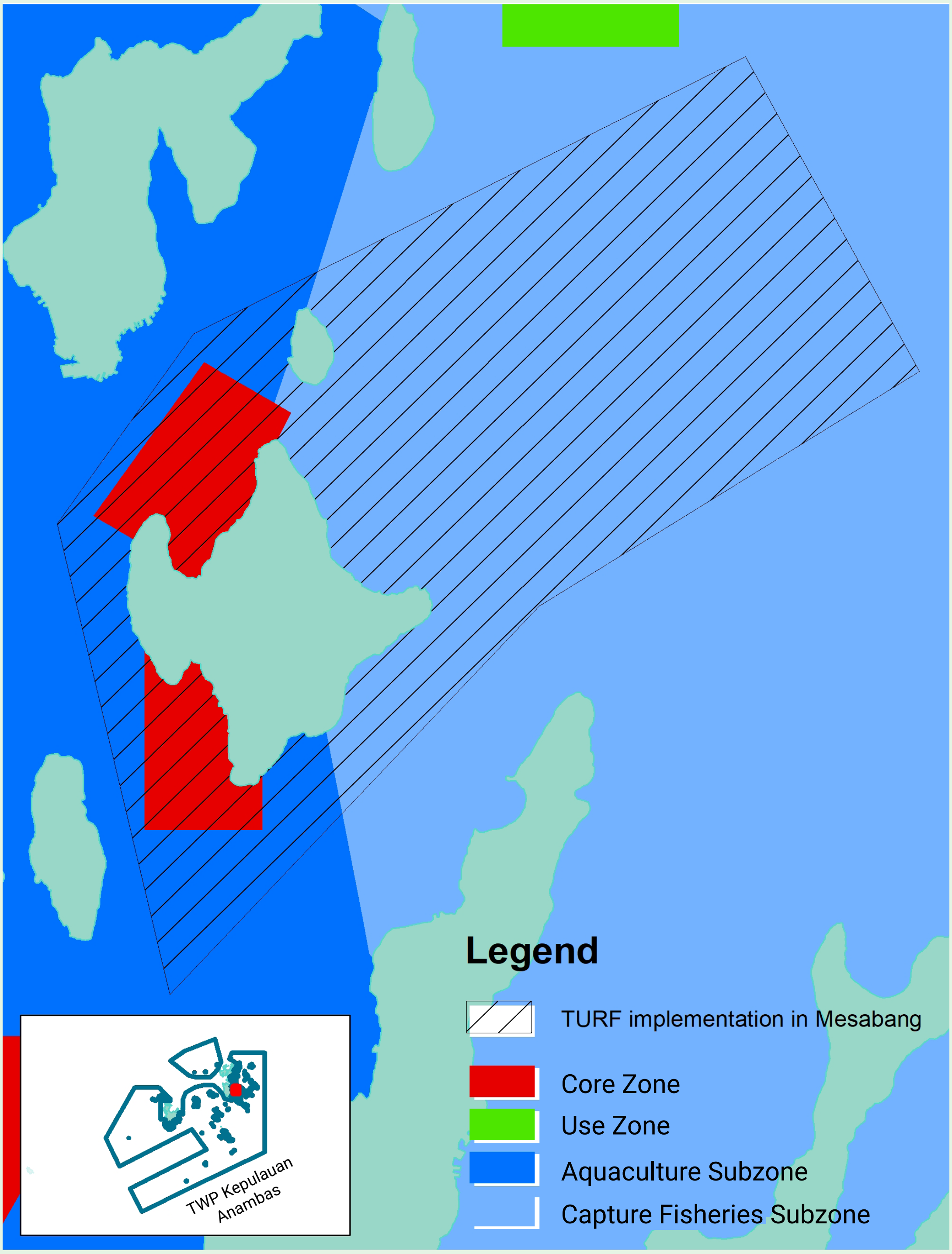

Figure 7.C.1. The location of TURF implementation in Mesabang within TWP Kepulauan Anambas.

7.7 Moving Forward

The current approach of MPAs in Indonesia is focused on conserving habitats, threatened species, and fisheries stocks within MPA boundaries. Moving forward, it is also important to consider the contribution of MPAs to improve sustainability of Indonesian fisheries outside of MPA boundaries, especially MPA contributions within FMAs. Firstly, there are key opportunities for partnership in the future, working with the fisheries management commissions for each FMA for MPA conservation activities to become more integrated with regional fisheries management activities. Secondly, the existing MPAs scattered throughout the eleven FMAs could be optimized if linked through a highly connected network of MPAs within each FMA, with the aim of supporting FMA fishery recovery. Thirdly, the endorsement of rights-based fisheries management in the Sustainable Fisheries Zone within MPAs should be expanded and replicated throughout all MPAs in Indonesia – especially those with areas of customary governance. A key factor for success for sustainable fisheries within MPAs is committed and functioning local small-scale fisher governance practices.

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Chapter 8. Tourism and Marine Protected Areas

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Abstract

As the marine tourism sector continues to rapidly develop and bolster economic growth, both nationally and worldwide, the Government of Indonesia (GoI) recognizes the need for its inclusion in national development plans and as a means for delivering on Sustainable Development Goal (SDG) commitments. This chapter provides information on potential benefits and threats to ecological, social, economic, and cultural aspects of marine tourism development within the context of Indonesia's tourism targets and as a growing industry for the country. The chapter specifically discusses marine tourism development within MPAs, currently regulated via zoning and category systems, as well as challenges and opportunities associated with using tourism as an instrument for MPA support.

Abstrak

*Sektor pariwisata laut terus berkembang dengan pesat dan mendukung pertumbuhan ekonomi, baik di tingkat nasional maupun global. Oleh karena itu, Pemerintah Indonesia melihat pentingnya sektor pariwisata untuk dimasukkan dalam rencana pembangunan nasional dan komitmen dalam mendukung pencapaian target Tujuan Pembangunan Berkelanjutan (*Sustainable Development Goals*/SDGs). Bab ini membahas potensi manfaat dan ancaman pengembangan wisata laut terhadap aspek ekologi, sosial, ekonomi, dan budaya dalam konteks target pariwisata Indonesia dan sebagai industri yang berkembang di Indonesia. Bab ini juga membahas secara spesifik terkait pengembangan wisata pesisir dan laut di dalam KKP yang diatur berdasarkan tipe KKP serta sistem zonasi yang berlaku, serta informasi terkait tantangan dan peluang pengembangan wisata pesisir dan laut sebagai instrumen pendukung KKP.*

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8.1 Introduction

Indonesia, as a nation characterized by high ecological, social, and cultural diversity, and located in the heart of the Coral Triangle, has significant potential for tourism development. Its self-branded "Wonderful Indonesia" concept underlies this promise, especially for marine tourism. The majority of the tourism portfolio in Indonesia is nature related, accounting for 60% of visits (Teguh 2017). Nature-based tourism includes ecotourism (45%) and marine tourism (35%) (Ollivaud and Haxton 2019). The province of Bali, with less than 1% of Indonesia's landmass, has been the dominant destination, receiving half of all foreign visitors (Ollivaud and Haxton 2019).

8.1.1 Tourism Status and Trends in Indonesia

The tourism sector's importance for economic advancement has been emphasized by Indonesia's Ministry of Tourism since 2015 and reflected in its targets, which include a shift from focusing on increasing the number of tourists to increasing community income through tourism (Asvaliantina 2019). Targets between 2015 and 2019 included an increase in international arrivals (9 million to 20 million people), an increase in domestic travels (250 million to 275 million trips), an increase in GDP domestic share (4% to 8%), doubling of foreign exchange revenue from tourism to roughly USD 16 billion, an increase in employment (2 million to 12 million people), and improvement in the World Economic Forum ranking of tourism competitiveness to 30th from 70th (Ollivaud and Haxton 2019). As of 2018, Indonesia reached two of these targets: domestic travel (300 million trips) and employment (12 million people) (Kemenpar RI 2018). International tourism visits worldwide are expected to increase by 3.3% per year until 2030, reaching 1.4 billion by 2020 and 1.8 billion by 2030 (World Tourism Organization and Asia-Pacific Tourism Exchange Center 2016). This sector also contributed USD 62.6 million, or 6%, of the nation's GDP, making it the third largest tourism economy in Southeast Asia, following Thailand and Philippines (BPS RI 2019c; Kemenpar RI 2018). The GDP contribution is predicted to quadruple, reaching USD 200 billion in 2035 (WWF-Pacific 2017). Foreign earnings from tourism have been steadily increasing: from 2013–2015, tourism became the fourth highest contributor, in 2016 it became the second, and in 2020 it is projected to be the first (BPS RI 2019b). In terms of business ventures, 55.15% were classified as aquatic tourism and 17.95% as nature tourism for 2017 (BPS RI 2018).

Increases in tourism-related statistics can be seen across the board for Indonesia, from entry points into the country (19), to the number of visitors, to financial incentives. Indonesia was ranked 20th in the world tourist industry, the 16th Most Beautiful Country, the ninth-fastest growing tourist sector in the world, and the third-fastest growing in Asia in 2017 (Cahill-Jones 2020; World Tourism Organization 2019). Tourism in Indonesia grew 7.8% in 2018, twice the global average of 3.9%, and foreign tourist arrivals reached 15.8 million, a significant increase from 8.8 million in 2013 (Figure 8.1; BPS RI 2019c). Most international travelers come from Malaysia, China, Singapore, Australia, and Timor-Leste. While international visits in 2018, specifically to Protected Areas (PAs) and Marine Protected Areas (MPAs) managed by the Ministry of Environment and Forestry (MoEF), only account for 3% of total travel, 7 million domestic visits were documented (Dirjen KSDAE 2019). The exact number of PAs and MPAs used in the analysis is unspecified within the data. Interestingly, formally documented international visits are higher than domestic visits within MPAs managed by the Ministry of Marine Affairs and Fisheries (MMAF) but the opposite is in effect for MPAs under MoEF, where domestic visits are higher (Figure 8.2). These positive trends can be attributed in part to the fact that Indonesia prioritizes tourism development for economic growth as well as the increase in demand worldwide for tourism experiences.

The impacts of these trends and increases, as well as how they will be handled, will have significant influence on the effectiveness of MPA implementation and management in Indonesia. Understanding the potential benefits and threats of various types of marine tourism in MPAs is essential to secure the effectiveness of these MPAs for both ecological and economic health.

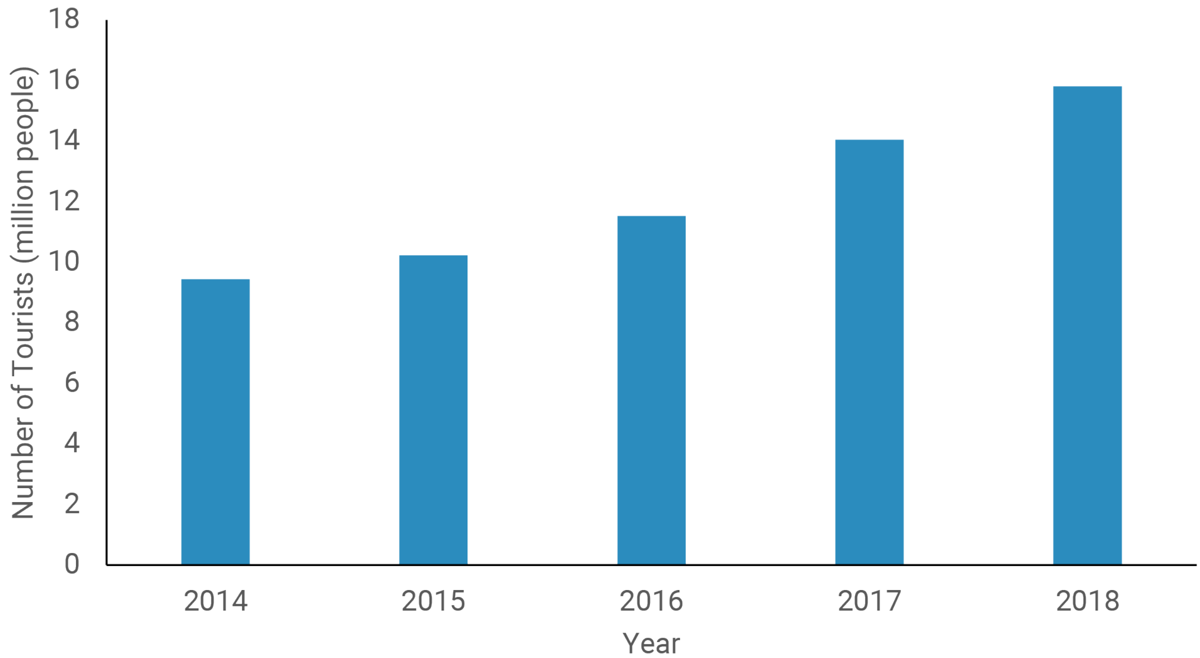


Figure 8.1. Number of international tourists in Indonesia 2014 – 2018 (BPS RI 2019c).

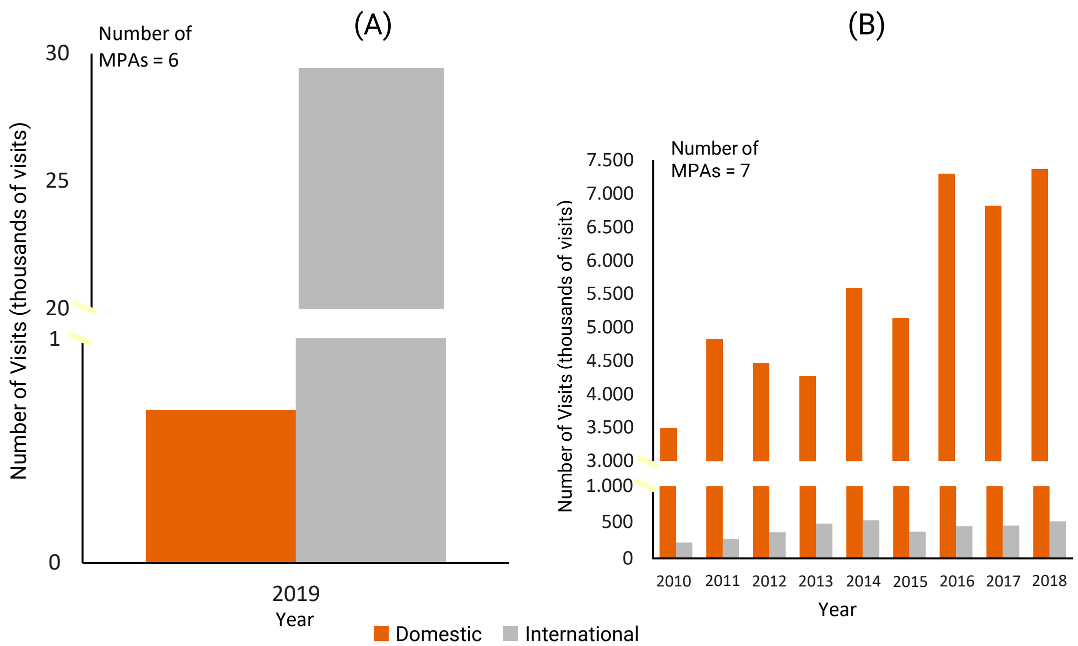


Figure 8.2. International and domestic visits to PAs and MPAs (A) under MMAF in 2019 (Ministry of Marine Affairs and Fisheries, unpublished data) and (B) under MoEF from 2010 – 2018 (Dirjen KSDAE 2016, 2017, 2018, 2019; Kemenhut RI 2012, 2013, 2014, 2015).

8.1.2 Marine Tourism in Indonesia

Marine tourism is the largest component of the world tourism market, and among the fastest growing (Hall, 2001; Papageorgiou, 2016). While often lumped together, there are two broad types of "marine tourism": (i) coastal tourism and (ii) open ocean-based tourism. Coastal tourism includes the entire spectrum of tourism, leisure, and recreationally oriented activities that take place in the coastal zone and offshore coastal waters, including its supporting coastal development and infrastructure (Dwyer and Gill 2019; Hall 2001). Open ocean-based marine tourism includes activities that occur in areas more remote from coastlines, such as sailing and deep-sea fishing. These two forms of tourism render a significant promise for many emerging destinations, following the same demand and supply factors as the global industry (i.e. economic growth, migration, technology, and globalization). Marine tourism presents opportunities for tourism stakeholders to raise local incomes, strengthen and enhance local infrastructure, and contribute to the well-being of local communities (Dwyer and Gill 2019), in addition to providing incentives and means for conservation and protecting biodiversity (Gossling 2018). Indeed, the tourism industry has been given priority in MPAs in many developing countries because it is recognized as a pillar of economic growth (Thi and Pham 2020) and an alternative livelihood from extractive resource use.

Marine tourism in Indonesia is embedded within the Government of Indonesia's (GoI) sustainable development framework as a priority in Indonesia's Long-Term National Development Plan 2005–2025 (*Rencana Pembangunan Jangka Panjang*/RPJP) and Masterplan for National Tourism Development 2010–2025 (*Rencana Induk Pembangunan Kepariwisataan Nasional*/Ripparnas). Based on these plans, Indonesia developed the Strategic Plan for Sustainable Tourism and Green Jobs in 2012 as a commitment to achieve the Sustainable Development Goals (SDGs), specifically Goal 12 (responsible consumption and production) and Goal 14 (life below water). Marine tourism in Indonesia, based on National Law PP RI No. 50/2011 and the Masterplan for National Tourism Development 2010–2025 (*Rencana Induk Pembangunan Kepariwisataan Nasional/* Ripparnas), is designated as part of nature tourism and divided into three categories based on zone (coastal, sea, and underwater), with 10 priority areas of development for each (Figure 8.3). The GoI also aims to develop 10 national priority tourism destinations, colloquially known as the "new Bali's": TNL Wakatobi, TNL Kepulauan Seribu, KKPD Morotai, Labuan Bajo, Tanjung Lesung, Belitung, Mandalika, Toba Lake, Borobudur Temple, and Bromo Tengger Semeru (Figure 8.3).

Within the marine tourism sector, three major activities are tracked by the GoI: cruise ships, yachting, and diving tourism, which are all increasing in demand (Kemenpar RI 2018). Of these tracked activities, cruises and yachts represent the largest segment of marine tourism globally; within Indonesia, cruise expansion to destinations includes Bali, Komodo, Semarang, Lombok, and Jakarta (Cruise Lines International Association 2017). Yacht rallies advertised under "Sail Indonesia", have also garnered visits, having occurred in ten destinations over the past 18 years. However, within the country, diving is the primary marine tourism attraction: the diving industry accounts for 55% of marine tourism (BPS RI 2017). Furthermore, Indonesia has been listed as the #1 dive destination by DIVE Magazine (2019), with at least one Indonesian site listed in the global top ten. An MoU between the Ministry of Tourism and MMAF was established to develop diving tourism across the country: as of 2019, 37 areas have been identified for diving, some within MPAs.

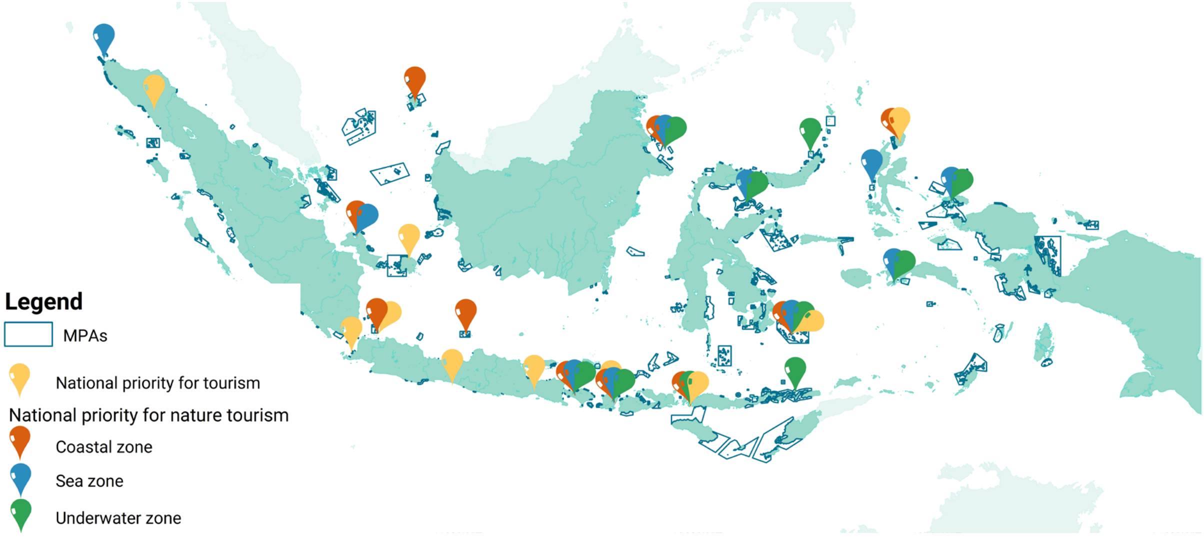


Figure 8.3. The ten national priority destinations for all tourism, also known as the "new Bali's" and the national priorities for nature tourism in coastal, sea, and underwater zones based on the Masterplan for National Tourism Development 2010–2025 (Rencana Induk Pembangunan Kepariwisataan Nasional/Ripparnas).

The ten national priority destinations are TNL Wakatobi, TNL Kepulauan Seribu, KKPD Morotai, Labuan Bajo, Tanjung Lesung, Belitung, Mandalika, Toba Lake, Borobudur Temple, and Bromo Tengger Semeru. The national priority areas for nature tourism per zone are (1) coastal zone: Natuna Anambas, Bangka Belitung, Kepulauan Seribu, Karimun Jawa, Derawan, Bali, Mandalika, Labuan Bajo, Wakatobi, and Morotai; (2) sea zone: Sabang Island, Belitung, Bali, Lombok, Derawan, Togean, Ambon, Ternate, Wakatobi, and Raja Ampat; and (3) underwater zone: Togean, Lombok, Bali, Alor, Derawan, Bunaken, Ambon-Banda, Labuan Bajo, Wakatobi, and Raja Ampat.

8.2 Potential Benefits and Threats from Marine Tourism

For many tropical developing countries, marine tourism contributes significantly to the economy, primarily in terms of foreign income and creating livelihoods, but can also have negative impacts on the environment, marine species, culture, society, and human rights (Hakim, Soemarno, and Hong 2012; Kinseng et al. 2018; Trave et al. 2017).

Marine tourism can provide many direct ecological, social, and economic benefits if managed well. It brings greater motivation for ocean protection, greater awareness of coastal environment dependency (Dwyer 2017), improving local communities' resilience and adaptive capacity to climate change (WWF-Pacific 2017), essential protection for species and habitats (Trave et al. 2017), as well as reducing pressures to ecosystems, such as unsustainable fishing activities (Lopes et al. 2015; Viana, Halpern, and Gaines 2017). Involving tourism stakeholders in MPA management can be a win-win solution, resulting in higher earned benefits for them and a greater probability of their support for biodiversity protection, such as developing monitoring programs using citizen science concepts (Kusumawati and Huang 2015; Leung et al. 2018). Marine tourism can increase benefits to fishers if they are involved in tourism activities as compensation of immediate loss through restrictions and closures (Lopes et al. 2015). Indirectly, marine tourism can be beneficial through an increase in employment opportunities, easier access to education, infrastructure improvement, expanded communication networks (such as mobile and internet access), maintained mental health, and development of new skills (Leung et al. 2018; WWF-Pacific 2017).

A study of the Belize Barrier Reef shows that marine tourism provides more benefit for local people through job opportunities, improving the quality of life and reducing fishing threats via the occupation shift from fishers to tour operators (Diedrich 2007). Marine tourism was proven to support coral reef conservation through raising awareness of tourists, which led to healthier corals. Government commitment to support local community welfare, involving local communities in all stages of tourism development, sustainable coastal development, and mitigation capacity for infrastructure and pollution are important aspects to be strengthened and implemented. These aspects are important to ensure the benefits of marine tourism are accessed by local people while protecting the coral reef ecosystems (Diedrich 2007).

Economic benefits from marine tourism are a derivative of those that directly (diving, snorkeling, etc.) and indirectly (beach, coastal activities) enjoy the environment, valued annually at USD 35.8 billion globally and USD 3.1 billion for Indonesia (Spalding et al. 2017). Marine tourism can be a source of support for managing PAs, using admission fees and charges as a source of revenue for conservation and management, as well as supporting local communities, enabling them in turn to support conservation (Dwyer 2017; Leung et al. 2018). It can also help to diversify local economies, offer additional livelihoods for communities, and contribute to the development of remote areas. Marine tourism can generate higher income than fishing activity, as was the case for whale shark tourism in TNL (*Taman Nasional Laut*; Marine National Park) Teluk Cendrawasih, Indonesia. In 2015, the economic value of whale shark tourism within TNL Teluk Cendrawasih reached more than USD 10 million that benefits the community directly and indirectly (Zuzy and Saputra 2017). Other positive impacts are socio-cultural, such as eliminating social prejudices and encouraging local pride in cultural traditions, such as with the Kataloka Festival in Koon, Indonesia, meant to raise awareness on art, culture, and environment, where it is listed under the Calendar of Events of Maluku Province (Festival Indonesia 2017; Rosana 2018). It has proved to benefit local community income (Madaul et al. 2018).

On the other hand, the impacts of marine tourism on the environment, economy, and society can be negative. Worldwide, marine tourism is dominated by mass tourism, implying that increasing numbers of people will access to a greater extent the marine world with sensitive environments (Dwyer 2017). High numbers of divers and snorkelers that are actively kicking and standing on the corals can damage the coral reef ecosystem. The increasing economic significance of marine tourism, the growth of nature-based tourism activities, and the perceived desire to experience environments as part of the tourist image have all led to an increase in research on the physical impacts of marine tourism (Hall 2001; Hany, Abdel-Hamid, and Amin 2010). Studies show that marine tourism development, in general, is responsible for land alteration (particularly in the coastal zone), an increase in energy and water consumption, extinction of species, threats and pressure on fish stocks, unplanned and unsustainable coastal development, pollution of air, light, sound, water, and other components of the natural ecosystem (Leung et al. 2018; Lopes et al. 2017; Papgeorgiou 2016), increased local living cost, dependency on tourism, and modification of traditional rituals, to name a few (Leung et al. 2018; WWF-Pacific 2017).

Intensive tourism infrastructure development also decreases water quality due to high sedimentation and eutrophication caused by coastal development and sewage run-off. This development increases nutrient concentration that leads to accelerated algae growth, thus blocking the sun from coral reefs (Hany et al. 2010). For example, TWP (*Taman Wisatan Perairan*; Aquatic Tourism Park) Gili Matra, Indonesia has been developed for tourism activities (scuba diving, snorkeling, sport fishing, canoeing, surfing, sunbathing) since the 1990s (Dahles and Bras 1999; Dodds, Graci, and Holmes 2010; Yulianto, Fahrudin, and Kusumaningsih 2007). As a result of intensive tourism development and large numbers of tourists (more than 400,000 tourists in 2014), the Gili Matra Islands experienced a decrease in coastlines by as much as 7.92 ha from 1972 to 2014 from sand mining, coral exploitation, and reclamation for construction of tourism facilities, as well as a decrease in live coral cover in most of the MPA area (Kurniawan et al. 2016). The Sunda Banda Seascape (SBS) also experienced ecological pressure due to marine tourism (Case Study 8.A).

Marine tourism and its associated value chain is not under any incentive to voluntarily avoid natural resource overexploitation (Lopes et al. 2017). Socio-environmental conflicts as a result of market competition are important to understand for MPA effectiveness. With continued increase in the number of tourists, the need for resources such as energy, food, and water are prioritized for them more than the local communities. This condition could lead to conflict with tourists and/or tourism operators and lead to an increase in criminal activities within the area. Though tourism provides opportunity for employment, offers are usually for lower positions that require low skill with low wages, and availability is dependent on the tourism seasons. Often, there is also unequal distribution of benefits, especially if dominated by a small elite group (Leung et al. 2018). Effects of marine tourism in Fernando de Noronha MPA, Brazil, for example, included an increased demand for fisheries commodities, which threatened the local fish stock, as well as a cultural loss due to non-extractive zone placed on traditional fishing grounds. Local people could not fish and were required to undergo endless bureaucracy to use the area for their recreational activities. The non-extractive zone also affected older fishers that could not quickly shift their livelihoods and potentially decreased their attachment to the traditional area due to the inability of access (Outeiro et al. 2019).

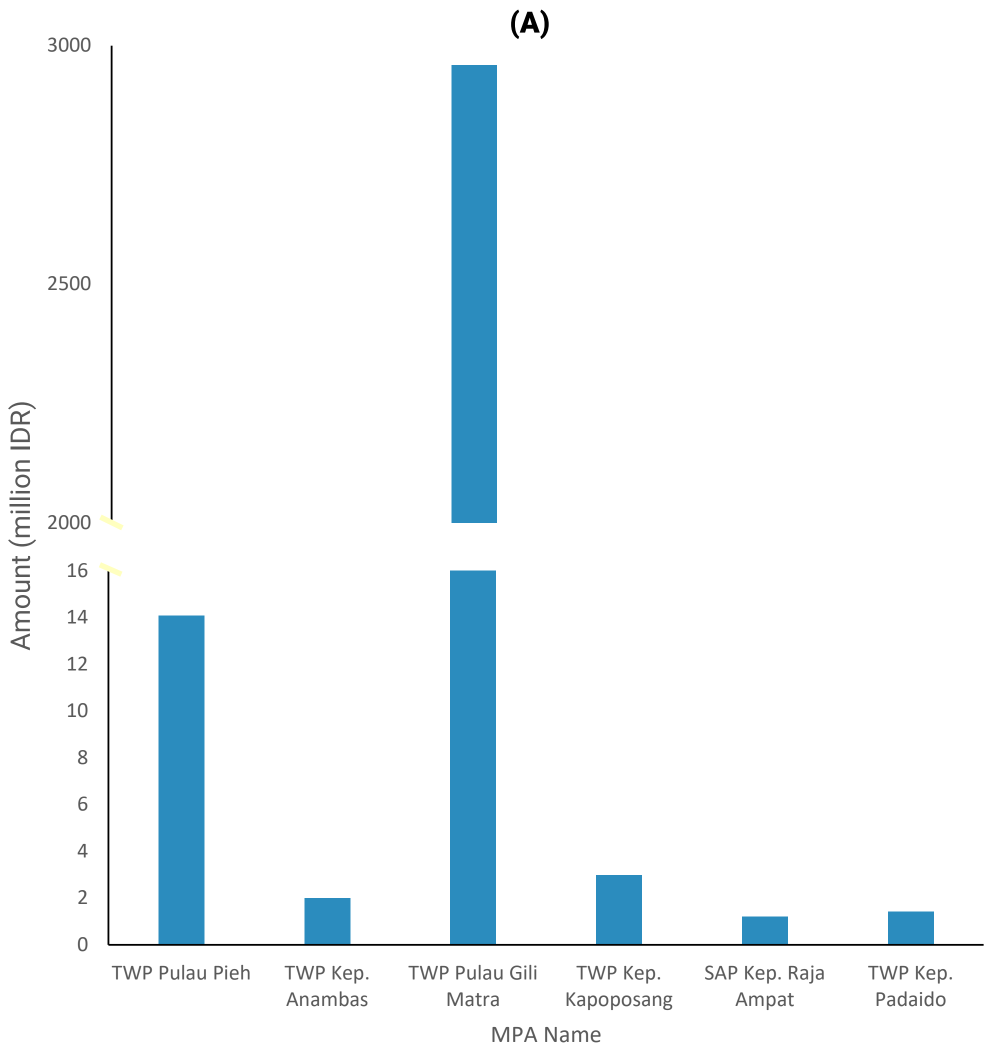
8.3 Marine Tourism within MPAs in Indonesia

8.3.1 Status and Trends in Indonesian MPA Tourism

As a result of the GoI's target to protect 23.4 million ha of coastal and marine areas within MPAs by 2020, MMAF rapidly established MPAs throughout Indonesia (Chapter 3), with many well-known as marine tourism destinations due to preserved marine biodiversity. To promote marine tourism within MPAs, the GoI also improved accessibility through enhanced transportation infrastructure as well as increased frequency of visits in seven national parks: TNL Bunaken, TNL Wakatobi, TNL Taka Bone Rate, TNL Teluk Cendrawasih, TNL Karimun Jawa, TNL Kepulauan Seribu, TNL Kepulauan Togean, and TN (*Taman Nasional*; National Park) Komodo (Asvaliantina 2019). These seven national parks under the management of MoEF have shown a steady increase in domestic and international visits from 2012-2018, with 3.4 million to 7.3 million domestic visits and 216,000 to 511,000 international visits, exceeding the target of 4 million visitors a year (Figure 8.2B Dirjen KSDAE 2016, 2017, 2018, 2019; Kemenhut RI 2012, 2013, 2014, 2015). As of 2019, diving destinations within MPAs are increasing, including TL (*Taman Laut*; Marine Park) Pulau Weh Sabang, TNL Kepulauan Seribu, TWP Gili Matra, TN Komodo, TP (*Taman Perairan*; Aquatic Park) and TPK (*Taman Pulau Kecil*; Small Islands Park) Kepulauan Derawan, TL Pulau Samama Sangalaki, TNL Bunaken, TNL Kepulauan Togean, TNL Wakatobi, TWP Kapoposang, TWP Taman Laut Banda, KKPD (*Kawasan Konservasi Perairan Daerah*; Provincial Marine Protected Area) Morotai, SAP (*Suaka Alam Perairan*; Aquatic Nature Reserve) Kepulauan Waigeo Sebelah Barat, TWP Raja Ampat, and TNL

Teluk Cendrawasih (Dermawan 2010; KKP RI 2012), though in fact diving can be done in all MPAs. In 2018, two of the most visited MPAs in Indonesia were TWP Gili Matra, Nusa Tenggara Barat (588,000 visits) and TWP Nusa Penida, Bali (253,000 visits) (Kicknews.today 2020; Mustofa 2019).

MMAF and MoEF have given particular attention to marine tourism as a sustainable financing mechanism and to provide livelihoods for local communities within MPAs (Gallegos, Vaahtera, and Wolfs 2005; Kurniawan et al. 2016; Pradati 2017) via national development laws (UU RI No. 5/1990, No. 31/2004 juncto No. 45/2009, No. 26/2007); and government regulations (PP RI No. 36/2010, No. 60/2007). Many MPAs under MoEF implemented an entrance fee system more than 20 years ago to support sustainable financing for each MPA (Walpole, Goodwin, and Ward 2001), while only a few MMAF MPAs applied a similar entrance fee system in the last several years. Since 2014, non-tax state income from entrance fees from seven MPAs under MoEF has increased each year, with a steep hike from 2017 to 2018 (Figure 8.2B). Meanwhile income from entrance fees from six MPAs under MMAF in 2019 reached almost IDR 3 billion, with the highest in TWP Gili Matra (Figure 8.4A; Ministry of Marine Affairs and Fisheries, unpublished data). A prediction of global average operational cost needed to be able to effectively manage MPAs for 2020-2050 is USD 2,000/km^2/year (Brander et al. 2015). The calculation includes costs for administration and management, monitoring, compliance and enforcement, communication, on-going research cost, periodic reviews, periodic revisions, and off-reserve management.



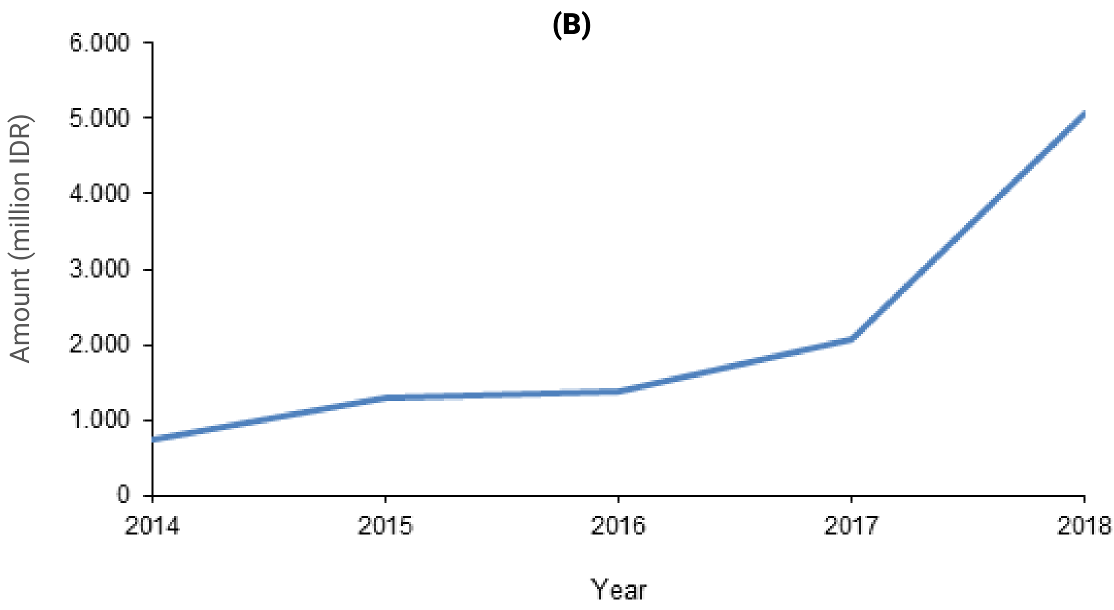


Figure 8.4. Non-Tax State Income (*Pendapatan Negara Bukan Pajak*/PNBP) from (A) six MPAs in Indonesia in 2019 (Ministry of Marine Affairs and Fisheries, unpublished data) and (B) seven national parks in Indonesia from 2014–2018 (TNL Bunaken, TNL Karimun Jawa, TNL Kepulauan Seribu, TNL Kepulauan Togean, TNL Taka Bone Rate, TNL Teluk Cendrawasih, and TNL Wakatobi) (Dirjen KSDAE 2016, 2017, 2018, 2019; Kemenhut RI 2012, 2013, 2014, 2015).

8.3.2 Marine Tourism Management in MPAs

Marine tourism within MPAs in Indonesia is defined as activities inside conservation areas for enjoying the unique and beautiful natural scenes within those areas (Suraji et al. 2010). Of ten MPA categories managed by MMAF (Chapter 1), four include tourism development as part of their main objectives: TNP (*Taman Nasional Perairan*; Aquatic National Park), TWP (*Taman Wisata Perairan*; Aquatic Tourism Parks), TP (*Taman Pesisir*; Coastal Parks), and TPK (*Taman Pulau Kecil*; Small Islands Parks) (Lubis et al. 2014). As of 2019, there are 20 of 166 MMAF MPAs that fall within these categories. Of the five MPA types managed by MoEF (Chapter 1), only KPA (*Kawasan Pelestarian Alam*; Nature Conservation Areas), which include TN (*Taman Nasional*; National Parks), TWA (*Taman Wisata Alam*; Nature Recreational Parks), and TAHURA (*Taman Hutan Raya*; Grand Forest Parks) are allowed for tourism use. As of 2019, there are twelve TWA out of 30 MoEF MPAs in Indonesia. Although only certain types of MPAs include tourism as part of their main objective, tourism development can be implemented in all types of MPAs.

MPAs in Indonesia are managed using a zonation system (Chapter 6). For MMAF MPAs, marine tourism activities can be implemented within certain zones: Sustainable Fisheries Zone (*Zona Perikanan Berkelanjutan*), Use Zone (*Zona Pemanfaatan*), Limited-Use Zone (*Zona Pemanfaatan Terbatas*), and Other Zone (*Zona Lainnya*), following Permen KP No. PER.17/MEN/2008; PP RI No. 60/2007. Marine tourism activities that are allowed within MPAs are divided into two groups: tourism activities (such as water sports, sightseeing, education tourism, and research tourism) and tourism businesses (services: tours and travels, transportation, guides, food and beverages, and tourism information; and amenities: water sport facilities, accommodations, and adventure facilities) (Suraji et al. 2010). However, details on tourism implementation within MPAs, such as the total allowable number of tourists per area per day, monitoring and evaluation system, etc. are not regulated by the national regulations. Similar to MPAs under MMAF, MoEF MPAs are managed under a zonation/block system, and marine tourism can be done in the Use Zone (*Zona Pemanfaatan*), Marine Protected Zone (*Zona Perlindungan Bahari*), Traditional Zone (*Zona Tradisional*), and Religious, Cultural, and Historical Zone (*Zona Religi, Budaya, dan Sejarah*) (Permen Hut No. P.56/ Menhut-II/2006; Permen LHK No. P.76/ Menlhk-Setjen/2015).

8.3.3 Community-Based Tourism

As mentioned previously, nature attraction in Indonesia accounts for 35% of tourists' preference, and of that, 45% prefer ecotourism, 35% marine tourism, and 20% adventure tourism (Ollivaud and Haxton 2019). A shift from mass tourism to ecotourism, or sustainable tourism (*Pariwisata Berkelanjutan*), is occurring within the marine realm, and offers opportunities for both improvements in community welfare and conservation, such as through Community-Based Tourism/ CBT (*Pariwista Berbasis Masyarakat*). CBT is defined as ecotourism which focuses on enhancing the role of an active community. Involving the local community is crucial due to its strong knowledge on nature and culture where it lives (Lopes et al. 2015; Suraji et al. 2010). The success of CBT is strongly driven by three important aspects: respect to society and culture, benefits to society and economy, and sustainability (Drumm and Moore 2005; Gunn and Var 2002; Weaver 2005).

CBT is often a tool used in the development of sustainable tourism, and prioritizes local community participation during tourism development planning and operations, aiming for the sustainability of local economy, culture, and the environment while providing a satisfactory CBT experience for visitors (Ernawati, Sudarmini, and Sukmawati 2018). It is also a tool for community development, with potency to diversify livelihoods, increase economic income from ecotourism activities, and increase awareness and involvement of communities in MPA management. Nevertheless, developing CBT, in many cases, can face many constraints which include a lack of capital and human resources as well as a long decision-making process. If CBT is to be promoted and integrated into MPA management, proper planning and management are needed to prevent adverse effects on the environment. Regardless of the constraints, CBT appeals to many communities and governments to use marine tourism as a means of development (Ernawati et al. 2018).

8.3.4 Benefits from Marine Tourism for MPA Management

Conservation and marine tourism can be mutually beneficial, and CBT is one method of achieving this. MMAF strongly suggests developing community-based ecotourism to reduce extractive use of marine resources (Suraji et al. 2010). However, tourists themselves can become involved in marine conservation. In TNL Kepulauan Seribu, for example, tourists not only provide incentives for conservation and community livelihoods, but also increase participation of tourists and other stakeholders in ecosystem rehabilitation, thereby maintaining coral cover and increasing mangrove forest extent with help from local communities, tourists, companies, and other stakeholders (Kepulauan Seribu National Park 2020; Putri and Kristiyanto 2018). With careful planning and management, such activities can become new ecotourism programs and packages that can be sold to tourists (e.g. mangrove replanting activities, adopt-a-coral, etc.). Another approach is using marine tourism as a sustainable financing tool to support conservation and increase knowledge awareness. TNL Bunaken uses a formalized entrance fee system, allocating 80% of the income for conservation programs to cover law enforcement, environmental education, and waste management, as well as a small grant program, from which 30% of the fund is used for local communities to develop small-scale conservation and community development projects (Cater and Cater 2008). Another example is in Raja Ampat, where a network of six MPAs exists; here, the entrance fee is a form of Payment for Ecosystem Services (PES) arrangement, developed by the local authority in 2007 to generate revenue to cover marine conservation. PES is designed as an incentive for the managers to reduce threats and protect their environment (Atmodjo, Lamers, and Mol 2017; Mangubhai et al. 2012). Approximately USD 120,000 of tourism revenue from the MPA network is disbursed to a community fund, with the rest for management costs (Atmodjo, Lamers, and Mol 2019). According to Maas et al. (2020), visitors in Raja Ampat MPA increased 30 fold since 2007, from 998 to 28,896 visitors in 2018, suggesting that tourists are willing to pay MPA fees to contibute to management in order to visit the MPAs.

Marine tourism can support conservation and the welfare of the local communities, but a development plan is crucial to counteract the negative impacts that may occur. In order to address negative impacts caused by tourists, codes of conduct are a commonly used tool to reduce tourism impacts, should be established via stakeholder input, and be based on sound science (Yusri 2013). One such code of conduct is implementing a carrying capacity threshold, as mentioned in the Code of Ethics, Article 3 specifically for nature tourism and ecotourism (United Nation of World Tourism Organization 2010). This is being used, for example, to reverse the decrease in the number of manta rays observed in 2012 in the Manta Sandy spot in KKPD (*Kawasan Konservasi Perairan Daerah*; Provincial MPA) Selat Dampier. Currently, limits include a maximum trip size of 30 – 40 divers, with a carrying capacity of 11 divers per trip and a maximum of three trips per day (Papilaya, Boli, and Nikijuluw 2019). One approach underway to address tourist levels in general is the disbursement of tourism concentration from Bali, where half of foreign tourists are received, to other MPA destinations across Indonesia.

As MPAs are increasing in number (Chapter 3) and inadequate resource availability can pose a series of challenges to MPA management effectiveness (Chapter 5), different strategies are needed to provide benefits for the local community as well as reduce threats and protect biodiversity. Marine tourism is one of the potential options to fill the gap; however, as the number of tourists keeps increasing, if not developed carefully, it will lead to adverse impacts within MPAs. A multi-stakeholder approach and CBT in developing marine tourism within MPAs is key, supported by codes of conduct and sustainble practices. Following the Global Sustainable Tourism Council (GSTC) perfomance indicators, efforts in developing sustainability in the tourism sector must incorporate four aspects of sustainability: sustainable management, socio-economic sustainability, cultural sustainability, and environmental sustainability (The Global Sustainable Tourism Council 2019).

8.4 Challenges and Opportunities

Biodiversity conservation can be argued as the most vital element and a prerequisite for nature-based tourism success, particularly in MPAs. No tourism effort is likely to be sustainable unless it involves proper biodiversity conservation scenarios; MPA managers should implement methods such as mapping biodiversity, designing areas to accommodate biodiversity conservation, and protecting fragile seascape-landscape areas to prioritize conservation (Hakim et al. 2012).

While biodiversity richness presents an opportunity to attract tourists, there is an obvious challenge that affects conservation objectives: the impact of tourists within the MPA and subsequent limited monitoring of these activities. This can affect management and effectiveness of MPA implementation; lack of coordination and compliance as well as a greater interest in economic exploitation can hinder sustainable tourism practices (Trave et al. 2017). Value and quality of the environment is the most important aspect in attracting tourists to visit as well as their willingness to re-visit in the future and to pay an entrance fee to visit. Control of tourist numbers and activities is required, especially given that more tourists are visiting destinations to areas once they are designated as MPAs (Figure 8.2). Implementing carrying capacity studies and/or tolerance limits, as well as tourism perceptions for tourism accommodation and management is a potential solution. It must be emphasized and included within MPA management plans or other forms of regulation, however, that strong enforcement is essential, from developing formal regulations on rules and ethics to socializing them to communities, government, media. etc. (Papilaya et al. 2019; Petrosillo et al. 2007). Without a proper marine tourism management plan and implementation, MPAs will have risk exposure to mass tourism impacts. An associated challenge is limited access, amenities, and capacity to promote marine tourism in most MPAs, especially for MPAs in remote areas. If marine tourism is to be expanded across MPAs, capacity, infrastructure, and management capacity will need to be improved as well.

Perhaps the biggest challenge for promoting marine tourism within MPAs is the dual use for fisheries: because of conflicting activities and the fear of losing control and access to natural resources, negative attitudes can occur, especially from the fishing community, due to fisherman marginalization and local livelihood transitions caused by the development of tourism facilities (Wibisono and Rosyidie 2016). This can also affect biodiversity objectives, such as in TWP Gili Matra (Plummer and Fennell 2009). Fisheries and tourism must share the benefits, and the local people must be involved in participatory planning. Higher levels of organization could likely empower fishers to establish a more beneficial value chain for themselves with value added to sustainably exploited products (Lopes et al. 2015). Indeed, fishing activities actually provide many assets to tourists and present diversification in available activity (Wibisono and Rosyidie 2016). Diversification of fisheries is already successful in other tourism markets such as the Maldives, where shark fishers shifted to the tourism market through reef fish suppliers and work directly in the tourism sector (Zimmerhackel et al. 2018). A holistic approach with integrated coastal management practices for fisheries diversification development should be included for MPA and fisheries management effectiveness. A more indirect approach is to involve the community (especially key members) and emphasize respect for their rights to protect biodiversity. For example, Misool Eco Resort in Raja Ampat, Indonesia has been supporting tourism and conservation since 2005 by developing a non-extractive zone. An agreement between the resort developer and the community was made to ban fishing within the area and in turn the latter is allowed to harvest two types of shellfish when it opens every two years. The resort "rents" the area and pays a fee to the community every five years. They also provide other benefits such as health insurance, job training, and English lessons. This approach garnered the least conflict and gained commitment from the community (Niesten and Gjertsen 2010).

Adaptive co-management can be an effective governance solution to many of these challenges, particularly fisheries, and can also capitalize on present opportunities (Case Study 8.B). This concept has been used in cases of natural resource management, including MPAs and fisheries, as an alternative to traditional approaches, as well as in the context of climate change adaptation. Adaptive co-management champions participatory "bottom-up" approaches to planning, management, and governance, which empowers and benefits local communities. "Top-down" "command and control" governance approaches are seen as ineffective at addressing the underlying social and ecological system complexities and uncertainties faced by PAs, particularly those that are also tourism destinations and so face additional complexity in their governance systems (Islam, Ruhanen, and Ritchie 2018). Failure to consider the existing socio-economic and cultural context of the destination where marine tourism is occurring could lead to negative repercussions on the local population, thereby eliciting negative impacts on marine wildlife and on tourists.

If communities are marginalized through tourism development, the resulting conflict could jeopardize the sustainability of the tourism industry itself (Kinseng et al. 2018).

Developing marine tourism in MPAs in Indonesia will never be a static process. Active participation, information sharing, cooperation, respect to local culture, and compliance to the regulation and zonation within MPAs of all different parties involved (i.e. governments, management agencies, researchers and scientists, operators, and local communities) in the main stages (planning, managing, monitoring) of the industry are required to ensure long-term ecological sustainability, with continued benefits. Incorporating needs and interests of tourists in the management plan is also important to effectively promote marine tourism within an MPA and strategically mollify threats (Petrosillo et al. 2007). Developing sustainable nature and marine-based tourism is ultimately more beneficial than mass tourism, due to tailored consideration of the specific environment as well as local culture (WWF-Pacific 2017).

Case Study 8.A
Mapping Tourism Pressure in the Sunda Banda Seascape MPA Network

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The Sunda-Banda Seascape (SBS) is a biodiverse ecoregion located in southeast Indonesia, encompassing 151 million ha across seven provinces; its MPA network consists of 85 MPAs, covering 9.6 million ha (Setyawan et al. 2017). More than 2.4 million households in the SBS rely on access to marine resources for their livelihoods and needs (Burke et al. 2012). The region has been identified by the Government of Indonesia (GoI) as a marine conservation priority (Setyawan et al. 2017), while parts of the SBS have also been earmarked for future tourism development.

Within the SBS, Tourism Zone are established within MPAs as non-extractive zone, though these have been implemented in only 17 of the 85 MPAs that have zones as of 2017 (Setyawan et al. 2017). Tourism has not been extensively studied in the SBS, but implications, particularly ecological, from tourism pressure through monitoring and modeling are now being brought to light. One recent study determined existing spatial patterns around tourism development in the seascape (Husseini 2020). Broadly, the level of tourism development declines in MPAs that are further removed from existing development, in particular, MPAs located farther east. Tourism pressure in and around MPAs varies spatially, with some MPAs experiencing higher tourism pressure directly along or within its borders while others have established tourism hubs located farther away.

The study of nine MPAs across the SBS – TNL Wakatobi, KKPD Provinsi Sultra, KKPD Pulau Koon, TPK Kei Kecil, KKPD Kepulauan Tanimbar, SAP Selat Pantar, KKPD Flores Timur, and TWP Taman Laut Banda – and one with intense marine tourism, TN Komodo, spatially modeled tourism pressure via the concept of “gravity” and fish biomass to determine if MPAs with higher levels of tourism may have high fish biomass as a result of reduced fishing pressure and greater conservation incentive (i.e. a more lucrative form of income for fishers) (Figure 8.A.1).

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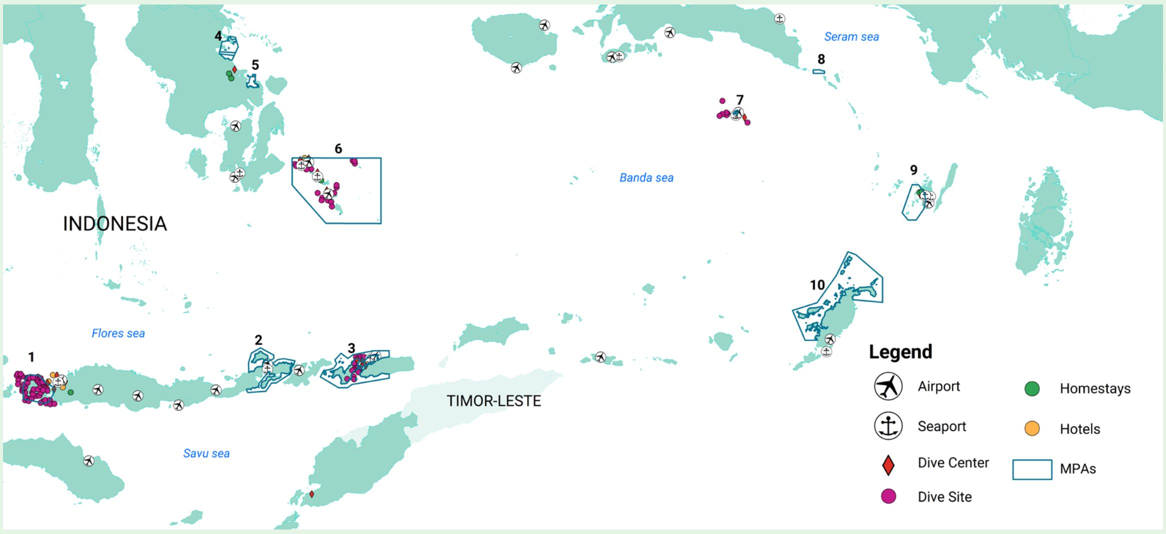

Figure 8.A.1. Tourism variable locations found within 35 km of MPA Boundaries. (1) TN Komodo (2) KKPD Flores Timur (3) SAP Selat Pantar (4) TWA Teluk Lasolo (5) KKPD Provinsi Sultra (6) TNL Wakatobi (7) TWP Taman Laut Banda (8) KKPD Pulau Koon (9) TPK Kei Kecil (10) KKPD Kepulauan Tanimbar.

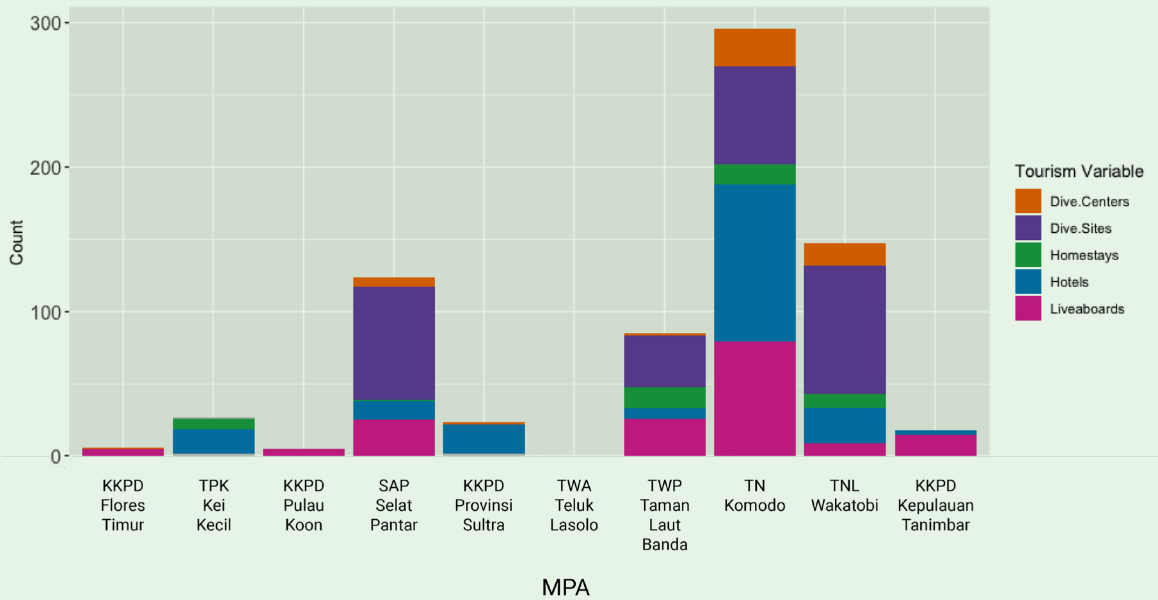

Figure 8.A.2. The number tourism points found in or around MPAs, broken down by tourism variable type.

This concept of "gravity" states that the interaction between two places is positively related to mass (e.g. population size) and inversely related to distance (Anderson 2011). A "tourism gravity" function was adapted based on methods used by Cinner et al. (2018) and Threlfall (2018), derived by mapping the locations of marine tourism variables such as dive sites, dive centers, hotels, homestays, liveaboards, and air and sea ports (variables collected from online resources; for more detailed methodology, please refer to Husseini (2020)). The gravity for total tourism pressure in an example MPA is shown in Figure 8.A.2.

Though the analysis did not find a statistically significant relationship (R^2 =0.005, d.f = 131, p >0.1) between tourism pressure and fish biomass, the model has much potential for further exploration and highlighted important nuances between MPAs: although TN

Komodo exhibited the highest level of tourism pressure, it was concentrated around the port town of Labuan Bajo, approximately 20 km beyond the MPA borders. However, in TNL Wakatobi and SAP Selat Pantar – which have established dive industries but are lagging in supporting industries such as hotels, homestays and liveaboards – tourism development lies along the borders of the MPA. More remote MPAs such as KKPD Pulau Koon and KKPD Kepulauan Tanimbar show virtually no signs of tourism development and are likely to remain so if transportation infrastructure (i.e. airports and roads) remain undeveloped, thereby limiting access.

Going forward, tourism and MPA managers may consider the possible benefits of maintaining a "buffer" distance between MPA borders and tourism hubs as well as ways of monitoring the impacts of tourism.

Case Study 8.B
Development of Marine Tourism in TWP Nusa Penida, Bali

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The waters surrounding the Nusa Penida Islands have been designated as an MPA by MMAF decree since 2014. The ecosystems and animals targeted for conservation in TWP (*Taman Wisata Perairan*; Aquatic Tourism Park) Nusa Penida include coral reefs, mangrove forests, seagrass beds, manta rays, sunfish, sea turtles, sharks, whales, and dolphins. The primary objective of the MPA is to protect these natural resources, which are the main assets for marine tourism in Bali (Darma, Basuki, and Welly 2010). One of the zones in TWP Nusa Penida is a zone of limited use for marine tourism activities. In this zone, only activities such as diving, snorkeling, swimming, and sailing are allowed. Extractive activities such as fishing are not permitted in marine tourism zones.

The coral reefs, manta rays, and sunfish in TWP Nusa Penida have become an extraordinary attraction for tourists. Marine tourism activities here have developed fairly quickly, with the number of domestic and international visitors to the islands growing almost every year since the MPA was established in 2014 (Figure 8.B.1), bringing economic benefits to businesses and communities of the islands. Facilities to support the growing tourism industry have expanded, with the number of hotels and accommodations on the islands more than doubling between 2015 and 2017 (BPS RI 2019a).

This condition has raised challenges in the management of TWP Nusa Penida, as some of the facilities and recreational activities that support tourism threaten the natural resources the MPA is intended to conserve. Increasing amounts of litter, lack of environmental awareness by visitors, and damage to the seafloor caused by pontoons — moored structures with shower and toilet facilities that accommodate dozens or even hundreds of visitors at a time — have been reported by TWP Nusa Penida authorities (Jubaedah and Anas 2019). The growing number of speedboats and divers at popular sites such as Crystal Bay and Manta Point pose a threat to coral reefs, manta rays, and sunfish (Bato, Yulianda, and Fahruddin 2013). In the absence of quotas or restrictions on the number of boats and tourists that can visit dive sites, these sites have become overcrowded to the point that even human safety has been jeopardized (Coconut Bali 2018). Conflicts have been reported between pontoon operators and dive operators (Jubaedah and Anas 2019), and senseless acts of eco-vandalism, presumably by visiting divers or snorkelers, have left letters carved into living table corals (The Bali Sun 2020).

Patrols to enforce MPA regulations have been limited, in part due to the change of authority from Klungkung Regency to the Bali Provincial Government (UU No. 23/2014), As the transfer of authority has not yet been completed, budget and other constraints limit the management unit's ability to conduct patrols, supervise the behavior of tour operators and visitors, and enforce the MPA's zoning regulations. This has led to violations in the marine tourism zone. While a marine tourism code of conduct exists for the MPA, it is only implemented on a voluntary basis.

In order to regulate and limit the number of tourists, especially those who come for diving and snorkeling, studies are currently being conducted regarding the carrying capacity of the dive sites in TWP Nusa Penida. These study results are expected to provide recommendations on the number of tourists and speed boats that should be allowed at each site to minimize disturbance to coastal ecosystems and marine life. A visitor entrance fee was established in 2017 partly to control the number of tourists; due to the shifting management from municipality to provincial government, the entrance fee system needs to be reactivated. The management unit hopes that the funds collected can be used to strengthen patrol and surveillance (pers. comm. Head of the TWP Nusa Penida management unit 2020).

The role of tour operators is very important in educating tourists in how to avoid damaging or disturbing coastal ecosystems and marine life. A small but growing number of marine tourism businesses in the Penida islands have been certified through Green Fins, a conservation initiative of the United Nations Environment Program (promotes environmental standards for responsible marine tourism; https://www.greenfins.net/). Divers with operators who follow these standards have been found to make significantly less physical contact with the reef than divers with operators who do not (Roche et al. 2016).

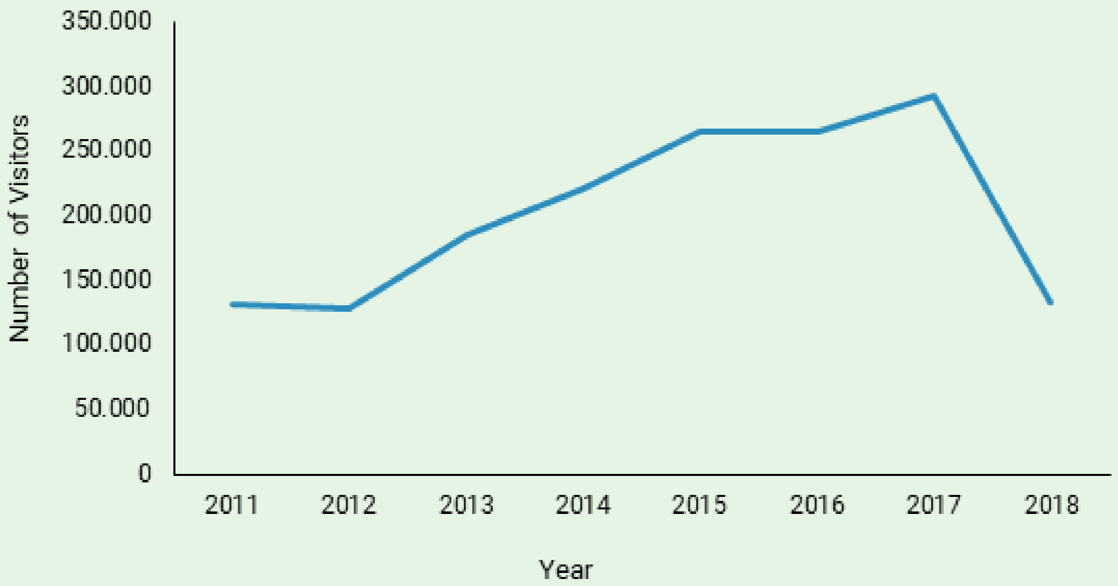

Figure 8.B.1. The annual number of foreign and domestic visitors to Nusa Penida grew in most years from 2011-2018 (BPS RI 2016, 2019a).

Ecological conservation and a thriving marine tourism industry can be mutually achieved if they are managed effectively. An MPA can provide healthy marine ecosystems and environmental services that can be enjoyed by tourists, as well as economic and social benefits to the communities living within. The development of marine tourism in an MPA should focus on environmental sustainability and conservation goals, and adherence to zoning rules as well as a marine tourism code of conduct should be mandatory. The marine tourism code of conduct should align with international standards, adapted to the local cultural and environmental context. Sufficient resources and capacity to manage marine tourism activities are necessary for the MPA management unit, including development plans for sustainable marine tourism in MPAs.

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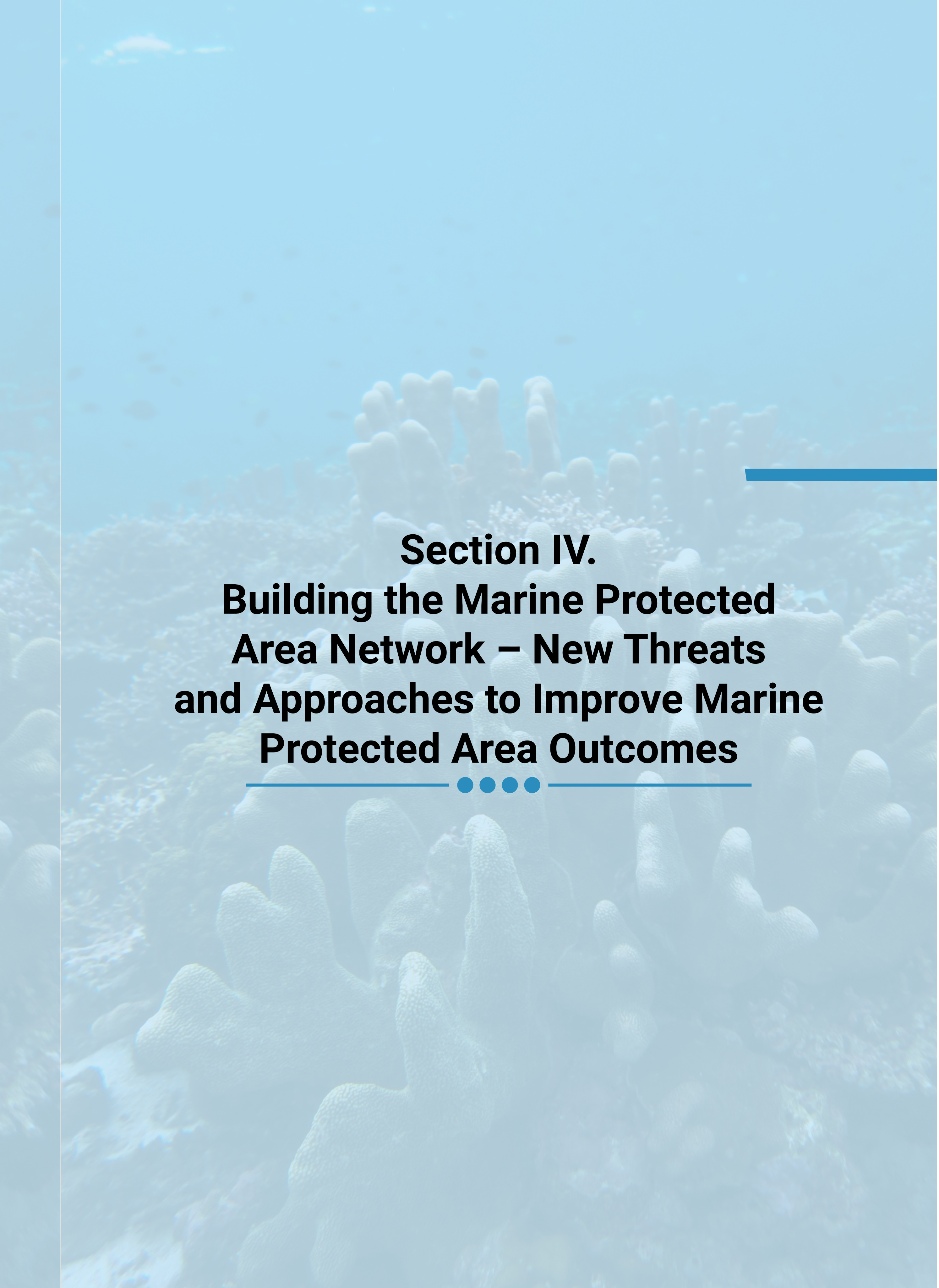

Section IV.
Building the Marine Protected Area Network – New Threats and Approaches to Improve Marine Protected Area Outcomes

Chapter 9. Climate Change and Marine Protected Areas

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Abstract

This chapter presents a general overview of climate change trends, impacts, and climate-resilient marine conservation policy in Indonesia. We introduce the ways in which the Government of Indonesia can address the growing threats from climate change — via climate change mitigation, adaptation, and building social-ecological resilience. Building resilience in coastal populations (often through co-management of marine protected areas, or MPAs) and implementing MPAs are useful strategies to build resilience and adapt to climate change. Local participation and stakeholder involvement are vital to develop and implement local and national policy on climate change. Establishing locations of climate stress refuges and identifying climate-resilient reefs will be necessary to strategically place future management actions.

Abstrak

Bab ini menyajikan gambaran umum mengenai tren dan dampak perubahan iklim serta kebijakan konservasi perairan yang terkait dengan ketahanan terhadap perubahan iklim di Indonesia. Terdapat beberapa pendekatan yang dapat digunakan oleh Pemerintah Indonesia untuk menghadapi berbagai macam ancaman dari perubahan iklim, yaitu melalui mitigasi dan adaptasi perubahan iklim, serta pembangunan ketahanan sosial-ekologi. Membangun ketahanan (resiliensi) pada masyarakat pesisir (melalui mekanisme pengelolaan bersama (co-management) *Kawasan Konservasi Perairan/KKP) dan melaksanakan KKP merupakan strategi untuk membangun ketahanan dan adaptasi terhadap perubahan iklim. Partisipasi masyarakat lokal dan pelibatan berbagai pemangku kepentingan merupakan hal penting untuk mengembangkan dan melaksanakan kebijakan lokal dan nasional yang berkaitan dengan perubahan iklim. Mengalokasikan lokasi yang tahan dari ancaman tekanan iklim dan mengindetifikasi terumbu karang yang memiliki ketahanan terhadap perubahan iklim akan sangat dibutuhkan untuk menentukan tindakan pengelolaan yang strategis di masa mendatang.*

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9.1 Introduction

Climate change severely threatens Indonesia's marine ecosystems and the negative impacts are projected to worsen with the continued rise in global emissions (IPCC 2019). Indonesia is part of the Coral Triangle, the heart of coral reef biodiversity (Veron et al. 2009). Indonesia's mega-diverse coastal ecosystems are already threatened by the changing climate, jeopardizing livelihoods, and food security for coastal populations. Ocean warming due to climate change is projected to cause a 20% decline in marine fisheries production by 2055 in Indonesia (Cheung et al. 2010). Critical coastal marine ecosystems such as coral reefs, mangrove forests, and seagrass beds are impacted by a range of climate stressors, though the focus is often on coral bleaching caused by ocean warming due to the large scale at which impacts can occur (Hughes et al. 2017). Other climate stressors, such as tropical cyclones and sea-level rise, alongside thermal stress, threaten all shallow marine ecosystems including coral reefs, mangrove forests, and seagrass beds (Alongi 2015).

The social and ecological impacts of climate change are a challenge for resource managers, policymakers, and resource users alike. The "*social-ecological resilience*" concept will be critical in helping managers develop strategies and plans to manage marine resources in a changing climate. Resilience can be defined as "*the capacity to deal with change while continuing to develop*" (Stockholm Resilience Centre 2015). WWF defines resilience as the ability of a social-ecological system to absorb and recover from shocks and disturbances, maintain functionality and services by adapting to chronic stressors, and transform when necessary (Hehmeyer et al. 2019). Tools that emerged from "resilience thinking" can help resource managers and policymakers carry out necessary tasks for marine resource management in a changing climate, such as assessing the vulnerability of coastal communities, impacts from climate change on both people and ecosystems, and how people might respond and adapt to these changes (Marshall et al. 2010).

Marine Protected Areas are recognized as a useful tool for building ecological resilience that can help local resource managers and governments cope with global environmental stressors such as climate change. Reduction of other stressors through MPAs can improve the general resilience of local marine populations to climate-related stressors (Micheli et al. 2012), for example, MPAs provide protection for juvenile organisms such as corals, and allow them to recover after severe climate-related disturbances, such as coral bleaching events. MPAs also protect other coastal marine ecosystems such as mangrove forests and seagrass beds which are essential for carbon sequestration (Crooks et al. 2011). However, MPAs should be designed carefully to meet their goals. Local engagement is important for strengthening MPA management. Several actions and points to be considered in designing, managing, and monitoring MPAs will be discussed later in this chapter.

9.2 Historical and Projected Changes in Climate

Indonesia is severely threatened by climate change. Mass coral bleaching occurred in some regions of Indonesia in 1983, 1997/98, 2010, and 2016 (Brown 1990; KKHL & PRL KKP 2016; Maynard et al. 2012; Wilkinson and Hodgson 1999). Coral bleaching has led to substantial damage to coral reefs on a global scale (16% of reefs suffered lasting damage in 1998 alone), with some areas losing 50–90% of their coral cover (Wilkinson 2000). Further degradation is predicted: severe coral bleaching events may be an annual occurrence by mid-century, even under optimistic climate scenarios (Van Hooidonk et al. 2016). Moreover, most islands including Jawa, Sumatra, Bali, Nusa Tenggara Timur, and Sulawesi Utara are moderately to highly vulnerable to climate change according to the SIDA vulnerability index (Yusuf and Francisco 2009). This vulnerability index was calculated as a function of exposure (exposure to climate-related hazards), sensitivity (human sensitivity to climate-related hazards), and adaptive capacity within social-ecological factors (Yusuf and Francisco 2009). Changes in climatic conditions have occurred in the last decade in Indonesia and are likely to accelerate in the coming decades.

The average sea surface temperature (SST) increase in Indonesia is higher than in other tropical countries (IPCC 2007). SST is projected to increase by 1–1.2°C by 2050 (KemenPPN/Bappenas RI 2014), and it has been suggested that sea level rise could be 7 mm/year and potentially even greater in some locations (KemenPPN/Bappenas RI 2014). Global sea level rise is projected to increase further by 2100 with averages of 8 to 16 mm/year (Church et al. 2013). Precipitation has varied both spatially and temporally and is likely to change in the coming decades (KemenPPN/Bappenas RI 2014). For example, time-series data up to 2010 showed that Sumatra island's rainfall has increased between 10–50 mm/year, whereas other islands such as Nusa Tenggara, Maluku, and Kalimantan are experiencing a decrease in rainfall and higher seasonal/inter-annual variance (KemenPPN/Bappenas RI 2014). While the majority of Indonesia is outside the tropical cyclone belt, tropical cyclones, including those of high intensity (Categories 4 and 5), have tracked near the northern and southern boundaries (Knapp et al. 2010; 2019). There is medium to high certainty that the proportion of high-intensity tropical cyclones will increase under future climate change (Knutson et al. 2020), which may impact Indonesia's southern and northern regions as a result.

The global oceans have absorbed almost one-third of the anthropogenic CO_2 emitted causing altered carbonate chemistry (Hoegh-Guldberg et al. 2018). The pH of the surface seawater has decreased by 0.1 since the pre-industrial era (Rhein et al. 2013). Ocean acidification is projected to cause a further 0.30–0.32 decrease in pH under the most fossil fuel-intensive emissions scenario (IPCC 2013). These projected changes will inevitably have consequences on both ecological and social systems in Indonesia (Figure 9.1).

9.3 Climate Change: Ecological Impacts

Coastal areas and small islands are very vulnerable to climate change (Diposaptono, Budiman, and Agung 2013). Coral reefs are severely threatened by climate change, as habitat-building corals already live at the upper limit of their thermal tolerance. Whilst not all coral individuals will die as a result of bleaching, thermal stress can lead to reduced fecundity and survival of recruits. However, coral species are not equally susceptible to coral bleaching or the negative impacts of other climate-related stressors (Pandolfi et al. 2011). For example, *Acropora* spp. and *Pocillopora* spp. severely bleached in Sumatra in 2010 while *Porites* spp. and *Montipora* spp. were less affected (Guest et al. 2012). In southern Sulawesi in 2020, widespread bleaching of Fungiids and massive *Galaxea* spp. was observed, with *Acropora* and other branching species less affected (*pers obs. by* Beger, M 2020). During the 2009 bleaching event, Amed in eastern Bali had the highest recorded hard coral bleaching in Bali – with 40% of hard coral in the area bleached. While the lowest level of bleaching was found at Tulamben (10%). The 2019 Bali bleaching affected the following corals: *Acropora* (tabulate and branching), *Astreopora, Ctenactis, Diploastrea, Favites, Fungia, Galaxea, Goniastrea, Heliopora, Hydnophora, Lobophyllia, Millepora, Montipora, Pavona, Pectinia, Platygyra, Pocillopora*, *Porites, Sandalolitha, Stylophora* (submassive and encrusting), and *Symphyllia*. The hard coral species more susceptible to bleachings, such as *Pavona, Pocillopora, Seriotopora,* and *Stylophora*, experienced severe bleaching, while the more resistant hard corals, such as *Porites*, were partially bleached, or not bleached at all. The soft corals *Sarcophyton* and *Sinularia*, anemones, and zooanthids were also bleached (*field obs.* Reef Check Worldwide 2009). During the 2016 bleaching event, 63% of hard corals in Amed experienced bleaching, and 42% in Tulamben (*field obs.* Reef Check Indonesia 2016).

However, long term monitoring before, during, and after bleaching events is very limited in Indonesia, thus the long term impacts of mass coral bleaching, such as the 2016 bleaching event, are unknown. Data collection is challenging due to the size, scattered distribution, and remoteness of coral reefs in Indonesia, besides the limitation of resources to carry out monitoring. To overcome these challenges, the Ministry of Marine Affairs and Fisheries (MMAF) is strengthening existing cooperation between NGOs, local government, and communities to participate in rapid coral bleaching surveys. In 2016, they reported that bleaching extended to most regions of Indonesia (KKHL & PRL KKP 2016). This cooperation to gain information is important to support the strategic choices and placements of management interventions.

Climate change is reported to cause a change in marine, terrestrial, and freshwater species distributions (Pecl et al. 2017). The change of land and sea surface temperature may contribute to shifting species ranges or range constrictions in the tropics. For example, a change in distribution pattern and a decline in production of skipjack tuna *Karsuwonus pelamis* caused by the change of sea surface temperature and chlorophyll-a distribution were reported in Bone Gulf, Sulawesi Selatan (Putri, Zainuddin, and Putri 2018).

Ocean acidification lowers coral growth rates and impairs recovery following disturbance (Van Hooidonk et al. 2014). Conversely, increased CO_2 may benefit adjacent seagrass beds and mangrove forests areas by enhancing photosynthesis and productivity (Unsworth et al. 2012; Wang et al. 2015). Seagrass beds in Indonesia also buffer against ocean acidification by reducing the dissolved inorganic carbon content of seawater and increasing the availability of carbonate ions for coral reef growth (Unsworth et al. 2012). Such interactions between ecosystems demonstrate the potential benefits of developing climate-resilient conservation initiatives that encompass a range of marine ecosystems.

Sea level rise due to the melting of major ice sheets degrades coral reef, mangrove forests, and seagrass beds ecosystems. Rising sea level increases sedimentation which reduces light levels required for photosynthesis of seagrass plants and coral symbionts and inundate mangrove areas. The three ecosystems are required to vertically accrete and/or migrate landward to keep pace with rising sea levels, and inability to do this will result in loss of ecosystem area (He and Silliman 2019). Sea level rise is projected to intensify coastal erosion and flooding (Łabuz 2015). As an archipelagic nation, many parts of Indonesia have experienced climate stressors such as erosion which can alter their coastal lines, as seen in a case study of Parangtritis beach (Alfiani et al. 2016).

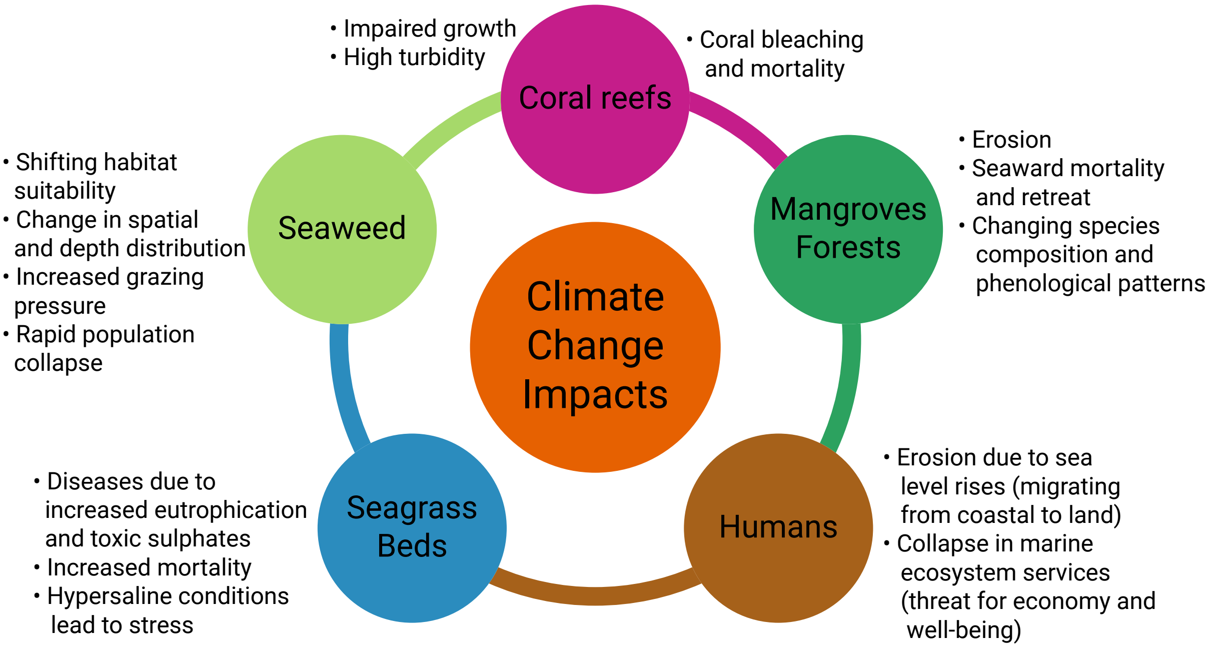

Figure 9.1. Climate change impacts on ecology and social aspects adapted from Laffoley and Baxter (2016).

9.4 Climate Change: Social Impacts

Climate change will have both direct and indirect impacts on coastal populations. Climate change threatens marine ecosystem services, which will indirectly impact coastal populations who depend on the marine environment for food and income (e.g. tourism). A review of the world's community perspective on climate and climate-driven changes recorded that some areas in Indonesia have been experiencing changes in weather pattern and seasonality, changes in wind direction and intensity, increase in landslide and flood frequency, and increase in saltwater intrusion (Savo et al. 2016).

Short to long-distance permanent migration of communites across Indonesia due to climate change impacts will likely increase in the future (Thiede and Gray 2017). A study on climate change impacts in Spermonde Islands showed that the major reported problems related to the changing climate were erosion, storms, and floods (Glaeser and Glaser 2010). Some families had to leave their island due to the increased frequency of flooding which destroyed their houses (Glaeser and Glaser 2010). In Bone Tambung, the local community contructed a sea wall to protect the island from rising sea level. However, corals were used for the building material which contributed to greater losses in coral cover (Glaeser and Glaser 2010). Furthermore, the rapid development of coastal areas in Indonesia, where new cities and urban areas are built along coastlines, may create cascading impacts in the future.

Field observations conducted by WWF reported that fishers from Aceh Utara have experienced unpredictable rainy seasons, high waves, frequent occurrence of tropical cyclones, and increasing temperatures (*field obs.* WWF Climate Crowd 2019). These climate stressors have several implications for fishers and fishing behavior. More fishers are deterred from going to sea because of high waves, while others choose to fish further away, sometimes in MPAs' non-extractive zones because of the unpredictable fishing grounds in other areas. Moreover, highly destructive trawling methods are now more frequently used as fishers need to increase their catch, but its impacts have reduced local catches by 40% (Stiles et al. 2010).

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In the coastal area, the increase in temperatures has forced fish farmers to spend more money on maintaining water temperatures. Salt farmers have had to build greenhouses to make production sustainable in unpredictable weather (*field obs.* WWF Climate Crowd 2019).

9.5 Taking Action on Climate Change in Indonesia: Mitigating, Adapting, and Building Resilience

Early actions that *mitigate* the impacts of climate change, promote sustainable *adaptation*, and build *social-ecological resilience* will help to reduce the negative impacts on marine ecosystems and coastal human populations. To do this, integrated responses in policy and cooperation are essential (Nurse et al. 2014).

Indonesia is one of six members of the multi-lateral Coral Triangle Initiative for Coral Reefs, Fisheries, and Food Security (CTI-CFF). The CTI-CFF launched the Early Action Plan for Climate Change Adaptation (REAP-CCA) to enhance the social-ecological resilience of coastal communities. Additionally, the Regional Action Plan for Marine Protected Areas was created to support adaptation and mitigation plans in Indonesia.

In addressing climate change, conservation and restoration approaches such as MPAs and mangrove forests restoration are an opportunity to enhance carbon sequestration and storage to reduce atmospheric CO_2 (Howard et al. 2017). Indonesia's mangrove forests reduce atmospheric CO_2 with total carbon storage estimated to be 3.14 PgC and estimated carbon stocks of 1,083 ± 378 MgC ha^{-1} (Murdiyarso et al. 2015). In addition to this, Indonesia's 30,000 km^2 of seagrass meadows provide an additional 368.5 TgC of carbon storage (Alongi et al. 2016).

9.5.1 Climate Change Mitigation

Climate change mitigation refers to "*human interventions to reduce the source or enhance the sinks of greenhouse gases*" (Nurse et al. 2014). Following the 2015 Paris Agreement, Indonesia set an ambitious Nationally Determined Contribution (NDC) to reduce national greenhouse gas emissions by 29% by 2030 and up to 41% if international funding support is available. These targets may be supported by policies to reduce carbon emissions such as promoting energy efficiency or boosting carbon sequestration and storage. To date, Indonesia does not mention protected areas in their NDCs, despite the significant carbon sequestration benefits they provide (Hehmeyer et al. 2019).

In this chapter, we focus mostly on strategies designed to build *resilience* and *adapt* to climate change, and particularly that of MPAs, given the important role marine resource management will play in both ensuring the sustainability of marine resources and the health of coastal communities in a changing climate.

9.5.2 Climate Change Adaptation

Climate change adaptation is "*the process of adjustment to actual or expected climate and its effect*" (Nurse et al. 2014). The climate change adaptation agenda must focus on areas that are vulnerable to climate change, namely: water resources, agriculture, fisheries, ecosystem and environmental services, human and societal welfare, infrastructure and industry, health, and forestry (Aldrian and Karmin 2011). As many coastal communities in Indonesia are highly dependent on marine ecosystems for their well-being (Hoegh-Guldberg et al. 2009), understanding the most effective ways to build an adaptive community in response to climate change impacts, both ecological and social, is critical (Cinner et al. 2018). Moreover, it is necessary to assure governance systems can support reef resilience.

Local participation is an effective method of building engagement between vulnerable sectors and policymakers (Marshall et al. 2010). Emphasizing local wisdom can be key to increase local participation. For example, *sasi* and other locally managed marine areas may support the sustainable management of marine conservation such as in Raja Ampat Islands (Lestari and Satria 2015). Additionally, incorporating community perspectives into local policy and management planning can help gain insight into community attitudes towards their environment and their willingness to adapt activities. For example, positive perception towards MPAs in Weh, Aceh, is reported as a key factor for achieving a successful MPA (Kusumawati and Huang 2015). Furthermore, there is a significant correlation between positive perception and high participation contributing to successful coral reef restoration projects in Bali Utara (Trialfhianty, Suadi, and Djumanto 2014). Thus, local perception and participation in addressing climate change is a crucial requirement to help create a resilience framework best-suited to a local or national context.

9.5.3 Building Social-Ecological Resilience to Climate Change

In Indonesia, REAP-CCA works on four major actions: (1) researching and monitoring climate change phenomenon; (2) formulating regulations, policies, and institutional capacities for adaptation to climate change; (3) developing and strengthening program activities such as habitat rehabilitation and conservation in coastal areas; and (4) building capacity in education, research, and information systems. Altogether, these are linked to the SDGs set up by the United Nations where they aim to end poverty (SDG 1), take action on climate change (SDG 13), promote sustainable energy (SDG 7), and preserve not only the sources of food (SDG 2) but also biodiversity on the planet (SDG 14).

These four actions can help managers tackle climate change in line with their integrated framework to achieve social-ecological resilience to climate change, of which MPAs are one approach. MPAs can reduce local-scale threats promoting resilience to and recovery from global-scale climate stressors (Beyer et al. 2018), and should form networks of static and mobile management areas to tackle climate change (Tittensor et al. 2019).

Building coastal community resilience is an important component of the CTI-CFF action plan. An integration framework is used to explain how the principle of community resilience is in line with the five CTI-CFF goals (Figure 9.2). In Indonesia, the Indonesian Climate Change Trust Fund (ICCTF), which was designed in 2009, supports Phase III of the Coral Reef Rehabilitation and Management Program—Coral Triangle Initiative (COREMAP-CTI). This program mainly focuses on strengthening institutions for coastal management, supporting demand-driven research through grants, and managing priority coastal ecosystems which are located primarily in three MPAs: TNP (*Taman Nasional Perairan*; Aquatic National Park) Laut Sawu, SAP (*Suaka Alam Perairan*; Aquatic Nature Reserve) Kepulauan Waigeo Sebelah Barat, and SAP Kepulauan Raja Ampat.

Building coastal community resilience is critical for ensuring conservation and restoration projects are successful as such initiatives often rely on community support. Many have proven that this support may not only increase the success of conservation goals but also transfer benefits to the community (e.g. knowledge and awareness). The awareness among communities to support climate change resilience is rising. Projects in the local community are growing and many stakeholders, including the Indonesian government and non-governmental organizations (NGOs), work alongside communities to help achieve their project's goal (Case Study 9.A, Case Study 9.B).

Figure 9.2. An integrated framework on how coastal community resilience can achieve the goal of sustainable coastal and marine ecosystems taken from REAP-CCA (2011). CTI-CFF goals for marine sustainability include: (1) strengthening the management of seascapes; (2) promoting an ecosystem approach to fisheries management; (3) establishing and improving effective management of MPAs; (4) improving coastal community resilience to climate change; and (5) protecting threatened species.

Case Study 9.A
Mangrove Replanting to Support Nearshore Farmland in Yogyakarta

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Located in the south of Yogyakarta Province, nearshore farmland was the primary source of food and income for the local community. Climate change has increasingly threatened this farmland as salty wind, land degradation, saltwater intrusion, and flooding have contributed to the loss of crops. Managed by a group of local youth called "*Kelompok Pemuda-Pemudi Baros*", the community began planting mangroves in 2003. The mangrove forests area has since grown by 5 ha in 10 years. Mangrove forests not only create a complex ecosystem which improves biodiversity but also provide a coastal defence for the farmland as well as capture and store carbon, highlighting their dual benefits for both climate adaptation and mitigation. The project has generated a total economic benefit of up to IDR 168,744,141 (USD 11,428) per ha per year for the villagers around the area (Trialfhianty et al. 2014). In 2014, the area was designated as a coastal protected area and received support from REDD+ (Reducing Emission by Deforestation and Forest Degradation, Carbon Stock Enhancement, and Forest Conservation) for its management. Local community perspectives, participation, and experiences may help local government and agencies build useful management strategies to tackle climate change.

9.6 Marine Conservation Strategies under Climate Change

Climate models are useful tools to help coral reef managers plan for future warming scenarios (Frieler et al. 2013); SST or accumulated thermal exposure metrics such as degree heating weeks (DHWs) are often used to predict future climate impacts on coral reefs, particularly coral bleaching and resulting coral mortality. Including other factors influencing bleaching occurrences such as light intensity, depth, and habitat improves their predictions, but are rarely included in future projections (McClanahan et al. 2019; Skirving et al. 2018). Similarly, coral genera display diverse responses to thermal stress (Kim et al. 2019), illustrating that the ecological context also needs to become part of climate impact projections (Dixon, Forster, and Beger 2020). Climate impacts such as thermal stress and tropical cyclones have been combined with local threats such as invasive species outbreaks and nutrient run-off to predict future responses of different coral species to climate change (Wolff et al. 2018), but this approach is yet to be applied to Indonesian reefs or implemented in conservation plans.

Targets of 1.5°C and 2.0°C of global warming in international climate policy are still predicted to cause severe declines in coral reef area (Frieler et al. 2013; Hoegh-Guldberg et al. 2018). One common strategy is the prioritization of low climate vulnerability reefs for management actions such as MPAs that address local stress such as bioclimatic reef units (around 20% of the 50-bioclimatic reefs in the global portfolio are located in Indonesia, (Figure 9.4; Beyer et al. 2018), combined with curbing emissions globally. Such local management actions for climate-resilience include four broad strategies; mitigate, repair, adapt, and protect (Gattuso et al. 2015).

This prioritization approach has been employed in the Lesser Sunda Region and the Bird's Head Seascape through a joint initiative between The Nature Conservancy (TNC), Yayasan WWF Indonesia, and Conservation International (CI), which aims to establish a network of climate-resilient MPAs using a set of criteria including consideration of features such as upwelling and high currents, which can help to buffer against warming SSTs (Reef Resilience Network 2014). Though it is critical to protect reefs that are less vulnerable to the effects of climate change, both existing and future MPAs also need to be carefully designed with carbon sequestration in mind (McLeod et al. 2009). Though MPAs can help to reduce overfishing, thereby enhancing the recovery of healthy food webs and energy cycling processes, risks from coastal water pollution, especially in areas with large human populations and tourism activities, also need to be reduced. It is important to note that identifying clear conservation

Case Study 9.B
Community Empowerment for Mangrove Replanting

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In SAP (*Suaka Alam Perairan*; Aquatic Nature Reserve) Selat Pantar, Alor, Martha Lontang and Kelompok Cinta Persahabatan have been planting thousands of mangroves. Martha's house flooded due to erosion and she quickly realized that this erosion would cause flooding in the entire village. She, with the support of the community group from Kelompok Cinta Persahabatan, has been expanding the mangrove forests area near the shoreline to protect the community's land from erosion. This demonstrates how communities can be empowered through increased awareness of the changing climate and adapt by restoring and conserving nature.

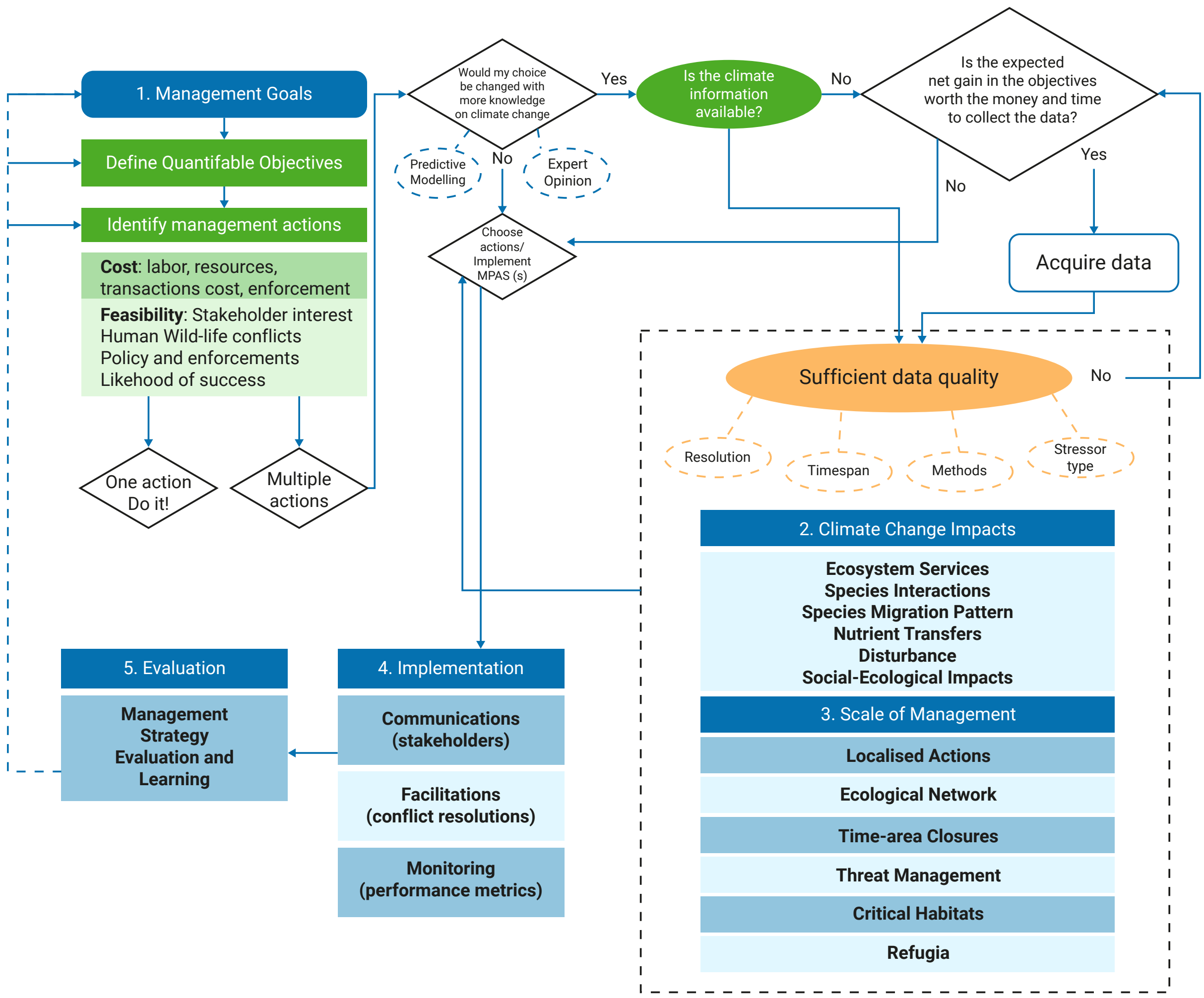

Figure 9.3. Management Framework for MPA design. Adapted from Allen and Singh (2016); McGowan and Possingham (2016).

objectives and priority actions is vital before designating MPAs (Brown et al. 2015; Harris et al. 2017). Above is a detailed framework for MPA design addressing the needs to reduce the impacts of climate change that can be used to help decision-makers and government evaluate an MPA's performance (Figure 9.3).

Protecting ecological refuges in critical coastal marine ecosystems is important for future management actions, especially in planning or rezoning MPAs. The Indonesian government designated fifteen locations to be used as a pioneer in climate change adaptation (CTI-CFF 2011). The selection is based on management criteria such as local government awareness and facilities. As the Indonesian Government is planning to expand the MPA network to 32.5 million ha by 2030, there is an opportunity to consider ecological aspects such as reef functional integrity and permanent vs. dynamic-permanent MPA networks (D'Aloia et al. 2019). The levels of vulnerability of reefs to climate-related stressors can guide the establishment of new MPAs in Indonesia (Figure 9.4). Selecting resilient reefs is important to ensure the sustainability of coral reefs under climate change. For example, resilient reefs can act as refugia which reseed other areas following damage by bleaching (Salm, Done, and McLeod 2006).

Fifty global Bioclimatic Units (BCUs) were recently identified to represent reef areas that are the least exposed to climate change whilst also being well placed to reseed surrounding areas once climate stabilizes (Beyer et al. 2018). The BCUs were identified based on five climate-related

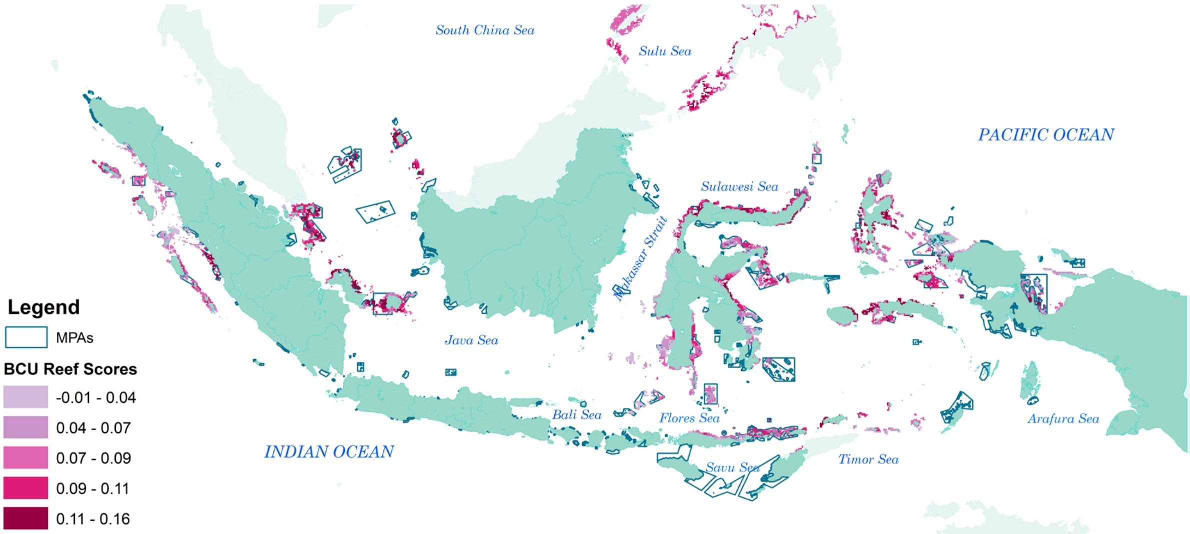

Figure 9.4. Climate stress index derived from thermal stress and potential connectivity for Bioclimatic Unit reefs (Beyer et al. 2018) where higher scores indicate more resilient reefs, and 2019 MPA distribution in Indonesia. Some of the Bioclimatic Unit reefs (e.g. in Maluku Utara, Maluku, and Sumatra Barat) that emerged as potential conservation priorities as part of a global portfolio of 50 climate refugia reef areas (Beyer et al. 2018) are not yet well protected. Note that there is uncertainty associated with the climate stress index presented here, as it does not incorporate several climate stressors (long-term thermal context, storms, acidification, sea level rise) and ignores ecological responses.

criteria: historical thermal conditions, predicted future thermal conditions, larval connectivity and settlement, cyclone wave damage and recent thermal conditions (Beyer et al. 2018). Several of the climate priority BCUs are located in Indonesia (Figure 9.4), and can provide a reference for future management plans for climate change adaptation.

The highest scoring BCU areas in Indonesia are within MPAs in provinces such as Maluku, Maluku Utara, Sulawesi, Riau Islands, and Papua Barat. Many of these MPAs are still within the initiation phase (red level-EKKP3K, Chapter 5). In addition, only three out of 24 MPAs that have achieved green level, or “minimally managed” status, contain highest scoring BCU areas, e.g. TWP (*Taman Wisata Perairan*; Aquatic Tourism Parks) Pulau Pieh, Anambas Island, and KKPD Batang Gasan — of which TWP Pulau Pieh and TWP Kepulauan Anambas are labelled as National MPAs (*Kawasan Konservasi Perairan Nasional*/KKPN). This condition implies that the other eight national priority MPAs having achieved green level, namely SAP Kepulauan Waigeo Sebelah Barat, SAP Kepulauan Raja Ampat, TWP Padaido, TWP Taman Laut Banda, SAP Kepulauan Aru Tenggara, TWP Kapoposang, TNP Laut Sawu, and TWP Gili Matra, are likely prone to climate change. In contrast, one MPA at the green level with potential to reach blue level, or “managed optimally”, has no BCU score, e.g. TWP Nusa Penida located in southern Bali. Repairing deteriorated ecosystems can help to reduce the impacts of climate change, if trait-based climate vulnerabilities are addressed in the project design. The growing number of coral reef and mangrove forests rehabilitation and restoration projects both inside and outside MPAs has helped the local community, stakeholders, and local government take actions to restore healthy marine ecosystems. In the Spermonde Archipelago, 11,000 hexagonal-shaped structures called “spiders” were used to attach coral fragments in a 7,000 m^2 area (Skirving et al. 2018). In addition, more than 2,000 artificial reefs were installed in Bali, and hundreds of Biorock structures are spread along the coast of Bali, Ambon, Lombok, and Kepulauan Seribu. In TN (*Taman Nasional*; National Park) Komodo, coral restoration facilitated natural coral recruitment and growth indicating that a simple method can successfully restore destroyed reefs if combined with long-term maintenance and monitoring (Fox et al. 2019). In KKPD (*Kawasan Konservasi Perairan Daerah*; Provincial MPA) Buleleng, periodic coral reef monitoring which includes rapid surveys and involvement of key local communities i.e. Locally Managed Marine Areas (LMMAs), proved to be effective in supporting MPA implementation, especially enhancing resilience of coral reefs to disruptive events (Case Study 9.C). Boosting coral reef restoration and monitoring can improve marine ecosystem health, use of marine ecosystem services, and benefit communities economically. However, actions to reduce the possibility of coral bleaching in restoration projects need to be considered. Where possible, restoration projects should focus on using coral fragments from heat-pools that are already adapted to warmth (Morikawa and Palumbi 2019), and use appropriate species and siting techniques to facilitate managed retreat to account for sea level rise in mangrove forests restoration initiatives (Gilman et al. 2008).

Strategies to cope with the effects of climate change on people can often have adverse impacts on ecosystems and exacerbate community vulnerability in the long term. For example, building a sea wall to prevent coastal erosion and sea level rise in Papua New Guinea had unintended consequences, causing the loss of biodiversity and reducing the source of local community foods and fisheries (Watson 2014). Other short-term strategies by local people to cope with climate impacts, such as shifting fishing location and gear type, may also have negative outcomes for biodiversity in and around MPAs. As such, it is vital that conservation practitioners support community-based adaptation solutions that reduce or have minimal ecological impacts, including nature-based solutions (Seddon et al. 2020). In line with building resilience in coastal communities, Indonesia may consider several actions to help the community adapt to the impacts of climate change: relocating local coastal communities in areas with a highly vulnerable climate change index should be considered, for example (see SIDA report; Yusuf and Francisco 2009 on Indonesia maps of vulnerability climate change index). Building adaptive capacity at the local scale is important, by first identifying the assets that people can draw upon in times of need and which are suitable to address climate-related problems. Local communities in different locations may face different problems and have different needs and assets they can use to prevent climate change impacts. Learning from existing community efforts to adapt to climate change may aid in the development of more effective strategies, as demonstrated through mangrove forests restoration efforts in Yogyakarta (Case Study 9.A). National policies should support actions such as gear diversification, livelihood diversification, introducing responsible coastal resources management (reef-based fisheries), temporary closures, restoration, resilience-based or trait-based management, and national adaptation plans (Anderson et al. n.d.; Cinner et al. 2009a; 2009b; McLeod et al. 2020; Tittensor et al. 2019).

9.7 MPAs in a Changing Climate

Climate change is a complex issue with cascading impacts on social and ecological systems. The various impacts may differ from one region to another. Many argue that MPAs cannot protect coral reefs from climate change. For example, during the 2016 bleaching event, severe bleaching and associated mortality occurred on the Great Barrier Reef in both non-extractive and fishing zones, confirming that regulating fisheries cannot reduce bleaching vulnerability (Hughes et al. 2017). However, MPAs may increase reef recovery following bleaching mortality through enhancing recovery processes, e.g. herbivory and recruitment (Mellin et al. 2016). They can be a powerful tool to support the functioning of coral reefs and ecosystem services (Roberts et al. 2017). MPAs can also manage local anthropogenic threats (Boon and Beger 2016) that often exacerbate the impacts of climate change on marine ecosystems. Therefore, attempts to protect coral reefs by improving MPAs, selecting resilient reefs, assisting colonization (Beyer et al. 2018), prioritizing management actions such as active reef restoration and managing land-based threats (Harris et al. 2017), and building coastal and small islands community resilience with government and stakeholder intervention are needed.

Case Study 9.C
Marine Protected Area Implementation in the Face of Climate Change: A Case Study from KKPD Buleleng, Bali

Derta Prabuning

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Global temperature are rising, with estimates of 2˚C increases by 2050 compared to 2010 (Hoegh-Guldberg et al. 2007), potentially causing up to a 43% decrease in suitable reef habitat over the next century (Freeman, Kleypas, and Miller 2013). Appropriate and up-to-date data is essential to inform coral reef management and responses in Indonesia in the face of climate change. Indonesia has experienced several mass coral bleaching events, with the worst in 1982, 1997, 2010, and 2016. While these lead to severe coral mortality over large areas in some regions, none have been archipelago-wide and some regions have experienced relatively little bleaching in the global context (Ahmadia et al. 2017). Neverthless, the many bleaching events across Indonesia have highlighted the need for regular standardized monitoring to track bleaching – i.e. to "*keep eyes on the reefs*."

To assist with this, Reef Check has worked with the Ministry of Marine Affairs and Fisheries (MMAF) and other partners to establish an Indonesian Coral Bleaching Network. The network encourages all people out on the water to look at the reefs they are visiting and report any noticiable events happening to the reefs, particularly coral bleaching, but also other issues such as crown-of-thorn starfish outbreaks. In 2010 when the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Watch released a bleaching alert and informed people to "*keep watch on coral reefs*," a fisherman from Bondalem Village in KKPD (*Kawasan Konservasi Perairan Daerah*; Provincial MPA) Buleleng, Bali reported that his homefront sea was sparkling white (i.e. severely bleached corals). Simple reports such as these from citizens can help track the presence of bleaching across Indonesia's vast archipelago, and allow surveys to be rapidly mobilized to assess the extent and severity of bleaching – as happened in this case. Data such as this is essential to inform MPA adaptive management.

While MPAs cannot protect reefs from the impacts of climate change, MPAs can enhance resilience of coral reefs to disturbance events. Also, MPAs can be used to protect reefs with the least exposure to the worst climate impacts. These reefs can then act as sources of coral and fish larve to help recovery elsewhere. Many of Indonesia's reefs are exposed to strong currents that reverse seasonally throughout the year which, combined with many narrow deep water channels between islands, leads to some reefs receiving highly variable temperature regimes. This affects connectivity for larvae, and in some cases may enhance coral resilience to bleaching events. Thus adding an additional layer of complexity for MPAs wishing to protect resilient laval-source reefs. Decision-makers therefore need to carefully consider MPA objectives and the vulnerability to climate change when making MPA placement and management decisions.
While climate change is unavoidable, there are four ways to optimize MPA implementation

to minimize the impacts of climate change. *First,* the MPA should be ecologically designed. This includes ensuring it is large enough to maintain self-sustaining populations of functionally-important reef species (e.g. herbivores, predators; Reef Resilience Network n.d.) and that the non-extractive use zones of the MPA are designated in areas containing more resistant coral species to elevated sea surface temperatures. *Second*, MPA managers should reduce local anthropogenic stressors within MPAs to minimize additional pressures on the reef environment (Harris et al. 2017). *Third*, promoting livelihood diversification will provide increased food and economic security and social resilience for local communities. This is essential, as it allows managers more flexibility in adjusting extractive use rules and regulations following bleaching and other climate change-related disturbace events (e.g. storms) to maximize recovery potential (IUCN *in* reefresilience.org). Last, it is necessary to develop a good governance system, both formal and informal, to support sustainable reef management. Management that encourages deliberation and participation where community voices are heard will be easier to build trust for compliance with co-designed MPA regulations to promote resilience and overcome problems (Lebel et al. 2006).

One example where MPA managers integrate climate change adaptation and a mitigation strategy into management is in KKPD Buleleng. This MPA was initiated in 2011 through a "bottom-up" approach. Before this initiation, there were several Locally Managed Marine Areas (LMMAs) with the objectives to strengthen the grass-root management to manage the coastal ecosystems through monitoring and surveillance, rehabilitation, livelihood diversification, and a micro-financial scheme. The LMMA communities build strong partnerships with governments, NGOs, universities, and other community groups to learn how to manage the environments and solve environmental problems. Mass coral bleaching events occurred and were reported in 2010 and 2016 in KKPD Buleleng (KKHL & PRL KKP 2016; Maynard et al. 2012). To cope with this situation, the MPA manager conducted a coral reef monitoring system, including rapid surveys and regular monitoring, promoted livelihood diversification with communities to shift their reef-based livelihood to pelagic-capture fisheries or land-based livelihoods. The MPA manager also actively involved the LMMA communities in participating in the coral reef monitoring activities and other management actions to support MPA implementation.

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Chapter 10. Other Effective Area-Based Conservation Measures (OECMs) and their Implications for Indonesia

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Abstract

Marine Protected Areas (MPAs) are the most commonly used area-based marine conservation tool, and Indonesia has currently established 196 MPAs (as of December 2019) which cover 7% of the nation's waters. However, there are other forms of management in Indonesia that are not formally recognized. More recently, the Convention on Biological Diversity's Aichi Target 11 and International Union for Conservation of Nature (IUCN) have introduced the formalization of a process to recognize area-based conservation beyond MPAs that protect biodiversity — known as Other Effective Area-Based Conservation Measures (OECMs). These are defined as geographic areas with a set of specific management rules, managed by an entity and can contribute to long-term biodiversity conservation. As a country with rich cultural history of customary management over marine resources, OECMs have the potential to be widely recognized in Indonesa as effective marine conservation measures that acknowledege efforts of locally driven management. This chapter explores the global OECM framework and characteristics and how this can be potentially applied in the Indonesian context. A preliminary exploration into possible OECMs identified 100 locations in Indonesia that potentially fulfill the IUCN-OECM characteristics, ranging from area management for customary practices to fisheries, tourism, and other purposes. Adopting the global IUCN-OECM framework in the Indonesian context does require adaptation to be in accordance with the country's existing protected area regulations and management practices. This chapter also proposes a potential Indonesian OECM framework that can be further explored by the Government of Indonesia and partners in the future.

Abstrak

Kawasan Konservasi Perairan (KKP) merupakan perangkat konservasi laut berbasis kawasan yang paling banyak digunakan. Saat ini Indonesia telah menetapkan 196 KKP (per Desember 2019) yang melindungi sekitar 7% dari perairan nasional. Selain KKP, terdapat berbagai bentuk pengelolaan lain di Indonesia yang belum diakui secara formal. Baru-baru ini Konvensi Keanekaragaman Hayati (Convention on Biological Diversity) *Aichi Target 11 dan International Union for Conservation of Nature (IUCN) memperkenalkan formalisasi dari suatu proses untuk mengakui konservasi berbasis kawasan di luar batas KKP yang dapat melindungi keanekaragaman hayati — dikenal sebagai Tindakan Efektif Lainnya untuk Konservasi Berbasis Kawasan/*Other Effective Area-Based Conservation Measures *(OECMs). OECM didefinisikan sebagai area geografis dengan satu perangkat peraturan pengelolaan spesifik, dikelola oleh suatu entitas dan bisa berkontribusi kepada konservasi keanekaragaman hayati secara jangka panjang. Di negara yang memiliki sejarah budaya terkait pengelolaan sumber daya alam secara adat, OECM mempunyai potensi untuk diperkenalkan di Indonesia sebagai upaya konservasi laut yang efektif yang mengakui upaya-upaya pengelolaan yang diinisiasi secara lokal. Bab ini mengeksplorasi kerangka kerja dan karakteristik OECM global dan bagaimana OECM bisa diaplikasikan dalam konteks Indonesia. Berdasarkan identifikasi awal, terdapat 100 OECM potensial di Indonesia yang sejalan dengan karakteristik IUCN OECM, berkisar dari pengelolaan kawasan untuk tujuan praktik adat, perikanan, wisata, dan lain-lain. Mengadopsi kerangka kerja OECM IUCN global ke dalam konteks Indonesia membutuhkan adaptasi sehingga kerangka kerja ini bisa sejalan dengan peraturan dan praktik pengelolaan kawasan konservasi yang berlaku. Bab ini juga mengusulkan kerangka kerja OECM potensial untuk Indonesia yang dapat dieksplorasi lebih jauh oleh Pemerintah Indonesia dan mitranya di masa mendatang.*

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10.1 Introduction

10.1.1 Definition, Function, and Criteria of OECMs

Over the last decade, there has been a global push for expanding area-based conservation targets following the Convention on Biological Diversity (CBD) in 2010 – specifically Aichi Target 11, which calls for *"[By 2020] at least 17 percent of terrestrial and inland water areas and* ***10 percent of coastal and marine areas****, especially areas of particular importance for biodiversity and ecosystem services, [to be] conserved through effectively and equitably managed, ecologically representative and well-connected systems of* ***protected areas and other effective area-based conservation measures****, and integrated into the wider landscape and seascape*" (Convention on Biological Diversity 2010). Much of the emphasis has been on the establishment of formally recognized protected areas (PAs) to reach this goal, with little attention on other effective area-based conservation measures (OECMs). Marine biodiversity management is implemented by many different actors other than governments, including local communities, traditional and indigenous people, and even private companies or individuals, outside PA boundaries. More recently, there have been efforts to focus on OECMs as another way to recognize the contribution of areas under other forms of management that generate conservation outcomes.

An OECM is *"a geographically defined area other than a protected area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values."* - Decision 14/8 of 14th (CBD COP 2018).

In short, OECMs are considered to be areas where conservation is not the primary objective but where long-term conservation outcomes are achieved. OECMs always have some other key purpose, and therefore do not meet the International Union for the Conservation of Nature (IUCN) definition of a PA – *"a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values"* – (Borrini-Feyerabend and Hill 2015; Dudley and Laffoley 2008). Conservation in OECMs can be secondary — for example, areas managed for sustainable use that confer a secondary benefit of biodiversity conservation and support of ecosystem services; or, ancillary — such as areas managed for cultural/other purposes, with a side-effect of biodiversity outcomes. The exception to this is for sites that have a primary conservation objective but are not reported as PAs and can be recognized as an OECM if the governance authority so wishes. This can include areas managed by indigenous peoples, areas managed by universities for research of natural ecosystems, and others.

OECMs need to be geographically delineated, governed, managed, have positive outcomes for *in-situ* biodiversity, and be established for the long-term (IUCN-WCPA Task Force on OECMs 2019). When managed effectively, not only can OECMs contribute to sustaining existing biodiversity values and improving biodiversity outcomes, but also contribute to ecologically representative and well-connected conservation networks within wider landscapes/seascapes. OECMs also provide an opportunity to engage and support a wide range of partners in conservation efforts. Thus, they can contribute tangibly to conservation objectives that align with those of PA systems as well as to biodiversity targets. The effectiveness of OECMs must be monitored regularly to ensure that sites continue to deliver conservation outcomes (Woodley et al. 2015).

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There are ten elements that contribute to the current definition and can be used to identify potential OECMs (IUCN-WCPA Task Force on OECMs 2019):

- An area not already designated as a PA, or lies within a PA.
- The area is a geographically defined area with agreed-upon and demarcated boundaries. While the size of OECMs may vary, they should be of sufficient size to achieve long-term *in-situ* biodiversity conservation.
- The area is under the authority of a specified entity, or an agreed-upon combination of entities. Governments can govern OECMs at various levels, as can private individuals or companies, indigenous peoples or local communities, and/or shared governance among multiple stakeholders.
- The area is being managed in a way that achieves positive and sustained long-term biodiversity conservation outcomes. An area where there is no management regime is not an OECM, even though its biodiversity may remain intact. Note that while management must be present, it does not have to recognize biodiversity as a desired outcome explicitly.
- OECMs should be effective at delivering positive and sustained outcomes for the *in-situ* conservation of biodiversity. There should be a clear association between management actions and biodiversity outcomes, with mechanisms in place to address existing or anticipated threats.
- The governance and management of OECMs are expected to be sustained and deliver long-term effective biodiversity outcomes. Short-term or temporary management strategies do not constitute an OECM.
- OECMs should deliver biodiversity outcomes of comparable importance to, and complementary with, those of PAs. OECMs are expected to achieve the conservation of nature as a whole, rather than only selected elements of biodiversity.
- OECMs must achieve the effective and sustained *in-situ* conservation of biodiversity and should include the identification of the range of biodiversity attributes for which the site is considered important.
- OECMs should protect ecosystem functions and services.
- OECMs may be achieved as part of cultural, spiritual, socio-economic, and other locally relevant values in practices.

To complement PA achievements, OECMs are likely to remain part of any post-2020 targets to conserve *in-situ* biodiversity. Unlike PAs, the OECM framework is recently established and has wide-range applicability. Therefore, the global OECM framework must be well understood before it is adapted and applied by each CBD country. This chapter will explore some global examples of potential OECMs, the application of marine OECMs in Indonesia, as well as challenges and opportunities.

10.1.2 Global Examples

Guidelines released by IUCN provide the first efforts to assist the CBD Parties in interpreting and operationalizing the OECM targets of the CBD COP and provide initial guidance in developing the best practices for recognizing and reporting OECMs at various scales (IUCN-WCPA Task Force on OECMs 2019). Many CBD countries are now working towards developing guidelines and putting systems in place to help define different potential OECMs within a national context, as well as how these OECMs may contribute towards area-based conservation targets. While the OECM framework is relatively new, there are many OECMs that already exist and are well-implemented, but are not formally recognized yet for their biodiversity contributions. Some examples from several geographies where potential OECMs are being/have been evaluated include:

1. In Colombia, traditional PAs are regulated and managed by the National System for Protected Areas (*Sistema Nacional de Áreas Protegidas*/SINAP). Application of conservation strategies that move beyond SINAP system from

legal frameworks and local territorial processes and can be considered as OECM candidates (Matallana-Tobón et al. 2018). Some examples include:

i. Reciprocal Water Agreements, part of an Ecosystem Services scheme with the main objective of improving the connectivity, quality, and regulation of water in the 'Las Cruces' micro-watershed, using a shared governance structure that includes multiple stakeholders and guarantees direct results not only in terms of micro-basin conservation but also contributes to the conservation of biodiversity through the vegetation associated with water sources. In this way, even though biodiversity conservation is not the main objective of the conservation strategy, it is a secondary conservation outcome.

ii. Exclusive artisanal fishing zone, consisting of regulations for fishing and aquaculture activities in an area along the northern Pacific Coast; the objectives of the measure are to promote the recovery of fishing along the coast and improve the livelihoods of fishers and their families. Biodiversity conservation is thus perceived as an ancillary outcome and includes the conservation of rocky shore ecosystems, mangrove forests zones, seabed structure, and cetacean migration zones.

iii. The sacred site Jaba Tañiwashkaka of the Linea Negra, Sierra Nevada of Santa Marta, the first seashore sacred site recovered for the indigenous people of the Sierra Nevada de Santa Marta and declared a National Cultural Asset due to the historical, aesthetic, and symbolic value of this natural and traditional area; every element of biodiversity has its own meaning and must be managed in accordance with the law of origin of the indigenous peoples of the Sierra Nevada so that the balance in the cycles of nature and the welfare of the territory is ensured. Thus, there are biodiversity outputs managed by this indigenous community.

2. The Daasanach Pastoralists of Ileret, Kenya, use customary institutions to govern pastoral commons in Marsabit county and are currently being explored as Indigenous and Community Conserved Areas (ICCAs) and OECMs in East Africa. About 13,000 Daasanach are living in Kenya, with livelihoods dependent foremost on nomadic pastoralism due to the land's aridity and isolation. The Daasanach organize herding in seven spatially separated pastoral commons (though three are no longer under full community management jurisdiction, due to spatial overlap with Sibiloi National Park), with communally-owned resources (e.g. pasture, water, and biodiversity), utilized and managed by all members through communal governance, as well as protected through the community's eight clans-hierarchy customary norms (Mwamidi et al. 2018). While the Daasanach have managed their areas for several centuries to support their pastoral livelihoods, these practices have indirectly promoted the *in-situ* conservation of biodiversity and ecosystem services; in particular, they support the conservation of grasslands, hardy vegetation, and biodiversity in the riverine forests of the seasonal rivers of the area (Mwamidi et al. 2018).

3. Canadian Forces Base Shilo, an Operations and Training Base of the Canadian Armed Forces, is managed by the Department of National Defence and Canadian Armed Forces and located in the mixed-grass prairie ecosystem of south-central Manitoba. While parts of the base cannot qualify as an OECM due to infrastructure or high human traffic, approximately 21,138 ha of natural area that support diverse plant and wildlife communities exist. These areas have been assessed and found to meet all necessary conditions to be reported to the federal protected and

conserved areas database as an OECM, if the Department of National Defence decides to do so (Government of Canada 2019; IUCN-WCPA Task Force on OECMs 2019).

4. Ecosystem Restoration Concessions (ERCs), currently not considered a category of PA in Indonesia, offer an opportunity for the country to complement its PA network with conserved areas of high biodiversity value in forests designated for production purposes. Unlike other types of forestry concessions, ERCs do not require harvesting of timber for commercial purposes, resulting in a de facto logging moratorium at these sites: ERCs have shifted the forest management paradigm from timber-based towards an ecosystem-based approach, which allows management to integrate economic, social, and ecological objectives as deemed necessary according to the site conditions and context. Hutan Harapan is the first ERC pioneering new ways of conserving Sumatra's lowland rainforest and its biodiversity for the long term, adjusting management regulations to include conservation; because conservation is a primary objective this area meets the IUCN PA definition but is not recognized as a PA under Indonesian national legislation and is thus a possible candidate for an OECM (Utomo and Walsh 2018). The ERC has spatial boundaries, is governed by a partnership, and contains critical habitat for species. The forest contains two important bird areas, provides many ecosystem services, and is important for food security and livelihoods for the Batin Sembilan Indigenous Peoples. Its long-term management activities, while not directly reflective of biodiversity goals, create stakeholder support or financial sustainability to conserve biodiversity in the ERC for the long term and support national targets (National Biodiversity Strategy and Action Plan, Species Action Plans) (Utomo and Walsh 2018).

From the examples above, it is evident that, as in the case of PAs, OECMs can apply to both terrestrial and aquatic environments. The potential to contribute to ecologically representative and well connected Marine Protected Areas (MPAs) networks is increasingly receiving attention in the literature, with local sectoral area-based conservation measures such as Particularly Sensitive Sea Areas (PSSAs), Areas of Particular Environmental Interest (APEIs), Vulnerable Marine Ecosystems (VME) closures, and Locally Managed Marine Areas (LMMAs) as candidates (Diz et al. 2018). It is integral to approach the assignment and application of OECMs carefully, especially as the "zero draft" of the post-2020 Global Biodiversity Framework increases the global target to 30% of terrestrial and marine areas, also to be achieved through PAs and OECMs (CBD 2019).

10.2 Overview of Marine OECMs in Indonesia

To fulfill CBD-Aichi Target 11 for protecting 10% of marine areas, the Indonesian Ministry of Marine Affairs and Fisheries (MMAF) has focused its conservation efforts in the past decade to establish new MPAs and improve their management effectiveness. As of December 2019, there are 196 MPAs encompassing 23.1 million ha, covering approximately 7% of national waters (Chapter 3). Besides MPAs, Indonesia has other types of management that can contribute to *in-situ* biodiversity conservation, either managed by governments, traditional/customary/local communities, or private companies. Marine-based areas that lie outside of the formal MPA system can vary from harvest closures for fisheries species for various lengths of time, as seen in eastern Indonesia (McLeod, Szuster, and Salm 2009; Satria and Adhuri 2010), to other forms of resource management driven by local communities, such as mangrove forestry in Sulawesi Selatan for timber and mud crab fisheries (Amri 2005) or the LMMA model in Maluku Tenggara (Steenbergen 2016). In a study by Donald et al. (2019), of 433 Key Biodiversity Areas (KBAs) in Indonesia, 112 were protected (>50% coverage by PAs), 21 unprotected (<50% coverage by PAs) within areas likely qualifying as OECMs, and 28 unprotected outside of OECMs. KBAs are sites of importance for the global persistence of biodiversity, identified using quantitative criteria under a global standard; such forms of area management have not yet been recognized by MMAF towards contributing to the national or international targets. With a new OECM guideline published by IUCN in 2019 (IUCN-WCPA Task Force on OECMs 2019), MMAF recognizes an opportunity to strengthen and support the overall national marine conservation initiative and targets, and therefore has started to adopt this framework into the Indonesian context. Recognition of existing types of OECMs and the development of relevant regulations, guiding principles, and framework on OECMs are two crucial aspects that need to be immediately addressed.

10.3 Adopting the IUCN-OECM Framework into Indonesian Context: Why it Matters

The IUCN-OECM definition is designed to be complementary to the IUCN MPA definition. Indonesia is currently adopting the IUCN-OECM definition to be complementary to its own definition of MPAs and to the overall area management systems in Indonesia. Indonesian MPAs are defined as *"marine and coastal areas that are protected and managed within a zoning system to achieve sustainable fish resources as well as marine habitat"* (PP RI No. 60/2007). This, therefore, presents some challenges and nuances in how OECMs are applied in Indonesia.

The significant differences between the IUCN MPA definition and Indonesia MPA definition lie in the objectives and types of governance. IUCN MPAs focus on biodiversity conservation as the primary objective, promote the protection of an area, and can be formally governed either by governments or other stakeholders (e.g. local communities, private sector). Indonesia's MPAs have biodiversity and sustainable management as their primary objectives, promote multiple-use area management, and currently are governed by the Government of Indonesia (GoI) (though the legal framework allows MPAs in Indonesia to use co-management approaches between the government and other stakeholders). To complicate this further, MPAs in Indonesia are managed by two different ministries, MMAF and the Ministry of Environment and Forestry (MoEF – Chapter 1). MoEF manages all terrestrial PAs and 30 MPAs, with their own PA framework. MoEF PAs/MPAs have a similar framework to MMAF MPAs, except the primary objective is to protect biodiversity.

These differences between IUCN and Indonesian definitions for MPAs often lead to confusion and debate, particularly in measuring Indonesia's contribution to global marine conservation targets. This has implications for those areas in Indonesia that have biodiversity conservation as a primary objective and meet the IUCN definition of a MPA but not the GoI MPA definition, such as some LMMAs. Though the governance body may desire its site to be recognized as a PA (and could be if measured against IUCN's definition), because of misalignment with Indonesia's own MPA definition, the GoI does not allow this and prefers to recognize such areas as OECMs. One other caveat is that while these conservation measures provide an opportunity to recognize other efforts that contribute towards biodiversity conservation, there is concern that governing bodies may "double count" in order to reach area targets, such as the renaming of fishery management areas and critical habitats as "marine refuge OECMs" (Lemieux et al. 2019).

There are several things that need to be considered and addressed when modifying the IUCN definition of OECMs for Indonesia. *First*, Indonesian OECMs should accommodate all types of area-based management, in addition to MPAs that exist, including those that may or may not have biodiversity conservation as primary objectives if they provide long-term *in-situ* conservation. This may include some measures that may not be considered as OECM based on the IUCN-OECM framework (IUCN-WCPA Task Force on OECMs 2019); for example, intensively managed farms with a small proportion of the original native flora or fauna, or intentionally set-aside areas with limited active management that are secured in a way that supports biodiversity long term. *Second*, MMAF will likely include types of management that are not yet formally geographically defined nor delineated, and this includes traditional/customary knowledge or practices. However, MMAF will require those developments at a later stage of OECM measurement. *Third*, according to the GoI's Laws (UU RI No. 45/2009; UU RI No. 1/2014), local communities or other entities do not have a right to manage an area, but do have a right to manage the marine resources. *Fourth,* the Indonesian marine OECM framework that focuses on fisheries management will follow the Law on Fisheries (UU RI No. 31/2004 juncto UU RI No. 45/2009) and Law on The Management of Coastal Areas and Small Islands (UU RI No. 27/2007 juncto UU RI No. 1/2014) as a legal justification to develop a new regulation on OECMs, and this means that the OECM framework will emphasize area-based management to promote sustainable fisheries and biodiversity conservation. These regulations are not applicable to terrestrial OECMs; thus there might be differences in adopting the IUCN-OECM framework in Indonesia for marine and terrestrial realms – though these should be standardized as much as possible. OECMs that are related to tourism, the military, or other purposes must be discussed with the appropriate ministries to ensure they are in line with existing regulations on area management. These considerations, amongst others, will influence how Indonesia defines its OECMs and develops the OECM framework and guiding principles.

There is a temptation to rush into rapidly recognizing OECMs which could compromise their benefits with flawed models, such as in the fisheries space, where quantity is given priority over quality, placing sustainability (and long-term profitability) of Indonesia's fisheries at risk in order to meet Gross Domestic Product (GDP) targets (Mous et al. 2005). Alignment of OECM requirements according to the IUCN definition — designed to complement the IUCN MPA definition — with the differing Indonesian definition of an MPA could also hamper efforts and foster frustration if decisions are made without adequate long-term planning and consultation. Future areas to address will include ensuring that mechanisms are in place so OECMs have the capacity (resources and skills) needed to deliver conservation outcomes, processes for tracking and measuring those conservation outcomes, and pathways to achieving formal recognition.

Beginning in late 2019, MMAF began a process to apply and adopt the IUCN guiding principles and framework on OECMs to (1) identify potential OECMs in Indonesia and (2) determine when and how OECMs contribute to area-based conservation targets. The discussions are still ongoing between MMAF, other national governments, and stakeholders to formulate and shape an Indonesian OECM framework. At the time of this report's production, Indonesian marine OECM regulation, framework, and guiding principles had not yet developed nor formalized. According to internal discussions, MMAF and stakeholders have agreed that using a diverse toolbox beyond traditional marine spatial planning will likely be advantageous to achieving positive *in-situ* impacts, considering the wide range in local context.

OECMs in Indonesia should be complementary to MPAs – there are many examples of well-managed MPAs in Indonesia that are delivering positive social and ecological outcomes. However, if an area is in need of protection and an MPA cannot be established given the local context and cultural, political, and economic conditions, then supporting activities that would qualify that area as an OECM may be more suitable. In most cases OECMs will likely recognize the contributions to biodiversity of existing management activities already happening. These need to be formally recognized or acknowledged by the GoI as an OECM. OECMs provide Indonesia with an opportunity to recognize, elevate, and strengthen marine conservation beyond MPAs, particularly in a country with a long history of customary/traditional marine management and high marine resource dependence. If managed effectively, OECMs in Indonesia can contribute to a wide range of conservation outcomes, including conservation of essential ecosystems, habitats, and wildlife corridors outside of MPA areas; increased opportunities to strengthen the co-management systems between various key stakeholders to support area-based management; and improvement in the sustainable financing of conservation and area management.

10.4 Policy, Governance, and Potential Framework for Marine OECMs in Indonesia

There are currently no regulations specifically related to OECMs, in terms of managing biodiversity conservation outside of MPA boundaries. Regulations only provide a formal MPA management authority (national and local government), but coastal and small island communities have the right to manage marine resources. There are several regulations that can encompass elements of the definition of an OECM:

- Indonesian Law: UU RI No. 31/2004 juncto UU RI No. 45/2009 on Fisheries.
  - Article 6: fisheries management for fishing and aquaculture needs to consider customary law and/or local wisdom and include community participation.
- Indonesian Law: UU RI No. 27/2007 juncto UU RI No. 1/2014 on The Management of Coastal Areas and Small Islands.
  - Article 16: every person who makes use of some area in coastal waters and small islands permanently must have a location permit which then becomes the basis for granting a management permit.
  - Article 20: National and local government must facilitate the granting of location permits and management permits to local and traditional communities who make use of coastal waters and small islands to meet their daily needs.
  - Article 21: utilization of coastal waters and small islands areas and resources according to customary law; the customary law community is the authority.
  - Article 22: obligation to have a permit is excluded for the customary law community, recognized in the national law.
  - Article 60: rights to manage coastal and small island areas based on customary law if that management does not contradict the Law.
  - Article 61: the Government acknowledges, respects, and protects the rights of customary communities, traditional communities, and traditional knowledge on coastal and small island areas that have been utilized for generations.
- Ministry of Home Affairs Regulation: Permendagri No. 52/2014 on Guidelines for Recognition and Protection of Customary Law Communities: regent/mayor determines the recognition and protection of customary law community based on the recommendation of a customary law community committee by the regional head decree.
- MMAF Regulation Permen KP No. 8/PERMEN-KP/2018) on Procedure for Determining Customary Law Community Management Area in Spatial Use in Coastal Areas and Small Islands: identification and mapping of customary law community management areas are not carried out

by the governor; the minister may facilitate the process of identification and mapping of customary law community management areas.
- Directorate General of Marine Spatial Management Regulation (Perdirjen PRL No. 14/2018) on Technical Guidelines for Facilitating Establishment of Customary Law Community Management Areas: the scope of these technical guidelines includes.
  a. Recognition and protection of customary law community.
  b. Mapping of customary law community management areas.
  c. Proposing of customary law community management areas.
  d. Determination in the zoning plan.

Based on a series of discussions that have been held in the past year on marine OECMs in Indonesia, there is currently a broad spectrum of OECMs established and being considered in the country (Figure 10.1), partly due to the country's new commitments to expand MPAs to 32.5 million ha by 2030 as well as to improve their management effectiveness. The group also identified several potential marine OECM characteristics in Indonesia (Agung 2020):
- An area that does not lie within an MPA nor allocated for marine conservation areas under provincial Zoning Plan for Coastal Areas and Small Islands (*Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil*/RZWP3K).
- Biodiversity conservation may or may not be the primary objective. This will include traditional or customary knowledge or practices.
- Geographically defined with recognized boundaries.
- Managed either by communities, private companies, individuals, governments, or a combination of these stakeholders.
- Communal/informal governance where the management of each area is governed by the responsible entity, although any regulations and mechanisms that will be applied should be in line with the governments' regulations.
- A wide range of management schemes, such as open/seasonal/fully closed systems, targeted species protection, specific fishing gears banned, etc., and can be applied individually or in combination in an area.
- Wide range of OECM types: customary/locally managed areas, fisheries management areas, responsible/private tourism areas, military sites, etc.
- When resources are available, changes and impacts of OECM management need to be monitored/tracked regularly.
- Management capacity and financing scheme will be highly dependent on the capacity of the governing entity.

MMAF and stakeholders recognize that the characteristics above do not fully comply with IUCN-OECM characteristics. While this Indonesia-specific list is more relevant to the Indonesian context, there are some risks if the GoI does not fully adopt or modifies the IUCN-OECM guiding principles when adopting them in Indonesia. The major challenge is this could generate confusion in measuring the contribution of marine OECMs in Indonesia towards Aichi Target 11. An additional complication is reporting OECM effectiveness in the global context, as Indonesia may have a different set of criteria. These risks have been identified and carefully considered, with discussions underway to find the most suitable marine OECM framework for Indonesia.

To achieve *in situ* biodiversity conservation

Low desire to conserve biodiversity → ***High desire to conserve biodiversity***

Biodiversity conservation objective	Ancillary	Secondary	Primary
Management authority: Government Regulated Managed Areas *These are sites or expanses of marine areas that have some form of specific marine management regulation stipulated by the government authority*	• Deep Sea no-fishing zones in high seas • Outermost Islands • Military areas	• Closure Areas within FMA 714 for yellow fin tuna • Artificial fish stock support areas (*Apartemen ikan*) • National Strategic Area (KSN)/ Integrated National Strategic Area (KSNT)	• World heritage sites • Nature wonder sites
Community/Customary Managed Areas *These are areas designated by the community / village level agreement. These may sometimes be supported by formal village regulation (PerDes), and in some cases further authorized by District regulation (PerDa)*	• Marine tenure areas	• Customary managed areas with specific uses such as *meti areas, sasi, etc.* • Mangrove forestry in South Sulawesi for timber and mud crab fisheries	• Locally Managed Marine Areas • Customary managed areas such as *Sasi, Panglima Laot, Awig-awig, etc.* • Village Conservation Areas (*Daerah Perlindungan Laut)* • Taboo/sacred places
Private Sector Managed *These are areas where some form of agreement exists with a private sector partner for the management of the area*	• Oil and Gas platforms/concession areas	• Marine Tourism Village program (*Dewi Bahari*) • Aquaculture areas • Specific tourism areas managed by resorts	• Marine Conservation Agreement by Private Sector (e.g., Resort)

Figure 10.1. OECM spectrum for Indonesia, modified from Jonas (2020). Examples of potential OECMs were summarized from a Focus Group Discussion at Lokakarya Pengelolaan Keanekaragaman Hayati Laut, Pesisir dan Pulau-pulau Kecil Berbasis Wilayah, Jakarta, 22 January 2020.

10.5 Examples of Potential Marine OECMs in Indonesia

10.5.1 Distribution of Potential Marine OECMs in Indonesia

Many OECMs in Indonesia are poorly documented, and information that exists is scattered between many sources. Here, we document the distribution of potential marine OECMs in Indonesia based on identification during a series of focus group discussions (FGDs) that involved relevant stakeholders and experts. The intention of this exercise was not to identify all potential OECMs in Indonesia, but instead to capture a sample to highlight diverse areas and large geographical spread of areas that potentially may qualify as OECMs. We identified 100 potential OECMs in Indonesia that fall within the potential Indonesian marine OECM/IUCN-OECM framework (Figure 10.2). They are widespread across the nation, with managed areas for fisheries (52%) commonly located in the Java Sea, costumary/community-managed areas (19%) in eastern Indonesia, and managed areas for marine tourism (29%) scattered across the country. Managed areas for fisheries include aquaculture sites, fish restocking areas, fish spawning grounds, and territorial use rights for fishing areas. Meanwhile, the customary/community-managed areas include Customary Law Community (*Masyarakat Hukum Adat*/MHA) areas, LMMAs, *sasi*, etc. Managed areas for marine tourism include tourism villages, wreck areas, ecotourism sites, etc. This exercise only identified one *Panglima Laôt* site in Aceh, in fact, each village/region in Aceh has a separate panglima laot system. This exercise also did not include marine military sites due to the inaccessibility of data during FGDs as well as other potential OECMs that are very localized and have never been documented. Thus, the real number of potential marine OECMs in Indonesia could be higher.

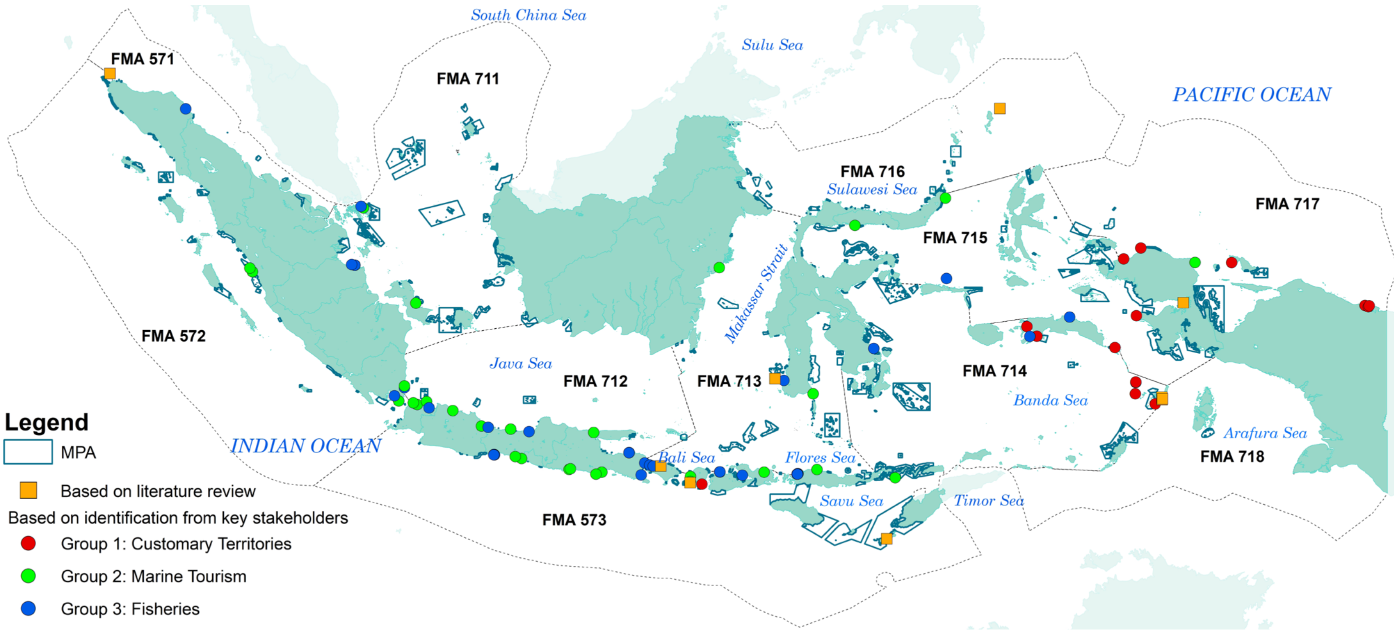

Figure 10.2. Distribution of potential OECMs in Indonesia. The three area types are based on stakeholders' identification during a Focus Group Discussion at Lokakarya Pengelolaan Keanekaragaman Hayati Laut, Pesisir dan Pulau-Pulau Kecil Berbasis Wilayah (Jakarta, 22 January 2020). Potential OECMs are categorized based on type of activities and do not reflect the managing authorities of these activities. Outlines of nationally recognized MPAs and Fisheries Management Areas (FMAs) and other potential OECM sites based on literature review are shown.

These potential OECM sites are located outside of MPA boundaries and have a definite management entity (government, communities, private companies, or individuals). There are several caveats identified from this exercise, i.e. the majority of these potential marine OECMs (1) do not have documented, agreed, or recognized geographical delineation yet, (2) are not monitored regularly and thus long-term *in-situ* conservation benefits are unknown, and (3) have no written documentation of governance or management systems that are applied. Therefore, the total area of these potential marine OECMs that could contribute to national or international targets, as well as management effectiveness, remains unknown.

10.5.2 Alignment of Potential Marine OECMs to IUCN Criteria for OECMs

While it is likely MMAF will have its own criteria for Indonesian marine OECMs, as a CBD signatory, the GoI must report the country's progress on OECM development that aligns with the IUCN criteria for OECMs. We completed an assessment of nine different forms of traditionally-managed areas that most commonly occur in different regions throughout Indonesia as an exploratory exercise to see how they align with the IUCN criteria, as these OECMs are the likeliest candidates for IUCN defined OECMs (Table 10.1, Figure 10.2, and Figure 10.3). Data was collected based on a literature review or field observation by co-authors. Of the different types of traditional management, all have clear and/or agreed-upon boundaries, are governed by customary/community groups, and have rules governing an area or marine resource management. Two of these examples do not yet show long-term sustainability, of those that are monitored, one of these examples is not currently providing *in-situ* biodiversity conservation and in fact is showing declines in the coastal ecosystem. However, almost one-third of these potential OECMs are not monitored; therefore, their effectiveness in delivering biodiversity conservation and ecosystem functions/services is still unknown. Nevertheless, for the examples we present here (Figure 10.3), most fulfill the majority of IUCN's criteria for OECMs.

1. *Panglima Laôt* or "Sea Commander", located in Aceh, is divided into 140 'Ihoks' or estuaries, each with its own set of rules and leader (Case Study 10.A). Only small parts of Aceh waters are within MPAs and the remaining areas are governed under the *Panglima Laôt* system. The rules for this area managed for fisheries dictate, for example, who is entitled to a catch sighted at sea, bans fishers from fishing on Fridays, obliges them to stop fishing in the unfortunate event of a fisherman drowning, and enforces protection of their coastal environment (Campbell et al. 2012; Janssen 2005; Quimby 2015). It has played an important role in the anti-illegal fishing campaign, organizing local fishers with the support of several NGOs, and minimizing habitat degradation and maintaining fish biomass despite ongoing access to the fishery.

2. The East Buleleng Marine Conservation Zone resides along 26 km of coastline located in northeastern Bali. Its 54,000 inhabitants are distributed across ten administrative and 60 customary village divisions that comprise the Tejakula sub-district. Coastal communities rely on fisheries (~2,000 local fishers in 47 fishers' associations), the marine aquarium trade, aquaculture (shrimp, fish, seaweed), and tourism to meet subsistence and livelihood needs (Berdej and Armitage 2016). Coastal-marine regulations here stem from regency and village administrative laws, as well as customary law. Other regulatory bodies include fishers' and ornamental fishers' associations, and community groups responsible for LMMAs. Community-based organizations were created for each, and take on the majority of responsibility to implement, manage, and monitor these spaces and zones. The creation of LMMAs, aimed to curb illegal activities and promote sustainable resource use, are not embraced by all. Still, with help from The Indonesian Nature Foundation (*Yayasan LINI*), fishers from Les village, for example, have taken on stewardship of reef restoration in the area since 2010 (Berdej and Armitage 2016).

3. *Awig-awig*, practiced in Lombok Barat, is a seasonal closure/taboo concept, rooted in a pre-existing order known as *sawen* or *nyawen* (lit. "boundary delineation") that existed before the beginning of the "New Order" Regime in 1966, and was applied to forests, farmland, and the coast (Satria and Adhuri 2010). *Awig-awig* was established to create zones and associated permitted/prohibited activities, based on a combination of traditional knowledge and myth. Many of the religious ceremonies that preceded them demonstrate that myths were influential in resource management. *Awig-awig* is governed by *mangku*, who must maintain the traditional value of social and human-nature relationships as well as resource management. In addition, there is also a local community association called "*Awig-awig Lembaga Masyarakat Nelayan Lombok Utara*", established in 2000 to prevent destructive practices such as blast fishing and the use of poisons (Satria and Adhuri 2010).

4. *Papadak/hoholok* is a set of ethics and solidarity values focusing on natural resource management in paddy fields, instituted in Rote Ndao, Nusa Tenggara Timur. This system has been implemented for generations and focused on land management; recently it was reinvented for the management of marine resources, practiced within and outside TNP (*Taman Nasional Perairan; Aquatic* National Park) Laut Sawu (Oktavia, Salim, and Perdanahardja 2018). The district is divided into 19 subdistricts (*nusak*) governed by a *Leo* (an elderly community member and a king in a clan chosen by majority vote) as well as the customary institution *Forum Komunikasi Tokoh Adat Peduli Budaya*

(FKTA-PB). The *papadak/hoholok* rules include zonation for fishing and species protection, fishing restrictions, waste management for tourism and industrial activities, etc. *Papadak/hoholok* has had significant positive impacts on social sustainability: villages involved have higher levels of interaction around community issues, a stronger tradition of collective action, and less conflict regarding the use of marine resources, as well as positive ecological outcomes for managed species such as sea turtles (Oktavia et al. 2018)

5. *Mane' e* at Kokoropitan Island, Sangihe, Sulawesi Utara encompasses a statement of agreement within a local community to perform an activity together, such as rituals to prepare fishing equipment or conduct fish harvest ceremonies together, or can also be interpreted as an activity to implement fishing operations on the basis of cooperation, solidarity, and unity. It is part of a customary law process called *Eha'*, a warning against the take of natural resources during a certain time (Reppie 2015). This local wisdom has been practiced since the 16th century in Nunasa Islands, a tradition that has become a tourist attraction. It is implemented with the concept of protecting the marine ecosystems and natural resources from overexploitation, though catches are currently on the decline, likely due to environmental degradation.

6. Marine fisheries management systems, such as in Langkai Island, Spermonde, Sulawesi Selatan, can be effective means for more sustainable marine resource use and thus urgently needed to address rapid development. Unlike elsewhere in Indonesia, traditional customary fishery management systems are not found in the Spermonde Archipelago. Yet, in addition to official government laws, informal means to organize marine resource use have emerged. Today, local agreements between fishers (locally called *kesepakatan*) constitute informal rules, which have developed over time, and contribute to organizing fisheries in several areas, including the territory around Langkai Island (Gorris 2016). Based on informal agreements, three locally devised rules were instituted for the use of marine resources in the Langkai Island waters. These include the prohibition of blast fishing, poison fishing, and the use of spear-guns for mackerel fishing. Surveillance and enforcement are carried out by local resource users. Despite the presence of a diverse set of rules, conservation objectives play almost no role in rationale; they were intended to ensure that the local community gets an adequate share of the diminishing local marine resources, exploited by a growing number of fishers from elsewhere. The environmental conservation effects in the area may be limited and should be considered incidental (Gorris 2016).

7. *Sasi* are centuries-old community-based fisheries closures that last roughly two to five years (Pannell 1997; Samian and Santiago 2018) and commonly practiced in Maluku and Papua (Case Study 10.B). *Sasi* in Werka, Ohoirenan and Ohoiwait, Maluku Tenggara, for example, are governed by the associated customary community with rules on what to fish, when to fish, and where to fish. These practices have been implemented for generations and are currently under the formal acknowledgment of the Head of Regency (*Bupati*). Positive effects include the conservation of target species, such as reef fish, one of *Throcus* species (or known as *lola* in local name), and sea cucumber.

8. Temporary fishing closure in the Banda Sea, Maluku Tengah (or in Fisheries Management Area/FMA 714), is regulated by Permen KP No. 4/PERMEN-KP/2015, stating a temporary and partial closure of the Banda Sea from fishing from October to December every year. This closure covers about 130,000 km^2 (20%) of the total area of FMA 714. The main objective of this partial

closure is to maintain stock recovery by preserving the spawning ground of yellowfin tuna (*Thunnus albacares*) by reducing the fishing pressure on this species. After the implementation of this regulation, the annual landing of yellowfin tuna indicated a positive trend, the catch value also increased, and the predicted profit level of the industrial tuna fishing fleet consistently increased (Muawanah et al., in prep). Nevertheless, the impacts of this regulation on small scale tuna fishing in small islands are unknown.

9. Traditional community-based fisheries management areas (TCBFM), with examples found in Teluk Bintuni and Werur, Tambrauw (Papua Barat), dictate rules on where to fish, fish species targets, and catch targets. These practices are also legalized via the Head of Regency. In the first location, seven major ethnic groups manage the area (Suku Kuri, Wamesa, Sebyar, Sough, Moskona, Irarutu, and Sumuri), in the latter, the Karak Biak clan. Baseline surveys have been conducted to monitor the health of target fish species.

Case Study 10.A
***Panglima Laôt*, the Guard of Weh Island Coastal Ecosystems**

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The people of Weh Island recognize *Panglima Laôt* (Sea Commander) as the leader of *Laôt* indigenous people under the auspices of a *Hukôm Adat Laôt* (customary marine law) institution. This *Panglima Laôt* institution and customary marine law were initially recognized during the era of Sultan Iskandar Muda (1607 – 1637), of the Samudra Pasai Sultanate. In the "New Order" (*Orde Baru*) Regime (1966 – 1988), *Hukôm Adat Laôt* declined significantly but was revitalized in the 2000s with the introduction of regional autonomy and Aceh Government Law. This customary structure regulates fishing practices and social life in coastal areas known as *Lhôk*. In a *Lhôk*, some *Pantang Laôt* (prohibition for going out to sea), such as the temporal and geographic restrictions as well as procedures for the community's activities at sea, are regulated. For example, *Lhôk* Anoi Itam regulates fishing activities through limiting allowable fishing gear (e.g. hand lines) and prohibiting the use of non-environmentally friendly fishing gear and destructive fishing practices, such as bombs and poisons. Additionally, *Lhôk* Anoi Itam established several no-fishing zones called *Cot Geulumpang*. This *pantang* (prohibited) system is found not only in *Lhôk* Anoi Itam but also in other *Lhôks*. The distribution of *Lhôks* on Weh Island is presented in Figure 10.A.1.

To strengthen customary marine law, some *Lhôks* impose sanctions on violations of the agreed rules, such as through confiscations, fines, or formal legal procedures. For example, sanctions for violating fishing day restrictions include seizing the ships and fishing gear, in addition to prohibiting the fishers from going to sea for seven days. For blast and poison fishing, similar sanctions are authorized: confiscation of the ships and fishing gear, with the hand-over of the perpetrators to law enforcement officers. For other destructive fishing activities, the sanctions will be determined by the customary marine law institution.

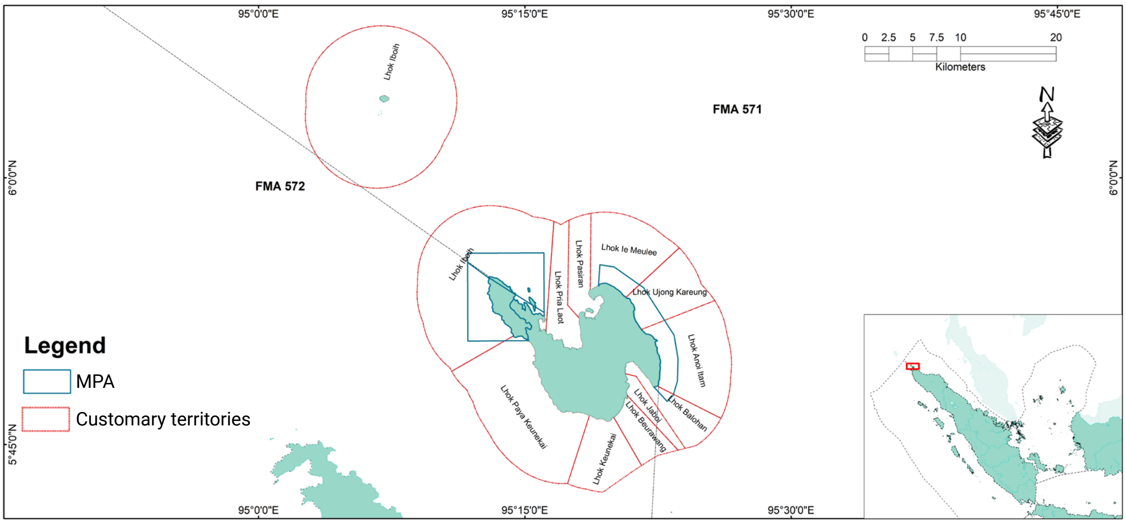

Figure 10.A.1 Area of *Hukôm Adat Laôt* in Weh Island.

Another example is *Lhôk* Iboih, one of the *Lhôk*s on Weh Island, part of which belongs to the protected area of TL (*Taman Laut*; Marine Parks) Pulau Weh Sabang. The *Lhôk* has implemented regulations combining select prohibitions from customary marine law and formal law. The implementation also follows the sanction model. Monitoring of coral reef ecosystem conditions in *Lhôk* Iboih between 2013 (Muttaqin et al. 2014), 2016 (Muttaqin et al. 2016), and 2019 (Muhidin et al. 2020) indicates improved fish abundance and coral cover. Fish abundance in 2019 accounted for 22,822 ind/ha, increasing from 16,724 ind/ha in 2016 and 3,610 ind/ha in 2013. Hard coral cover increased from 20% in 2013 to 39% in 2019, although hard coral cover in 2016 was higher than in 2019, mainly due to coral bleaching. The increasing positive condition of coral reefs suggests that the management of natural resources in *Lhôk* Iboih increased the resilience of coral reefs to environmental changes and local pressures in the region. This provides a good example of using more formalized management to strengthen customary institutions in managing coastal ecosystems that has led to positive conservation outcomes.

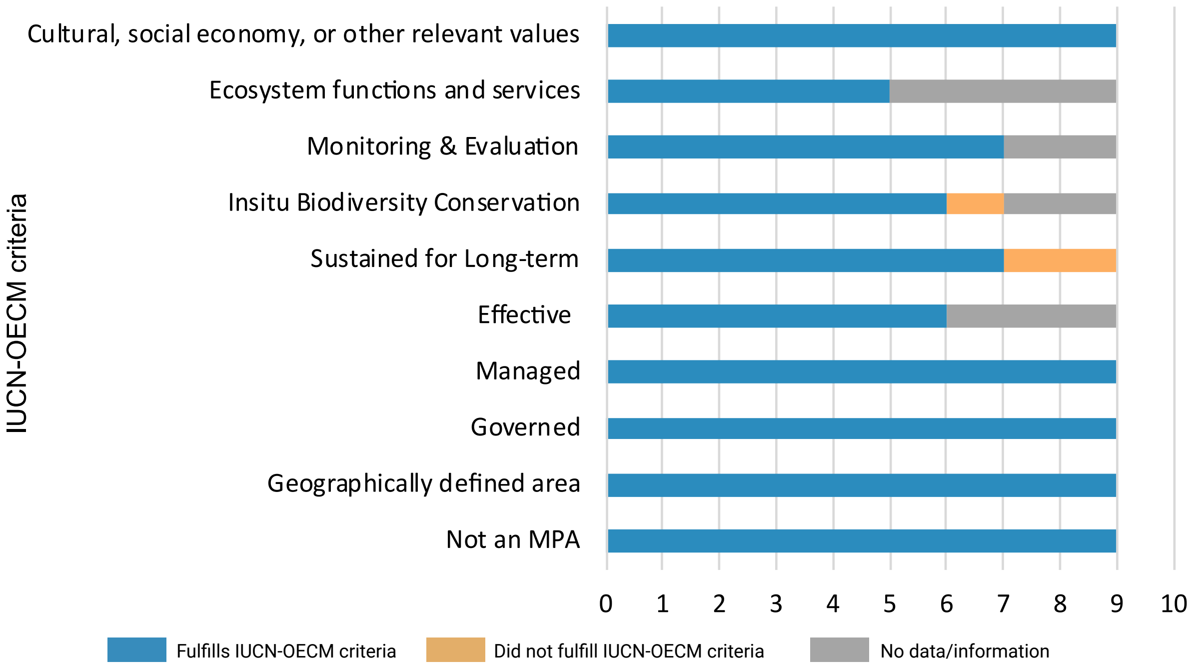

Figure 10.3. IUCN-OECM criteria alignment in definition characteristics for nine OECM examples in Indonesia.

Aside from the above examples, there are others with the potential to be designated as OECMs, including but not limited to LMMAs in the Kei Islands (Steenbergen 2016) community-based mangrove forestry/fisheries areas managed for mud crabs (Mulyana, Dermawan, and Direktorat KTNL 2008), where there is a perception of mangrove forests importance for supporting local livelihoods (Damastuti and de Groot 2017); Particularly Sensitive Sea Area (PSSA) designation by the International Maritime Organization in Lombok Strait, including Gili Islands and Nusa Penida Islands (Diz et al. 2018); or MHA/customary law communities that have been recognized by MMAF (there are 33 MHAs across eastern Indonesia and they have rights to manage their marine areas). Other de facto biodiversity protection exists in Indonesia, such as via closed access to marine areas for military use, or from privately managed marine areas such as Misool Eco Resort (Misool foundation 2020). Despite these protection areas having wide-ranging primary objectives, governance systems, and levels of protection, they can contribute towards national and global protection targets as OECMs.

Table 10.1. Several customary/community-led and government-led potential OECMs in Indonesia, and identification of their characteristics against IUCN-OECM criteria (IUCN-WCPA Task Force on OECMs, 2019). See the elements of the IUCN definition of an OECM in the Introduction for columns 4-13.

Type of management	Name of OECMs	Locations	Not an MPA	Geographically defined area	Governed	Managed	Effective	Sustained for Long-term	In-situ Biodiversity Conservation	Monitoring & Evaluation	Ecosystem functions and services	Cultural, social economy, or other relevant values	Sources
Area and fisheries management; there are rules to govern where to fish/not fish, when to fish, what to fish, how to fish, or who can fish. The applied rules can be varied between each area.	*Panglima Laôt*	Aceh	1	1	1	1	1	1	1	1		1	Janssen (2005); Quimby. (2015); Campbell et al. (2012)
	East Buleleng Marine Conservation Zone	Buleleng, Bali	1	1	1	1		0	1	1	1	1	Berdej and Armitage (2016)
	Awig-awig	Lombok Barat, Nusa Tenggara Barat	1	1	1	1		1		1	1	1	Satria and Adhuri (2010)
	Papadak/ hoholok	Rote Ndao, Nusa Tenggara Timur	1	1	1	1	1	1	1	1		1	Oktavia et al. (2018)
	Mane'e	Sangihe, Sulawesi Utara	1	1	1	1	1	1	0	1	1	1	Reppie (2015)
	Marine fisheries management systems	Langkai Island, Spermonde, Sulawesi Selatan	1	1	1	1		0				1	Gorris (2016)
	Sasi	Werka, Ohoirenan, Ohoiwat, Maluku Tenggara, Maluku	1	1	1	1	1	1	1			1	Field observation by WWF-Indonesia
	Temporary fishing closure	Banda Sea, FMA 714	1	1	1	1	1	1	1	1	1	1	Muawanah et al., in prep
	TCBFM (Traditional Community-Based Fisheries Management/ *Pengelolaan Perikanan Berbasis Masyarakat Tradisional*)	Teluk Bintuni & Werur, Tambrauw, Papua Barat	1	1	1	1	1	1	1	1	1	1	Field observation by WWF-Indonesia

• 1= Fulfills IUCN-OECM criteria • 0= does not fulfill IUCN-OECM criteria • Blank cells= No data/information

10.6 Challenges and Opportunities

In Indonesia, there are a number of challenges to establishing OECMs effectively, including:

– alignment of IUCN criteria and that of the Indonesian context for OECMs in relation to the respective MPA definitions, especially for global reporting purposes towards national/international targets.
– many Indonesian OECMs remain undocumented, both in terms of type and specific individual detail, and therefore, there is a need for a process to recognize OECMs and one that is consistently implemented.
– there are currently no OECM-specific regulations, and thus no standard governance systems; some rights on customary laws are embedded in other regulations, and in some customary areas, governance and organization structures are available and better defined.
– monitoring for ecological outcomes is needed; because many OECMs are not recognized nor documented, the ecological impacts remain unknown and thus nullify the use of these areas as tools for conservation. Developing Standard Operating Systems (SOPs) for (a) continued collection of OECM data over time; and (b) assessing the levels of "effectiveness" and "impacts" of OECMs (screening process) could help contribute to proper use and understanding of these areas.
– ensuring the OECMs can be implemented sustainably in the long-term will require sustainable financing and strong management capacity, and this can be a burden for many OECMs implemented by entities that do not have such capacities.

Thus, identification and process will be the first steps in addressing these challenges around OECMs and developing the most suitable and applicable marine OECM framework for Indonesia. Consideration of OECMs requires a paradigm shift in many ways, to:

– consider how definitions of area-based conservation measures will impact progress towards targets and real positive outcomes for biodiversity.
– refrain from the creation or recognition of OECMs to meet targets if they are not appropriate, initiate counterproductive outcomes, or used as a gap fill for other various needs.
– recognize customary governance as a means of effective management for conservation and ecosystem services, particularly when an MPA is not feasible.

With the introduction of OECMs as an alternative formally recognized conservation tool to MPAs, it is likely the implementation of OECMs will become common in the future. Despite the challenges mentioned above, OECMs provide immense opportunity for contributing to the national MPA targets, i.e. 32.5 million ha of MPAs by 2030 and global Aichi Target 11, i.e. to protect 10% of marine areas. OECMs can help close the remaining gap in MPA achievements. An exploration of how partnerships and networking mechanisms might support the integration of OECMs into MPA achievements at the national level (*Kawasan Konservasi Perairan Nasional*/KKPN; National MPAs) and local level (*Kawasan Konservasi Perairan Daerah*/KKPD; Provincial MPAs) would likely be beneficial. Customary OECMs, which are the most identified, exhibit high compliance; customary management has been practiced for generations, even centuries, and the rules are actively followed/obeyed by communities. The legalization of provincial marine zoning plan documents will provide a considerable opportunity for OECM designation and long-term implementation because the provincial governments have formally allocated and acknowledged a certain type of area management within their jurisdiction. Finally, OECMs can strengthen co-management among key stakeholders and increase the involvement of communities in the area management, especially in areas that not traditional closed access PAs.

Case Study 10.B
***Sasi Laut*: A Traditional Institutional System to Promote Sustainable Fisheries Management in an Open-Access Marine Area**

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Sasi Laut (marine *sasi,* and will be written as *sasi)* is one of the oldest marine traditional management systems in Indonesia. Predated from the 17th century, *sasi* refers to “local communities’ regulations that govern the harvesting of resources” (Naamin and Badrudin 1993) and has been commonly practiced in the eastern part of Indonesia, especially Maluku. *Sasi* is a traditional-based fisheries management system that provides equal access and opportunities to fisheries for local communities (Novaczek 2001). Central to *sasi* practice is the system of beliefs, rules, and rituals related to temporal use of the territory. When *sasi* is applied to a particular resource or area, no one can harvest it or within until the *sasi* is open. In most practices, *sasi* is closed for one to five years and is open for less than a week (Satria and Adhuri 2010). Within the opening duration, the local communities of all ages can harvest the resources that were initially prohibited. In principle, *sasi* has clearly defined territorial boundaries, enforceable rules, regular monitoring and surveillance, graduated sanctions, and legitimate authority (Satria and Adhuri 2010). Although these principles are agreed upon and enforced by local communities, they are not commonly written/ formalized.

There is a paradox as to whether *sasi* can provide conservation benefits. Some scientists speculate that *sasi* strongly supports marine conservation (Boli et al. 2014; McLeod et al. 2009) and can create an unintentional MPA (Dwiono, personal communication in Thorburn 2000). On the other hand, in some villages in Maluku, the total harvest nowadays has shown a decline when compared to total harvest in the 1970s mainly due to degradation of marine ecosystems and the stealing of marine resources by outside fishers (Evans et al. 1997; Thorburn 2000). According to historical analysis, the objectives of *sasi* have shifted or broadened towards or against conservation. *Sasi* in Haruku Island, Maluku, for example, has expanded its objective from resource management to species conservation and habitat protection (Mony et al. 2017). In Luang Island, Maluku, the economic needs have changed the *sasi* system implementation, such as shortening the closed period from three years to one so the local community can enjoy economic benefits more often and transfer the control from the community to village government.

Limited studies and anecdotal evidence suggests that *sasi* can provides conservation benefits. Likely, given certain conditions, *sasi* can deliver conservation benefits, and it will be important to ensure that enabling conditions are in place to better support effective management and conservations outcomes. *Sasi* management principles should be seen as an institutional system that can manage fisheries and marine habitats in an open-access area, and thus may contribute to conservation when managed effectively.

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Chapter 11. Applying *The MPA Guide* to Indonesia's Marine Protected Area Network

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Abstract

The MPA Guide represents a newly proposed global framework for tracking MPA progress using a common language. The authors conducted the first ever nationwide MPA assessment, based on Indonesia's MPA extent, and following The MPA Guide criteria for Stage of Establishment and Level of Protection. MPAs were classified based on management effectiveness assessments, and zonation plans submitted to government ministries. This assessment found that 39% of Indonesia's MPA extent meets The MPA Guide definition of Actively Managed — representing 8,174,900 ha. By area, Proposed, Designated, and Implemented represented 14%, 30%, and 16% of Indonesia's MPA area, respectively. The analysis of Level of Protection assessed 21% of MPAs in Indonesia, however, these represented 57% of national MPA extent (13,383,030 ha). The majority of these MPAs contained Minimally (58.7%) or Lightly (36.4%) protected zones, while Highly (2.5%) and Fully (2.4%) protected zones represented a lower proportion of Indonesia's MPA estate. This is unsurprising, given the dual MPA objectives of biodiversity conservation and building sustainable fisheries management for fisheries-dependent coastal communities. Additionally, there are 9,913,432 ha in 154 MPAs that do not yet have zonation plans available or remain "not zoned" – suggesting substantial potential for the relative area of each Level of Protection within Indonesia to change in the future.

Abstrak

MPA Guide (atau Pedoman Kawasan Konservasi Perairan/KKP) merupakan kerangka kerja global yang baru saja diperkenalkan di dunia untuk menilai capaian KKP menggunakan kriteria yang standar. Untuk pertama kali, para penulis melakukan penilaian terhadap seluruh KKP di Indonesia berdasarkan luas KKP Indonesia. Penulis merujuk pada kriteria MPA Guide untuk memetakan "Stage of Establishment" (Tahap Pengembangan) dan "Level of Protection" (Tingkat Perlindungan) dari seluruh KKP di Indonesia. KKP diklasifikasikan berdasarkan penilaian efektivitas pengelolaan dan rencana zonasi yang diajukan kepada kementerian terkait. Temuan dari penilaian Tahap Pengembangan menggunakan kriteria MPA Guide ini menunjukkan bahwa 39% dari total luasan KKP di Indonesia telah mencapai Tahap "Dikelola Secara Aktif" (Actively Managed) — mewakili 8.174.900 ha. Sementara itu, 14% dari luasan KKP di Indonesia dikategorikan sebagai "Diusulkan" (Proposed), 30% sebagai "Ditetapkan" (Designated), dan 16% sebagai "Diimplementasikan" (Implemented). Analisis Tingkat Perlindungan hanya menggunakan data dari sekitar 21% jumlah KKP di Indonesia terutama KKP yang telah memiliki zonasi, namun sejumlah KKP ini mewakili sekitar 57% dari luas KKP di Indonesia (13.383.030 ha). Sebagian besar tingkat perlindungan KKP berada pada tingkat "Rendah" (Minimally, 58,7%) atau "Sedang" (Lightly 36,4), sementara tingkat perlindungan yang "Tinggi" (Highly, 2,5%) dan "Penuh" (Fully, 2,4%) mewakili proporsi yang lebih rendah dari seluruh luasan KKP di Indonesia. Ini merupakan hal yang wajar, mengingat sebagian besar KKP di Indonesia memiliki tujuan ganda yaitu konservasi keanekaragaman hayati dan pengelolaan perikanan berkelanjutan bagi masyarakat pesisir yang bergantung pada sumber daya laut. Selain itu, terdapat 9.913.432 ha dalam 154 KKP di Indonesia yang belum memiliki rencana zonasi atau "tanpa zona". Hal ini mengindikasikan potensi besar bagi Indonesia untuk mengalami perubahan Tingkat Perlindungan KKP di masa mendatang.

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11.1 Introduction

Marine Protected Areas (MPAs) are widely used by governments, marine conservationists, and other stakeholders wishing to increase marine biodiversity protection and have rapidly expanded in coverage in recent decades (Lubchenco and Grorud-Colvert 2015; Spalding et al. 2013). This rapid expansion has, in part, been driven by global and national targets. For example, United Nations Convention on Biological Diversity Aichi Target 11 calls for nations to designate at least 10% of their marine area as protected areas by 2020, with high likelihood that new targets will include a further expansion of this area-based target. For Indonesia, both national and regional (e.g. Coral Triangle Initiative) targets give explicit area-based targets for MPA expansion (Chapter 2). MPA initiation (i.e. proposal and legal designation) is only the first step. To reach their full potential (i.e. optimal management), MPAs must be implemented with regulations in place "on the water", equitably governed, and actively managed (Wells et al. 2016). Active management includes ongoing monitoring, evaluation, and learning, and enforcement that informs adaptive management to ensure conservation outcomes. Many MPAs worldwide have not yet reached these optimal levels of management (Sala et al. 2018; Wells et al. 2016). It is clear that providing resources to improve adaptive management of existing MPAs will, in addition to new MPA establishment, remain a prominent conservation intervention for many years to come.

There are many challenges when tracking MPA progress towards targets at the national and international levels. International and national MPAs targets are multidimensional, often including elements around extent, management effectiveness, representativeness, connectivity, and outcomes. Individual MPAs are also highly diverse, including a wide range of approaches from complete access closures of marine areas to partial protection approaches that allow substantial resource use (Sala et al. 2018). It is well established in the scientific literature that fully protected areas (also known as "no take" areas) — locations where all extractive and destructive activities are prohibited — generate the greatest positive biodiversity outcomes (Edgar et al. 2014). Indeed, the primary goal of an MPA, as defined by IUCN, must be the conservation of nature (IUCN-WCPA 2018). MPAs, however, are often established in coastal areas where local communities have high natural resource dependency, and thus the goals of the MPA necessarily include equitable access to resources. Therefore, many nations adopt modified forms of the IUCN MPA definition that recognize other local needs. For example, Indonesian MPAs — known officially as "Marine, Coasts, and Small Islands Conservation Areas" — are legally defined as: "*spatially defined, marine, coastal or small island areas that are protected and managed by a zoning system to achieve sustainable management of fisheries resources and environmental outcomes*" (PP RI No. 60/2007). Conservationists, therefore, often advocate for and recognize the important biodiversity gains that can be made from lightly protected areas that seek to optimize both biodiversity conservation and human well-being while allowing extractive use (Carvalho et al. 2019; Lester and Halpern 2008; Sciberras et al. 2013; Zupan et al. 2018). MPAs are established under complex legal and customary governance frameworks within and between nations, which are often implemented by stakeholders ranging from governments and indigenous rights-holders to communities (e.g. Chapter 1). As a result, many different terms are currently being used to describe similar management practices "on the water", or, conversely, the same term is being used in different contexts to refer to very different management practices. These issues make tracking MPA progress at the national and international levels challenging.

To address these challenges, a global community of marine conservation stakeholders have come together to create *The MPA Guide* (2020). *The MPA Guide* provides a common language and framework for governments and other stakeholders with the aim of tracking MPAs based on the different protection levels they provide, facilitating monitoring progress, and enabling discussions about realistic outcomes based on permitted and prohibited activities. *The MPA Guide* does not intend to change or replace individual tools developed and used by national governments but aims to help communicate progress in the global context. *The Guide* is structured with two core components: (i) the *Stage of Establishment* of an MPA, and (ii) the *Level of Protection* provided by an MPA. The *Stages* and *Levels* each have four components, which can be plotted on two axes (Figure 11.1) to allow individual MPAs, zones within MPAs, MPA networks, or regional or global MPA estates to be tracked through time. *Stages of Establishment* range from Proposed/Committed, where the intention to establish an MPA is expressed publicly, through to Actively Managed, where there is an adaptively managed, functional MPA on the water that is meeting its goals (Table 11.1). In most cases, an entire MPA will fall into a single category for *Stage of Establishment* based on current establishment or management status. *Levels of Protection* range from *Fully Protected* where no extractive or destructive activities are allowed and all impacts are minimized, to *Highly Protected*, where some extractive activities are allowed but at such low levels as to still enable high biodiversity conservation, to *Lightly Protected*, where more extractive activities are allowed to balance human use, to *Minimally Protected* where extensive extraction is allowed (Table 11.2). As individual MPAs are often zoned into distinct spatial areas with differing rules and regulations, the *Level of Protection* can vary between different zones within a single MPA. An individual MPA may be comprised of a patchwork of different *Levels of Protection* that will affect the overall biodiversity outcomes expected from the MPA.

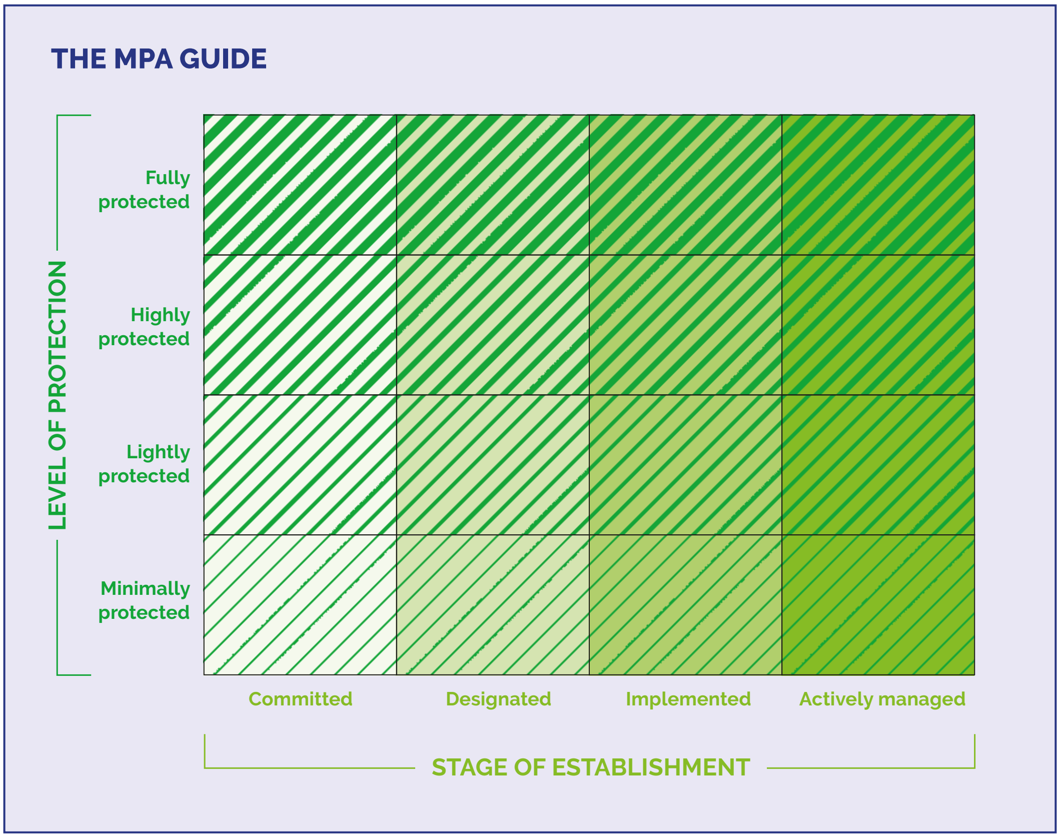


Figure 11.1. *The MPA Guide* matrix framework. Source: Grorud-Colvert et al. (in review).

Table 11.1. *Stage of Establishment* from *The MPA Guide*.

Stage	Description
Proposed/Committed	The intent to create an MPA is made public, for example through a submission to the Convention on Biological Diversity or other initiation, conference announcement, official press release, or other official declaration.
Designated	The MPA is established or recognized through legal means or other authoritative rule-making. The MPA now exists “on paper” and in law or other formal process. It must have (1) defined boundaries, (2) legal gazetting, and (3) a clear definition of uses and associated regulations.
Implemented	An MPA transitions from existence “on paper” to being operational and “in force on the water” with a plan for management that reflects the primacy of conservation objectives (as per the IUCN definition of an MPA). The management plan can include descriptions of zones, if applicable, and their goals.
Actively Managed	Management of the MPA is ongoing with monitoring, periodic review, and changes made as needed to achieve conservation goals. Best practice is to monitor the impact of management across indicators of ecological and human well-being and to adjust as needed to meet goals.

Source: Grorud-Colvert et al. (in review)

Table 11.2. *Level of Protection* from *The MPA Guide*.

Level	Description
Fully Protected	No extractive or destructive activities are allowed, and all abatable impacts are minimized.
Highly Protected	Only light extractive activities are allowed, and other impacts are minimized to the extent possible.
Lightly Protected	Some protection exists but moderate to significant extraction and impacts are allowed.
Minimally Protected	Extensive extraction and other impacts are allowed while still providing some conservation benefit to the area.

Source: Grorud-Colvert et al. (in review)

This chapter presents an assessment of Indonesia’s national MPA estate using *The MPA Guide Stage of Establishment* and *Level of Protection* criteria. By using *The MPA Guide* to understand the *Stages* and *Levels* of Indonesia’s MPAs, this analysis identifies the investments Indonesia has made in MPAs using a new global framework and demonstrate the ongoing process to establish and actively manage these sites. *The MPA Guide* framework makes no judgement on desired or appropriate conservation interventions, which must be adapted to ensure appropriateness to local context and national priorities. Instead, it is a tool for evaluating, celebrating, and supporting steady improvement in MPAs and MPA networks. This is the first ever national level MPA evaluation using *The MPA Guide* for any country globally. Here, the authors aim to classify all recognized MPAs within Indonesia for *Stage of Establishment* and *Level of Protection*. This chapter is intended to inform on recent MPA progress in Indonesia and increase clarity for communicating this progress internationally by reporting against *The MPA Guide* as a recognized global framework.

11.2 MPA *Stage of Establishment*

To identify the *Stage of Establishment*, this analysis used existing MPA assessment tools in Indonesia. Indonesia's MPAs are managed by the Ministry of Marine Affairs and Fisheries (MMAF) and the Ministry of Environment and Forestry (MoEF) — see Chapter 1 and Chapter 5 for more detailed description. As of December 2019, there are 196 recognized MPAs in Indonesia with 166 under MMAF management which are officially called marine conservation areas (Chapter 3). The remaining 30 MPAs are protected areas managed by MoEF — these are comprised of several MPA types including national parks (Chapter 3).

To track individual MPA establishment, progress, and management effectiveness, MMAF uses its own assessment tool — the Management Effectiveness of Aquatic, Coasts, and Small Islands Conservation Areas (*Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil*/E-KKP3K) (KKJI 2012). This tool categorizes each MPA into one of five levels based on establishment stage and management: (i) Red — Conservation area initiated, (ii) Yellow — Conservation area established, (iii) Green — Conservation area managed minimally, (iv) Blue — Conservation area managed optimally, and (v) Gold — Self-reliant conservation area. E-KKP3K functions as an MPA self-assessment, where an assessment team from MMAF works through 74 multiple-choice questions with the MPA managers to identify current status of their MPAs. Chapter 5 provides a more detailed overview of the E-KKP3K. For this analysis, the data were sourced from MMAF's raw E-KKP3K data from 2019, which included data for 122 of the 166 MMAF MPAs (73%). The authors aligned the individual E-KKP3K questions to match with the core criteria for each *Stage of Establishment* from *The MPA Guide* (Appendix 11.1). For example, the criteria for an MPA to be *Proposed* includes: "*Site identified. Conservation is primary objective*." This was matched with question M2 from the E-KKP3K which states: "*Proposal to initiate establishment of the conservation area is submitted to national government or local government (M2A) without preliminary survey and map, or (M2B) with preliminary survey and map*." In this case, answering yes to either part M2A or M2B meets the criterion. As another example, for an MPA to be *Implemented* the criteria includes that: "*Management body/team exists*." The authors matched this criterion with E-KKP3K question K9 — which asks: "*Are there conservation area management personnel in place?*". To meet this *Implemented* criterion answering yes, there are management personnel in place, is required. See Appendix 11.1 for the full matching of criteria between *Stage of Establishment* and the E-KKP3K questions. This approach allowed us to categorize these 122 MPAs by their *Stage of Establishment*.

MoEF uses the Management Effectiveness Tracking Tool (METT) to track progress of its 30 MPAs. METT is a globally recognized framework for assessing management effectiveness of protected areas that has been adopted by many governments worldwide (Stolton et al. 2019). The original METT was designed for all protected areas — both terrestrial and marine — but a marine-specific version was also developed later (Staub and Hatziolos 2004). MoEF has adapted the standardized METT framework (Stolton et al. 2007) and the MPA-specific METT framework (Staub and Hatziolos 2004) to produce its own terrestrial-specific (*Penilaian Efektivitas Pengelolaan Kawasan Konservasi Daratan*) and marine-specific (*Penilaian Efektivitas Pengelolaan Kawasan Konservasi Perairan*) METT frameworks (KSDAE 2015). The MoEF METT assessments have varying numbers of points (normally 1–3) available for each question based on progress of the protected area. Some questions have additional bonus points (Chapter 5 for an overview of METT in Indonesia). METT assessments from 2017 were available for 26 of the 30 MoEF MPAs (87%) from the MoEF public METT repository (http://mett.ksdae.menlhk.go.id). Fourteen of these MoEF MPAs had been assessed with the Indonesian marine-specific METT assessment, and twelve had been assessed with the terrestrial-specific METT assessment. The authors therefore aligned the METT questions from both of these assessments against *The MPA Guide Stage of Establishment* criteria (Appendix 11.2; Appendix 11.3). For example, to be *Designated* an MPA must have "Legal gazetting." This matched with question 1 from the marine-focused MoEF METT assessment, which asks: "*Does the Marine Protected Area have legal status?*". From the multiple-choice answers to this question, only the answer worth three points which states "*The conservation area has formal legal status*" meets the *MPA Guide* criterion. See Appendix 11.2 and Appendix 11.3 for the complete alignment between METT questions and *MPA Guide* criteria.

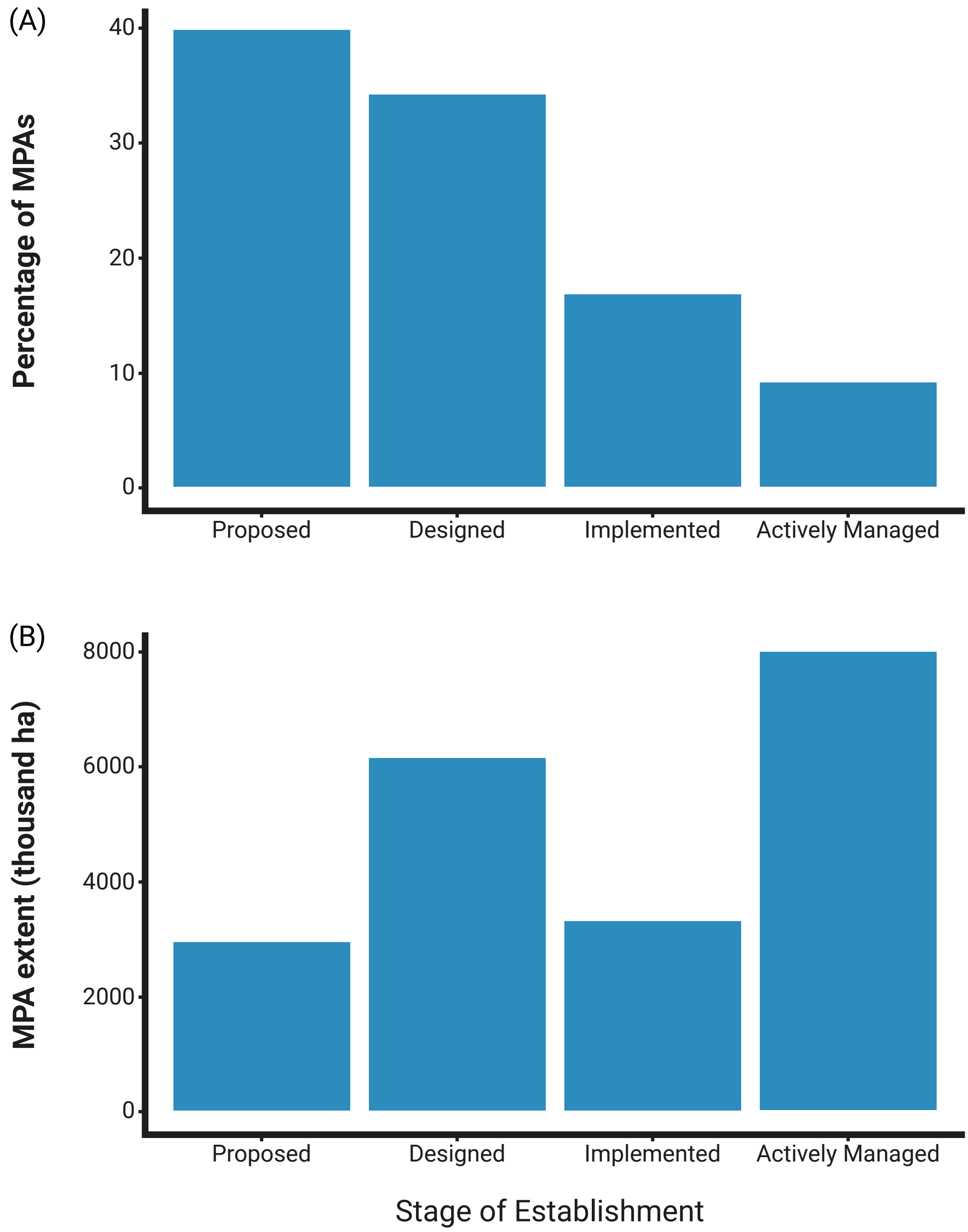


Figure 11.2. *Stage of Establishment* for the assessed MPAs in Indonesia based on *The MPA Guide* criteria. (A) Percentage of MPAs in each *Stage of Establishment*. Note, percentages are calculated based on the number of MPAs in each *Stage* and does not account for differing sizes of MPAs. (B) MPA extent under each *Stage of Establishment*. Results in both parts of the figure are based on the 143 MPAs (out of the 148 assessed MPAs) that had spatial data files available for outer boundaries.

11.2.1 Results for Stage of Establishment

Overall, the analysis identified the *Stage of Establishment* for 148 of the 196 MPAs based on E-KKP3K or METT assessments—representing 76% of Indonesian MPAs. In addition, the authors were able to obtain outer MPA boundary shapefiles for 189 MPAs from MMAF and MoEF records. These 189 MPA boundary shapefiles included 143 of the 148 MPAs that had been allocated a *Stage of Establishment*. The overall area of Indonesia's MPAs under each *Stage of Establishment* was therefore calculated for these 143 MPAs, and results are presented for these MPAs.

Across Indonesia, the analysis identified 57 "*Proposed*" MPAs, 49 *Designated* MPAs, 24 *Implemented* MPAs, and 13 "*Actively Managed*" MPAs (Figure 11.2.A). The largest number of MPAs were therefore in the "*Proposed*" category, with decreasing numbers of MPAs at increased *Stages of Establishment*. Figure 11.2 summarizes our *Stage of Establishment* results, with Figure 11.2.A showing the percentage of MPAs (i.e. based on number of individual MPAs) in each category. Despite "*Actively Managed*" having the least number of MPAs, 39% of overall MPA area in Indonesia (8,174,900 ha) is being "*Actively Managed*" — making this the largest *Stage of Establishment* category by area (Figure 11.2.B). This is because the thirteen "*Actively Managed*" MPAs represent some of the largest and oldest MPAs in Indonesia (Table 11.3). Figure 11.2.B shows the total area of MPAs summed across Indonesia in each *Stage of Establishment* category. By area, "*Proposed*", "*Designated*", and "*Implemented*" represented 14%, 30%, and 16% of Indonesia's MPA area, respectively (Figure 11.2.B). Therefore, there is a less consistent pattern in *Stage of Establishment* when considering MPA extent than the number of MPAs. These results also suggest that "*Proposed*" MPAs are smaller on average than those which have already been "*Designated*", "*Implemented*", or "*Actively Managed*".

11.3 MPA *Level of Protection*

Identifying *Level of Protection* is challenging, as all MPAs in Indonesia are required to use zonation to balance different stakeholder needs (Chapter 6). This means that all MPAs in Indonesia have differing applied rules and regulations by zone, that lead to varying Levels of Protection for different zones within individual MPAs. The process of MPA establishment in Indonesia is long (Chapter 5 and Chapter 6), with MPAs initiated and outer boundaries given formal legal recognition before zonation is developed. Within the MMAF E-KKP3K framework, zonation is required to achieve MPA establishment. This means that many MPAs in Indonesia under development have a *Stage of Establishment* ("*Proposed*" or "*Designated*") but have not yet developed zonation plans and so have anticipated *Levels of Protection*.

At the national level, under the legal instruments used to designate MPAs, both MMAF and MoEF specify the zone types that can be used and the minimum associated *Level of Protection* (based on activities allowed) that they must provide. For example, all MPAs are required to prohibit medium and large (industrial) fishing fleets from fishing anywhere within the MPA — defined as vessels larger than 10 GT. For MMAF MPAs, the Core Zone (where all activities are prohibited except research) should be at least 2% of the total size of the MPA (Chapter 6). However, MPA managers have flexibility when drafting management plans to enlarge Core Zone and bring in additional tailored regulations for zones based on local context. This makes detailed understanding of each MPA's unique set of rules and regulations difficult when conducting a national-level assessment. Collation and review of individual MPA management plans are necessary, but these are hard to access.
All MPA managers, however, are required to submit their zonation plans to MMAF or MoEF. These plans (often a printed map with coordinates or GIS shapefiles) identify all zones within the MPA, including

Table 11.3. Extent and *Level of Protection* of MPAs classified as *Actively Managed*.

MPA Name	Province	Management Authority	Stage of Establishment	Level of Protection based on Extent of Protection (ha)				Total MPA area (ha)
				Fully	Highly	Lightly	Minimally	
TWP Nusa Penida	Bali	MMAF	Actively Managed	477	47	2,568	17,283	20,375
TNL Kepulauan Seribu	DKI Jakarta	MoEF	Actively Managed	5,833	26,279	59,745	17,050	108,907
TP Pantai Penyu Pangumbahan	Jawa Barat	MMAF	Actively Managed	509	60	83	2,087	2,739
TNL Karimun Jawa	Jawa Tengah	MoEF	Actively Managed	2,046	2,704	4,201	112,872	121,823
TWP Kepulauan Anambas	Kepulauan Riau	MMAF	Actively Managed	30,442	0	15,791	1,221.201	1,267,433
TPK Kei Kecil	Maluku	MMAF	Actively Managed	8,600	0	18,177	124,655	151,432
SAP Pesisir Timur Pulau Weh	Aceh	MMAF	Actively Managed	66	0	111	3,054	3,231
TNP Laut Sawu	Nusa Tenggara Timur	MMAF	Actively Managed	82,378	0	1,343,473	2,037,398	3,463,249
TWP Raja Ampat	Papua Barat	MMAF	Actively Managed	6,369	0	552,729	466,961	1,026,058
TP Jeen Womom	Papua Barat	MMAF	Actively Managed	2,249	122	1,134	28,718	32,223
TNL Taka Bone Rate	Sulawesi Selatan	MoEF	Actively Managed	10,342	29,873	9,607	488,496	538,319
TNL Wakatobi	Sulawesi Tenggara	MoEF	Actively Managed	1,560	38,993	1,316,206	45,295	1,402,054
TWP Pulau Pieh	Sumatera Barat	MMAF	Actively Managed	805	1,017	108	35,142	37,072
Total (ha)				151,676	99,094	3,323,934	4,600,212	8,174,916

Note: MPAs include TNL (*Taman Nasional Laut;* Marine National Park), TWP (*Taman Wisata Perairan;* Aquatic Tourism Park), TP (*Taman Pesisir;* Coastal Park), TPK (*Taman Pulau Kecil;* Small Island Park), SAP (*Suaka Alam Perairan;* Water Sanctuary), and TNP (*Taman Nasional Perairan;* Aquatic National Park).

the name of each zone following the zone types as specified in MPA laws. Thus, these plans can be analyzed relatively easily to identify the number of zone types based on zone names and the national zonation standards as well as the overall contribution by area of each of the different zones in the MPA. Many, but not all, of the shapefiles provide detailed information on locally implemented additional restrictions/ zone purposes that allow more nuanced evaluation. *Levels of Protection* assigned based on these zonation files, therefore, should be considered the minimum *Level of Protection* provided by zones. The authors applied *The MPA Guide Level of Protection* decision tree (Grorud-Colvert, et al., in review) to each of these zone types, and assigned the minimum *Level of Protection*.

MMAF manages three types of MPAs: KKP (*Kawasan Konservasi Perairan*; Aquatic Conservation Areas), KKP3K (*Kawasan Konservasi Pesisir dan Pulau Kecil*; Coast and Small Islands Conservation Areas), and KKM (*Kawasan Konservasi Maritim*; Maritime Conservation Areas). KKP MPAs have four zones: Core Zone (*Zona Inti*), Sustainable Fisheries Zone (*Zona Perikanan Berkelanjutan*), Use Zone (*Zona Pemanfaatan*), and Other Zone (*Zona Lainnya*) (PP RI No. 60/2007 on the conservation of fish resources). KKP3K and KKM MPAs have three zones: Core Zone (*Zona Inti*), Limited-Use Zone (*Zona Pemanfaatan Terbatas*), and Other Zone (*Zona Lainnya*) (Permen KP No. PER.17/ MEN/2008). For KKP3K and KKM MPAs, the Limited-Use Zone can include allowing or prohibiting combinations of fishing, aquaculture, and tourism — so these individual MPA zones can vary between being "*Highly Protected*" to "*Minimally Protected*". Information on the objectives and *Level of Protection* in specific zones of MMAF-regulated MPAs is detailed in Table 11.4.

Of the 122 MMAF MPAs in Indonesia that were evaluated in 2019 by E-KKP3K, 70 MPAs were "initiated" (Red level), 28 MPAs were "established" (Yellow level), and 24 MPAs were "managed minimally" (Green level). The authors were able to obtain zonation plans for 33 MMAF MPAs, representing 63% of zoned MMAF MPAs in Indonesia.

MoEF has similar national zonation regulations to MMAF, with its MPAs grouped as two types: (i) KSA (*Kawasan Suaka Alam*; Sanctuary Reserve) which include CA (*Cagar Alam*; Nature Reserve) and SM (*Suaka Margasatwa*; Wildlife Reserve), and (ii) KPA (*Kawasan Pelestarian Alam*; Nature Conservation Areas) which include TN (*Taman Nasional*; National Parks), TWA (*Taman Wisata Alam*; Nature Recreation Parks), and TAHURA (*Taman Hutan Raya*; Grand Forest Parks). For the zoning system, MoEF has two different name systems; national parks use the terminology "Zone", whereas all other KSA/ KPA areas use "Block" based on MoEF legacy of managing terrestrial forest areas. All MoEF protected areas can contain a Use Zone/Block (*Zona Pemanfaatan*), Marine Protected Zone/Block (*Zona Perlindungan Bahari*), Traditional Zone/Block (*Zona Tradisional*), Rehabilitation Zone/Block (*Zona Rehabilitasi)*, Religious, Cultural, and Historical Zone/Block (*Zona Religi, Budaya, dan Sejarah*), and Special Zone/Block (*Zona Khusus*). National parks additionally have a Core Zone (*Zona Inti*), and a Wilderness Zone (*Zona Rimba*). See Chapter 6 for a more detailed overview of MoEF zoning. Information on the objectives and *Level of Protection* in specific zones of MoEF-regulated MPAs are detailed in Table 11.5. The authors were able to obtain zonation spatial plans for nine of the 30 MoEF MPAs (30%).

Table 11.4. Zonation types, objectives, and *Level of Protection* for MMAF-regulated MPAs.

Objective	KKP Zone Types				KKP3K and KKM Zone Types		
	Core	Sustainable Fisheries	Use	Other	Core	Limited-Use	Other
(Absolute) protection of fish habitats and populations	(x)		x		(x)	x	
Protection of unique and/ or vulnerable coastal ecosystems					x		
Protection of traditional cultural sites					x		
Research (and development)	x		(x)		x	x	
Education	x		x		x	x	
Environmentally friendly fishing activities		x				x	
Environmentally friendly aquaculture		x				x	
Tourism and recreation		x	x			x	
Habitat Rehabilitation				x			x
Level of protection	**Fully**	**Minimally**	**Lightly**	**Varies based on stated purpose**[1]	**Fully**	**Varies based on stated purpose**[1]	**Varies based on stated purpose**[*]

Note: Activities shown for KKP MPAs following PP RI No. 60/2007, and for KKP3K and KKM MPAs following Article 35 Permen KP No. PER.17/MEN/2008. Parentheses on check marks "(x)" reflect aspects of the objectives that are also in parentheses, to distinguish flexibility within each zone type.
See Chapter 6 for more detailed discussion on zonation objectives and allowed and prohibited activities.
The Other Zone is a zone with defined multiple objectives (e.g. habitat rehabilitation) and may have variable protection levels, but at a minimum will adopt regulations as strict as the Sustainable Fisheries Zones.
[*]Assummed to be *Minimally Protected* in the absence of any zone description providing additional information.

Table 11.5. Zonation types and objectives for MoEF-regulated MPAs.

Objectives			Block					
	Zone							
	Core	Wilderness	Use	Protected (marine)	Traditional	Rehabilitation	Religious, Cultural, and Historical	Special
Protection and security*	x	x	x	x	x	x	x	x
Inventory and monitoring of natural resources	x	x	x	x	x	x	x	x
Supporting habitats and populations to maintain wildlife (or marine biota) populations	x	x	x	(x)	x			
Scientific research and development	x	x	x	x	x	x	x	x
Education and raising awareness for nature conservation	x	x	x				x	
Utilization of genetic resources and germplasm to support cultivation	x	x	x	x	x	x	x	x
Carbon storage and/ or sequestration	x	x	x	x				
Development of (limited) infrastructure for nature tourism, research, and education		(x)	x	(x)	(x)		(x)	
Enabling nature tourism, carbon storage and/or absorption, water storage, or water, heat, and wind energy			x					
Ecosystem recovery (rehabilitation and/or restoration)			x			x	x	(x)
Traditional usage of natural resources					x			

Objectives			Block					
	Zone							
	Core	Wilderness	Use	Protected (marine)	Traditional	Rehabilitation	Religious, Cultural, and Historical	Special
Absorption and storage of carbon environmental services						x		
Release and/or reintroduction of native species						x		
Organizing cultural, traditional, and/or religious ceremonies							x	
Maintenance of religious, cultural, and/or historical sites							x	
Limited construction of management facilities and infrastructure to support activities within zone/block	x	x	x	x	x	x		
Construction and maintenance infrastructure for telecommunications, electrical facilities, transportation, defence and security facilities, and others that are strategic and unavoidable								x
Level of protection	**Fully**	**Fully**	**Lightly**	**Fully**	**Minimally**	**Highly**	**Highly**	**Varies based on stated purpose****

Note: Parentheses on check marks "(x)" reflect aspects of the objectives that are also in parentheses, to distinguish flexibility within each zone or block type. Asterisk (*) means that this objective is more relevant to the terrestrial protected areas because it intends to (1) prevent and limit the destruction of forests, forest areas, and forest products, (2) protect the rights of the rights holders for forest management, and (3) protect the forest and its functions (Article 5, PP RI No. 45/2004).
See Chapter 6 for more detailed discussion on zonation objectives and allowed and prohibited activities.
**Assumed to be *Minimally Protected* in the absence of any zone description providing additional information.

11.3.1 Results for *Level of Protection*

The analysis of Level of Protection assessed 42 of the 196 MPAs (21%) in Indonesia. These 42 MPAs represent the majority of national MPA extent (57.4% covering 13,383,030 ha). The analysis found that the majority of these MPAs were "Lightly" (36.4%, 4,871,425 ha) or "Minimally" (58.7%, 7,857,044 ha) protected (Figure 11.3). "Fully" and "Highly Protected" represented a lower proportion of Indonesia's MPA area at 2.4% (317,508 ha) and 2.5% (337,056 ha), respectively. The MPA with the greatest combined "Fully" and "Highly Protected" area was TNL (Taman Nasional Laut; Marine National Park) Teluk Cendrawasih (Table 11.6). Generally, the MPAs that contain the most "Fully" and "Highly Protected" area are Indonesia's largest MPAs (Table 11.6). This is unsurprising given the dual objectives for Indonesia's MPAs of both biodiversity conservation and improving sustainable fisheries management. These larger MPAs are able to place substantial extent within "Fully" and "Highly Protected" zones, while still maintaining the majority of their MPA extent for sustainable fisheries. Therefore, while MPAs listed in Table 11.6 contain the greatest "Fully" and "Highly Protected" area of any Indonesian MPAs, this represents a small proportion of their total MPA area. Additionally, it is worth noting that analysis of the 189 MPAs that had outer boundaries available for analysis showed that there are at least 9,913,432 ha of MPA area in 154 MPAs that did not have zonation plans available or are not yet zoned, as the MPAs are still under initiation. Therefore, there is substantial potential for the relative area of each Level of Protection within Indonesia to change in the future.

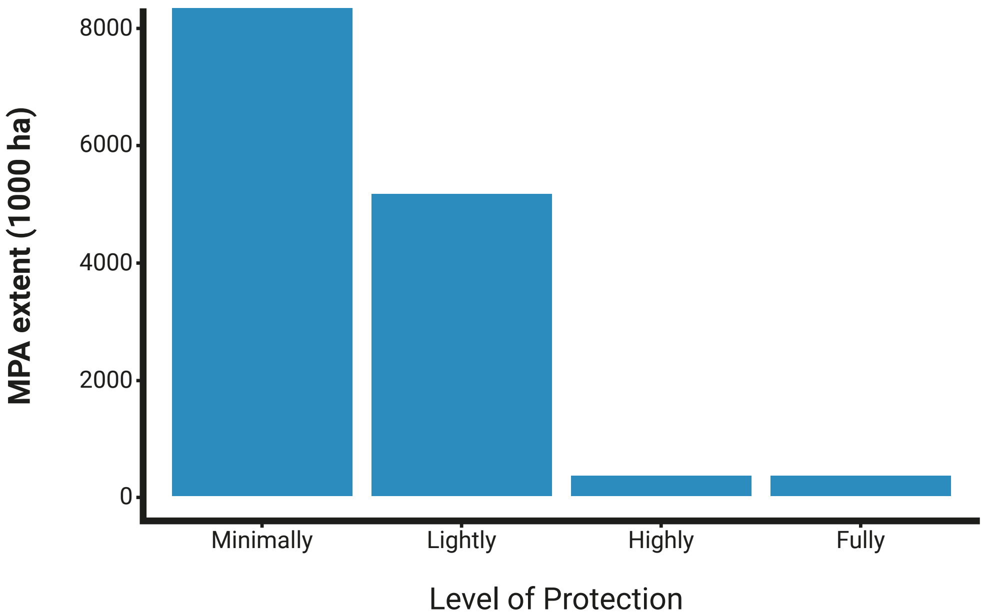


Figure 11.3. Extent of protection types across Indonesia based on the 42 MPAs with spatial zonation data available.

Table 11.6. Top ten MPAs for combined *"Fully"* and *"Highly Protected"* area extent in Indonesia based on the 42 MPAs with spatial zonation data available.

MPA Name	Province	Management Authority	Stage of Establishment	Level of Protection (ha)				MPA area (ha)
				Fully	Highly	Lightly	Minimally	
TNL Teluk Cendrawasih	Papua Barat	MoEF	Designated	32,333	111,320	924,599	408,634	1,476,886
TP dan TPK Banggai Dalaka	Sulawesi Tengah	MMAF	Designated	42,958	68,010	60,144	686,985	858,097
TNP Laut Sawu	Nusa Tenggara Timur	MMAF	Actively Managed	82,378	0	1,343,473	2,037,398	3,463,249
TNL Wakatobi	Sulawesi Tenggara	MoEF	Actively Managed	1,560	38,993	1,316,206	45,295	1,402,054
TNL Taka Bone Rate	Sulawesi Selatan	MoEF	Actively Managed	10,342	29,873	9,607	488,496	538,319
TNL Kepulauan Seribu	DKI Jakarta	MoEF	Actively Managed	5,833	26,279	59,745	17,050	108,907
TWP Kepulauan Anambas	Kepulauan Riau	MMAF	Actively Managed	30,442	0	15,791	1,221,201	1,267,433
KKPD Morowali	Sulawesi Tengah	MMAF	Proposed	8,824	20,381	6,707	258,138	294,050
TWP Kaimana	Papua Barat	MMAF	Designated	18,576	0	63,301	420,488	502,365
TWA Teluk Lasolo	Sulawesi Tenggara	MoEF	Designated	0	16,569	33,958	30,309	80,836

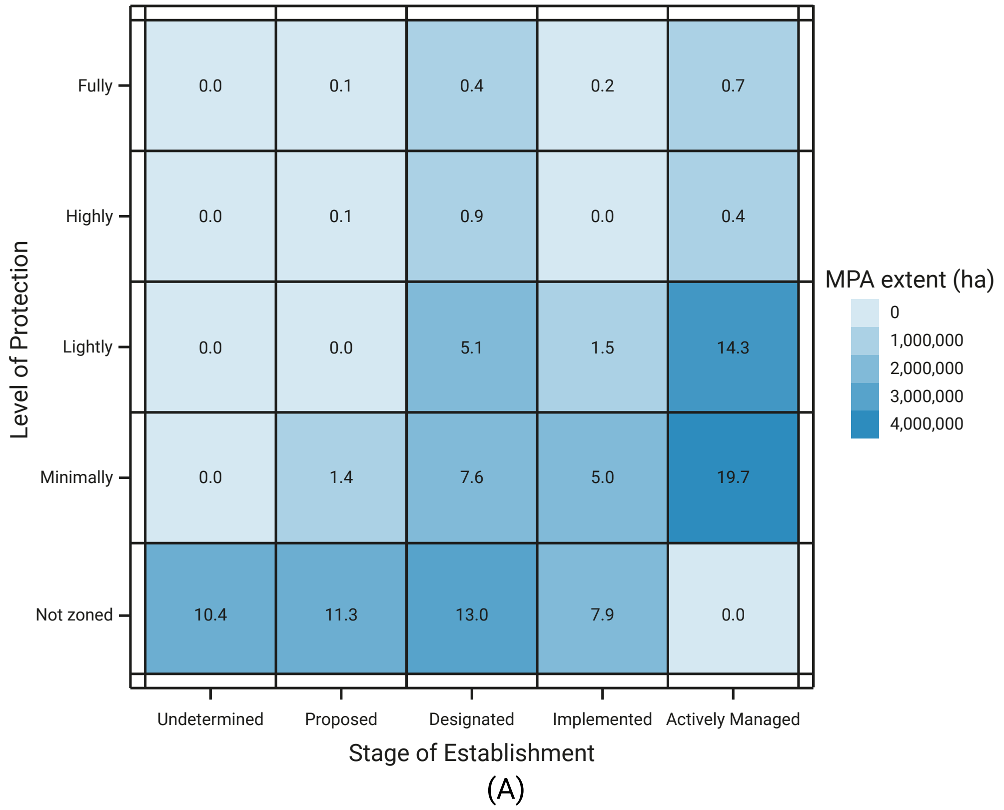
1 2 3 4 5 6 7 8 9 10 11

11.4 Combined results for *The MPA Guide Stage of Establishment* and *Level of Protection*

Across Indonesia, the authors were able to obtain outer MPA boundaries for 189 MPAs (from a total of 196 MPAs nationally). To consider MPAs nationally, despite gaps in identifying *Stage of Establishment* and *Level of Protection*, the authors added a new category to each axis. For *Stage of Establishment*, MPAs that had outer boundaries available but no allocated establishment category were considered as "*Undetermined*". While the authors were able to allocate *State of Establishment* for 148 MPAs, only 143 MPAs of these had outer boundaries, resulting in five assessed MPAs that could not be included in combined *Stage of Establishment* and *Level of Protection* analysis. As outer boundary data was available for 189 MPAs, this meant 143 MPAs had *The MPA Guide State of Establishment* and 46 MPAs were "*Undetermined*" for *Stage of Establishment*. For *Level of Protection*, MPAs with outer boundaries but no zonation developed or available were considered as "*not zoned*". As *The MPA Guide Level of Protection* were available for 42 MPAs, 147 MPAs were included in the new "*not zoned*" category.

Based on the 189 MPAs with outer boundaries available, 20% of MPA area was "*Actively Managed*" and "*Minimally Protected*" (Figure 11.4.A) — the greatest area of any combined establishment level and protection level. While the extent of "*Fully*" and "*Highly Protected*" area in Indonesia was low, this reflects the dual MPA objectives of supporting both biodiversity conservation and sustainable fisheries management. "*Designated*" MPAs had a greater proportion of "*Fully*" and "*Highly Protected*" relative to "*Lightly*" and "*Minimally Protected*" area (Figure 11.4.A). This is encouraging, as it suggests that the proportion of "*Fully*" and "*Highly Protected*" areas in Indonesia's MPAs will increase in the future.

For the combined analysis, 40 MPAs had sufficient data available for the authors to assign both a *Stage of Establishment* and a *Level of Protection* based on *The MPA Guide* categories (i.e. not using "undetermined" or "*not zoned*" categories) — see Table 11.7. These 40 MPAs represent 57.4% of total MPA area in Indonesia, with the largest area in "*Actively Managed*", "*Minimally Protected*" zones (34% of MPA area; Figure 11.4.B). "*Actively Managed*", "*Lightly Protected*" areas also represent a large part of Indonesia's MPA network at 25%. While currently only 1.9% of assessed MPA area is in "*Actively Managed*", "*Fully*" or "*Highly Protected*" zones, it is encouraging that 2.4% of MPA extent has been "*Designated*" as "*Fully*" or "*Highly Protected*". The full assessment results following *The MPA Guide* for all 196 MPAs are show in Appendix 11.4.



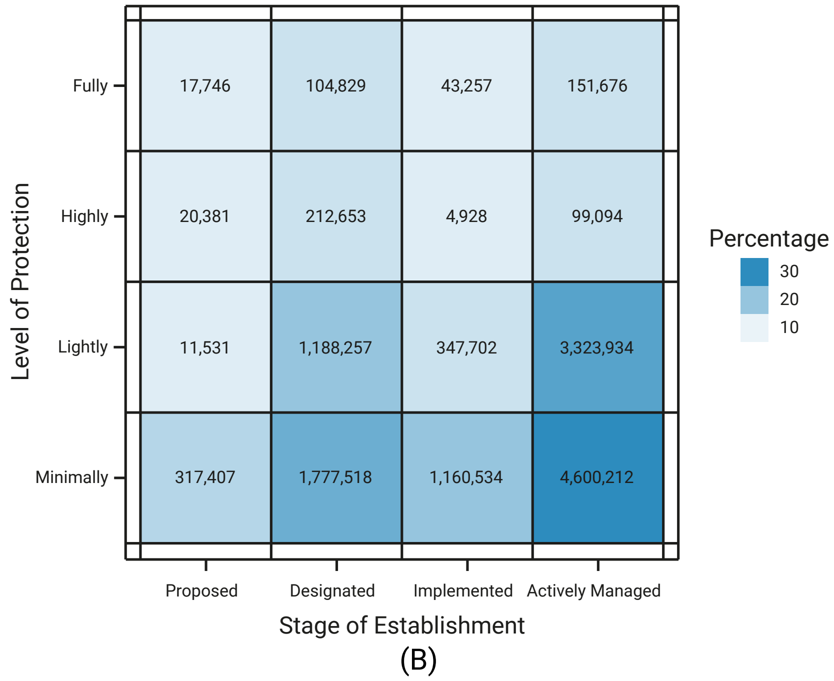


Figure 11.4. *Stage of Establishment* compared to *Level of Protection* in *The MPA Guide* matrix. (A) Breakdown of all 189 of the 196 MPAs in Indonesia that had outer boundary data available. Values on the grid represent the percentage of MPA area associated with each combination of categories, including areas that could not be assessed for *Stage of Establishment* or *Level of Protection*. Grid boxes are shaded by extent of Indonesian MPA area represented. (B) Breakdown for 40 MPAs that had *Stage of Establishment* and *Levels of Protection* determined. Values on the grid represent the MPA extent (ha) within the category. Grid boxes are shaded by percentage of Indonesian MPA area represented. These 40 Indonesian MPAs comprise 57.4% of Indonesian MPA area.

Table 11.7. The 40 MPAs that had *Stage of Establishment* and *Level of Protection* data available for combined analysis.

MPA Name	**Province**	**Ministry**	***Stage of Establishment***	***Level of Protection* (ha)**				**MPA area (ha)**
				Fully	**Highly**	**Lightly**	**Minimally**	
TWP Raja Ampat	Papua Barat	MMAF	A	6,369	0	552,729	466,961	1,026,058
SAP Pesisir Timur Pulau Weh	Nangroe Aceh Darussalam	MMAF	A	66	0	111	3,054	3,231
TP dan TPK Kepulauan Derawan	Kalimantan Timur	MMAF	I	10,528	0	0	274,787	285,316
TP Pantai Penyu Pangumbahan	Jawa Barat	MMAF	A	509	60	83	2,087	2,739
TPK Kei Kecil	Maluku	MMAF	A	8,600	0	18,177	124,655	151,432
SAP Kepulauan Aru Tenggara	Maluku	MMAF	I	2,383	0	7,991	99,975	110,348
SAP Kepulauan Raja Ampat	Papua Barat	MMAF	I	2,666	0	15,374	39,763	57,803
SAP Kepulauan Waigeo Sebelah Barat	Papua Barat	MMAF	I	5,929	0	261,195	0	267,124
SAP Alam Selat Pantar	Nusa Tenggara Timur	MMAF	I	8,585	0	17,556	250,967	277,108
TNL Bunaken	Sulawesi Utara	MoEF	D	2,643	141	73,253	2,593	78,630
TNL Karimun Jawa	Jawa Tengah	MoEF	A	2,046	2,704	4,201	112,872	121,823
TNL Kepulauan Seribu	DKI Jakarta	MoEF	A	5,833	26,279	59,745	17,050	108,907
TNP Laut Sawu	Nusa Tenggara Timur	MMAF	A	82,378	0	1,343,473	2,037,398	3,463,249
TNL Taka Bone Rate	Sulawesi Selatan	MoEF	A	10,342	29,873	9,607	488,496	538,319
TNL Teluk Cenderawasih	Papua Barat	MoEF	D	32,333	111,320	924,599	408,634	1,476,886

MPA Name	Province	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				MPA area (ha)
				Fully	Highly	Lightly	Minimally	
TNL Wakatobi	Sulawesi Tenggara	MoEF	A	1,560	38,993	1,316,206	45,295	1,402,054
TP dan TPK Banggai Dalaka	Sulawesi Tengah	MMAF	D	42,958	68,010	60,144	686,985	858,097
KKPD Doboto	Sulawesi Tengah	MMAF	D	3,471	1,187	270	55,076	60,005
TP Jeen Womom	Papua Barat	MMAF	A	2,249	122	1,134	28,718	32,223
KKPD Morowali	Sulawesi Tengah	MMAF	P	8,824	20,381	6,707	258,138	294,050
KKPD Teluk Tomini	Sulawesi Tengah	MMAF	D	3,512	8,756	3,302	113,041	128,611
TP Ujungnegoro Roban	Jawa Tengah	MMAF	I	587	115	36	3,337	4,074
TWP Kepulauan Anambas	Kepulauan Riau	MMAF	A	30,442	0	15,791	1,221,201	1,267,433
TWP Kapoposang	Sulawesi Selatan	MMAF	I	1,092	43	6,156	42,973	50,264
TWP Padaido	Papua	MMAF	I	3,957	0	1,731	171,792	177,480
TWP Taman Laut Banda	Maluku	MMAF	I	85	29	194	2,208	2,516
TWP Gili Matra	Nusa Tenggara Barat	MMAF	I	97	35	212	1,978	2,322
TWP Pulau Pieh	Sumatera Barat	MMAF	A	805	1,017	108	35,142	37,072
TWP Gili Sulat Lawang	Nusa Tenggara Barat	MMAF	I	352	0	419	9,449	10,221
TWP Gita Nada	Nusa Tenggara Barat	MMAF	I	507	0	1,843	19,289	21,639
TWP Momparang	Kepulauan Bangka Belitung	MMAF	I	3,138	0	11,370	109,947	124,456
TWP Sawo Laweha	Sumatera Utara	MMAF	I	610	178	821	27,763	29,372
TWP Nusa Penida	Bali	MMAF	A	477	47	2,568	17,283	20,375

MPA Name	Province	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				MPA area (ha)
				Fully	Highly	Lightly	Minimally	
TWP Selat Bunga Laut	Sumatera Barat	MMAF	I	2,740	0	20,770	106,298	129,808
TWP Kotawaringin Barat	Kalimantan Tengah	MMAF	D	1,335	0	2,335	57,920	61,590
TWP Teluk Kiluan	Lampung	MMAF	P	8,922	0	4,824	59,269	73,016
TL Pulau Weh Sabang	Aceh	MoEF	I	0	4,527	2,035	8	6,570
TWA Teluk Lasolo	Sulawesi Tenggara	MoEF	D	0	16,569	33,958	30,309	80,836
TWAL Padamarang	Sulawesi Tenggara	MoEF	D	0	6,670	27,095	2,472	36,237
TWP Kaimana	Papua Barat	MMAF	D	18,576	0	63,301	420,488	502,365

Note: Ministry represents whether the MPA is under MMAF or MoEF governance. *Stage of Establishment* indicates the establishment stage based on "*Actively Managed*" (A), "*Implemented*" (I), "*Designated*" (D), and "*Proposed*" (P). MPAs include KKPD (*Kawasan Konservasi Perairan Daerah;* Provincial MPAs), SAP (*Suaka Alam Perairan;* Water Sanctuary), TL (*Taman Laut;* Marine Park), TNL (*Taman Nasional Laut;* Marine National Park), TNP (*Taman Nasional Perairan;* Aquatic National Park), TP (*Taman Pesisir;* Coastal Park), TPK (*Taman Pulau Kecil;* Small Island Park), TW (*Taman Wisata;* Recreation Park), TWA (*Taman Wisata Alam;* Nature Recreation Park), TWAL (*Taman Wisata Alam Laut;* Marine Nature Recreation Park), and TWP (*Taman Wisata Perairan;* Aquatic Tourism Park).

11.5 Discussion

This is the first evaluation to be conducted in the world that attempts to assess all MPAs within a country using *The MPA Guide*, an international framework and tool for evaluating and tracking MPAs. It was able to successfully assess *Stage of Establishment* for 76% of Indonesia's MPAs, and *Level of Protection* for 57% of Indonesia's MPA extent. The analysis shows that majority of Indonesia's MPA extent is in *"Actively Managed"* MPAs, but that much of this area is *"Minimally Protected"*. Our results provide a clear understanding of Indonesia's MPA extent prior to 2020 mapped against a clearly defined international framework, allowing a better understanding of potential outcomes that can be expected from MPAs in Indonesia.

Our results highlight how much can be gained from looking at Indonesia's national MPA estate as more than just a single percentage area or millions of ha target. Our assessment demonstrates that Indonesia is a global leader in investment in active MPA management, while highlighting the potential for designating more MPAs with increased biodiversity conservation outcomes. Each *Level of Protection* when *"Actively Managed"* will be expected to have differing outcomes for biodiversity and human well-being. Furthermore, our results facilitate clear communication of Indonesia's progress towards international MPA targets, and positions Indonesia as a leader in transparency and accountability.

MPAs function as an important intervention to build sustainability of coastal resource use and protecting local community rights to fish, in addition to anticipated biodiversity outcomes. Indonesia is an archipelago nation, with extensive coastlines containing threatened marine ecosystems such as coral reefs, mangrove forests, and seagrass beds. Many millions of people in Indonesia depend on direct coastal resource use for their livelihoods, food security, and cultural identify. Given the needs and desires of local communities and the Government of Indonesia, it is important that MPAs progress along the *Stage of Establishment* axis of *The MPA Guide* towards *"Active Management"*, to deliver desired outcomes for biodiversity protection and human well-being. MPA *Level of Protection* should be set to achieve local goals, balancing community and government needs and desires — including sustainable fisheries management. In Indonesia, this is likely to be achieved by MPAs at a range of different *Levels of Protection* that optimize MPAs' ability to build fisheries sustainability as well as biodiversity conservation. Advocating for *all* Indonesian MPAs to be *"Fully"* or *"Highly Protected"*, therefore, without considering local context and equity for all stakeholders, is misguided. MPAs with different *Levels of Protection* can be evaluated for alignment with local to national goals and established in a portfolio approach to benefit biodiversity and human use.

This analysis shows it is possible to align existing nationally collected datasets with international tools to conduct rapid assessments of all MPAs within a nation. While the authors were able to assign MPA *Stage of Establishment* based on E-KKP3K and METT, these tools did not perfectly align with *The MPA Guide* to provide all the information that would be ideal to evaluate an MPA. For example, E-KKP3K provides little information about MPA compliance and community awareness of MPA rules, which are necessary for MPA effectiveness. Both E-KKP3K and METT also do not clearly identify whether adaptive management is being undertaken except in narrow context (e.g. whether monitoring and evaluation activities are informing adaptive management). However, despite these challenges, by selecting the most closely aligned questions it was possible to rapidly assign *Stage of Establishment* to all E-KKP3K or METT assessed MPAs. While conducting national assessments, assigning *Stage of Establishment* exclusively based on E-KKP3K and METT is likely to bias towards more established MPAs, as newly proposed MPAs are unlikely to have been assessed by these tools. MPA evaluation tools in Indonesia are highly adaptive, and the E-KKP3K tool is currently undergoing revision by MMAF. At a global level, there are also efforts underway to revise the METT, which may prompt changes in the MoEF METT framework. Therefore, the analysis presented in this chapter is learning from MPAs in Indonesia based on the assessment tools in use pre-2020. Future assessments may need to realign management assessment tools with *The MPA Guide*. Future assessments could also be improved by complementing these formal datasets with a search of recent government announcements around intentions to create MPAs. However, this is hard in Indonesia as announcements are made in a decentralized way by district and provincial governments that is difficult to track. Analyses such as this one would benefit from site-specific information from the MPA managers themselves.

One challenge in assessing *Level of Protection* was the way fisheries are regulated in Indonesia's MPAs. Most MPA zoning plans and regulations only list prohibited gears, rather than those allowed within the MPA. Given that *The MPA Guide* criteria classifies *Level of Protection* in part based on the number of allowed fishing gears and the impact of these gears, it was challenging to evaluate some zones. In particular, relatively few zone types were classified as *"Highly Protected"* because of the requirement that these areas have five or fewer fishing gears that are all highly selective and low impact. This criterion was hard to assess for many zones using nationally available data, and so when evaluating fishing impacts most zones types evaluated either remained *"Fully Protected"* (when no fishing was allowed) or dropped to "*Lightly Protected*". More fine scale assessments conducted by each MPA manager may therefore reclassify some of our "*Lightly Protected*" areas as "*Highly Protected*".

While this represents the first assessment of Indonesia's MPAs using *The MPA Guide*, there are also other internationally recognized MPA evaluation frameworks that have been applied or proposed to be applied in Indonesia. Many of these focus on management effectiveness, for example the IUCN Green List of Protected Areas or the Coral Triangle Initiative's Coral Triangle MPA System (CTMPAS) Framework. Both of these initiatives are aimed at increasing management effectiveness and can complement *The MPA Guide* assessment. MMAF has also recently proposed a new Indonesian MPA management effectiveness award (MMAF 2020). While each of these have differing specifics, they all share the broad aim of increasing MPA effectiveness and moving MPAs towards active management. Moving forward, it is crucial to clarify and improve how these initiatives align and communicate how they should be prioritized, to avoid overwhelming MPA management staff and maximize reporting capacity.

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Appendix

Appendix 11.1. Aligning questions from E-KKP3K to *Stage of Establishment* minimum criteria from *The MPA Guide*.

MPA Guide Stage of Establishment	**Core Criteria from *The MPA Guide***	**Relevant E-KKP3K Question number**	**E-KKP3K Question**	**Notes on alignment with *The MPA Guide***
Proposed	Site identified. Conservation is primary objective.	M2	Proposal to initiate establishment of the conservation area is submitted to national government or local government (M2A) without preliminary survey and map, or (M2B) with preliminary survey and map.	"Yes" to either M2A or M2B is acceptable to define the MPA as Proposed.
	Announced in some formal manner. Announcement is non-binding.	M8	Has the area been reserved (M8A) but not pursuant or (M8B) pursuant to the Minister of Marine Affairs and Fisheries Regulations Number PER.02/MEN/2009 and/or PER.17/MEN/2008?	"Yes" to either M8A or M8B is acceptable to define the MPA as Proposed.
Designated	MPA has defined boundaries.	M8	Has the area been reserved (M8A) but not pursuant or (M8B) pursuant to the Minister of Marine Affairs and Fisheries Regulations Number PER.02/MEN/2009 and/or PER.17/MEN/2008?	"Yes" to M8B is acceptable to define as Designated, as a defined outer MPA boundary required to be pursuant to these regulations.
	Legal gazetting	M8	Has the area been reserved (M8A) but not pursuant or (M8B) pursuant to the Minister of Marine Affairs and Fisheries Regulations Number PER.02/MEN/2009 and/or PER.17/MEN/2008?	"Yes" to M8B is acceptable to define as Designated, as it provides formal legal recognition for the MPA.
	Definition of uses and associated regulations	K13	What is the status of the management plan? • No management plan • Management plan being drafted • Management plan finalized	Only "management plan finalized" is acceptable to define as Designated, as first time uses and regulations are formally defined.
Implemented	MPA has a plan for regulating activities.	H29	Has the management plan been approved?	"Yes" is required to define as Implemented.
	Management body/team exists.	K9	Are there conservation area management personnel in place?	"Yes" is required to define as Implemented.

MPA Guide Stage of Establishment	Core Criteria from *The MPA Guide*	Relevant E-KKP3K Question number	E-KKP3K Question	Notes on alignment with *The MPA Guide*
	Compliance/ awareness of MPA regulations.	H32	Are there management standard operating procedures (for institutional strengthening, joint patrols, resource management, and socio-economic & cultural strengthening) that meet the minimum standards?	"Yes" is required to define as Implemented.
Actively Managed	Active/ongoing monitoring.	H20	Are there sufficient personnel in the management unit to execute the management functions (surveillance, resource monitoring, socio-economic & cultural monitoring)?	"Yes" is required to define as Implemented.
		B57	What is the condition of fish resource habitats in the conservation area? B57A - Has there been improvement to the condition of habitats in the Core Zone, Sustainable Fisheries Zone, Use Zone, Restricted Use zone, and/ or Other Zones, as indicated for example by an increase in the coverage of coral reef ecosystems and/or seagrass meadow and/or mangrove forest? B57B - Has there been improvement to the condition of habitats in the Core Zone, Sustainable Fisheries Zone, Use Zone, Restricted Use Zone, and/ or Other Zones, as indicated for example by an increase in the area of coral reef ecosystems and/or seagrass meadow and/or mangrove forest? B57C - Has the physical-chemical-geological quality of the waters in the Core Zone, Sustainable Fisheries Zone, Use Zone, Restricted Use Zone, and/or Other Zones been maintained/ preserved?	Any answer (yes or no) to any sub-part of this question qualifies, as it confirms that monitoring has been taking place and the MPA can be defined as Actively Managed.

MPA Guide Stage of Establishment	Core Criteria from *The MPA Guide*	Relevant E-KKP3K Question number	E-KKP3K Question	Notes on alignment with *The MPA Guide*
		B58	What is the condition of fish populations or non-fish target species populations in the conservation area? B58A - Have fish populations been maintained or increased in the Core Zone, Sustainable Fisheries Zone, and Use Zone? B58B - Has the quality (length and weight) of dominant fish species in the Core Zone, Sustainable Fisheries Zone, Use Zone and/ or Restricted Use Zone (capture fisheries) been maintained or improved? B58C - Has the volume of fishers' catches in the Sustainable Fisheries Zone/Restricted Use Zone been maintained or improved? B58D - Have fisher production volumes in the Sustainable Fisheries Zone/Restricted Use Zone (aquaculture) been maintained or improved? B58E - Have the number and diversity of non-fish target species in the Core Zone, Sustainable Use Zone and/or Restricted Use Zone been maintained or increased? B58F - Have populations of endemic species been maintained or increased?	Any answer (yes or no) to any sub-part of this question qualifies as confirming that monitoring has been taking place and the MPA can be defined as Actively Managed.
	Active/ongoing community engagement	B51	Have partnerships with stakeholders been implemented? • No • Yes, but incidental. • Yes, sustainable partnerships.	Any "yes" acceptable — may be incidental or sustainable partnerships to define as Actively Managed.
	Active/ongoing management evaluation	H33	Has the institutional strengthening strategy been implemented?	"Yes" is required to define as Actively Managed.
		B63	Has community participation in management of the conservation area increased?	"Yes" is required to define as Actively Managed.

Note E-KKP3K question numbers refer to the E-KKP3K assessment tool (KKJI 2012). The Notes column indicates which parts of an individual E-KKP3K question must be answered "yes" to allow classification of area under given *Stage of Establishment*.

Appendix 11.2. Aligning questions from the ***marine***-focused METT to *The MPA Guide Stage of Establishment* criteria.

MPA Guide Stage of Establishment	**Core Criteria from *The MPA Guide***	**Relevant marine METT Question number**	**METT Question**	**METT points – and METT criteria to meet *MPA Guide Stage of Establishment***
Proposed	Site identified. Conservation is primary objective.	1	Does the Marine Protected Area have legal status?	1 - There is an agreement that the conservation area must be affirmed in general but the process has not yet begun.
	Announced in some formal manner. Announcement is non-binding.	1	Does the Marine Protected Area have legal status?	1 - There is an agreement that the conservation area must be affirmed in general but the process has not yet begun.
Designated	MPA has defined boundaries.	4	Are the boundaries known and demarcated?	1 - The boundary of the conservation area is known by the management authority but is not yet known by the local residents/neighboring land users.
	Legal gazetting.	1	Does the Marine Protected Area have legal status?	3 - The conservation area has formal legal status.
	Definition of uses and associated regulations.	2	Are unsustainable human activities (e.g. poaching) controlled?	1 - There are some regulations governing land use and activities in conservation areas but there are still major shortcomings.
Implemented	MPA has a plan for regulating activities.	9	Is there a management plan and is it being implemented?	2 - Management plan has been approved but is only partly being implemented (there are funding constraints or other crucial issues).
	Management body/team exists.	11	Are there enough employees to manage the conservation area?	2 - Management staff are present, but the number of employees is below the optimum level for critical management activities.
	Compliance/ awareness of MPA regulations.	3	Can the employees (e.g. those responsible for managing the site) enforce the conservation area regulations well enough?	2 - Employees have sufficient capacity/resources to enforce laws and regulations related to conservation area but there are still some shortages.
		13	Are there educational program plans to meet conservation area goals and needs?	1 - There are limited and ad hoc education and awareness programs.

MPA Guide Stage of Establishment	Core Criteria from *The MPA Guide*	Relevant marine METT Question number	METT Question	METT points – and METT criteria to meet *MPA Guide Stage of Establishment*
		33	Are users complying with the rules within the area?	1 - 25–50% of users comply with the rules.
Actively Managed	Active/ongoing monitoring.	6	Is there enough information to manage this area?	2 - Information about habitats, species, ecological processes, and critical cultural values of conservation areas is sufficient for most key areas of planning and decision making.
	Active/ongoing community engagement.	14	Is there collaboration with nearby land and water users?	2 - There is a planned communication process with relevant stakeholders, but implementation is still limited.
		15	Do stakeholders provide meaningful input in management decision making?	1 - Stakeholders provide input into discussions related to management but are not directly involved in decision making.
		16	Can local people who live or regularly use conservation areas provide input in management decisions?	1 - Local communities provide some input in making decisions related to the management of conservation areas but do not directly play a role in decision-making.
	Active/ongoing management evaluation.	19	Are management activities monitored against performance?	3 - There is a good monitoring and evaluation system, implemented well and used in adaptive management.

Note:These should be considered the minimum METT criteria for an MPA to meet *The MPA Guide Stage of Establishment* criteria. Optimally functioning MPAs would be expected to exceed these minimum criteria. METT question numbers refer to the marine METT assessment tool (KSDAE 2015).

Appendix 11.3. Aligning questions from the ***terrestrial***-focused METT to *The MPA Guide Stage of Establishment* criteria.

MPA Guide Stage of Establishment	**Core Criteria from *The MPA Guide***	**Relevant terrestrial METT Question number**	**METT Question**	**METT points – and METT criteria to meet *MPA Guide Stage of Establishment***
Proposed	Site identified. Conservation is primary objective.	1	Does the Marine Protected Area have legal status?	1 - There is an agreement that the conservation area must be affirmed in general but the process has not yet begun.
	Announced in some formal manner. Announcement is non-binding.	1	Does the Marine Protected Area have legal status?	1 - There is an agreement that the conservation area must be affirmed in general but the process has not yet begun.
Designated	MPA has defined boundaries.	6	Are the boundaries known and demarcated?	1 - The boundary of the conservation area is known by the management authority but is not yet known by the local residents/neighboring land users.
	Legal gazetting.	1	Does the Marine Protected Area have legal status?	3 - The conservation area has formal legal status.
	Definition of uses and associated regulations.	2	Are unsustainable human activities (e.g. poaching) controlled?	1 - There are some regulations governing land use and activities in conservation areas but there are still major shortcomings.
Implemented	MPA has a plan for regulating activities.	7	Is there a management plan and is it being implemented?	2 - Management plans are in place but only part of them have been implemented due to funding constraints or other problems.
	Management body/team exists.	13	Are there enough employees to manage the Conservation Area?	2 - Management staff are present; number of employees is below the optimum level for critical management activities.
	Compliance/ awareness of MPA regulations.	3	Can the employees (e.g. those responsible for managing the site) enforce the conservation area regulations well enough?	2 - Employees have sufficient capacity/resources to enforce laws and regulations related to conservation area but there are still some shortages.
		20	Are there educational program plans to meet conservation area goals and needs?	1 - There are limited and ad hoc education and awareness programs.

MPA Guide Stage of Establishment	Core Criteria from *The MPA Guide*	Relevant terrestrial METT Question number	METT Question	METT points – and METT criteria to meet *MPA Guide Stage of Establishment*
Actively Managed	Active/ongoing monitoring.	9	Is there enough information to manage this area?	2 - Information about habitats, species, ecological processes, and critical cultural values of conservation areas is sufficient for most key areas of planning and decision making.
	Active/ongoing community engagement.	22	Is there collaboration with nearby land and water users?	2 - There is communication between the area manager and the surrounding land and water users, but there is only limited cooperation.
		23	Can indigenous peoples who live or regularly use conservation areas provide input in management decisions?	1 - Indigenous peoples can provide some input in making decisions regarding the management of conservation areas but do not directly play a role in management.
		24	Can local communities living close to conservation areas provide input?	1 - Local communities can provide some input in discussions related to conservation area management but do not have a direct role in management.
	Active/ongoing management evaluation.	26	Are management activities monitored against performance?	3 - There is a good monitoring and evaluation system, implemented well and used in adaptive management.

Note: These should be considered the minimum METT criteria for an MPA to meet *The MPA Guide Stage of Establishment* criteria. Optimally functioning MPAs would be expected to exceed these minimum criteria. METT question numbers refer to the terrestrial METT assessment tool (KSDAE 2015).

Appendix 11.4. The 196 MPAs in Indonesia classified against *The MPA Guide* criteria.

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Aceh	KKPD Simeulue	MMAF	D	0	0	0	0	69,054	69,054
Aceh	KKPD Aceh Barat Daya	MMAF	-	0	0	0	0	16,017	16,017
Aceh	KKPD Aceh Besar	MMAF	D	0	0	0	0	29,616	29,616
Aceh	KKPD Aceh Jaya	MMAF	D	0	0	0	0	50,041	50,041
Aceh	KKPD Aceh Selatan	MMAF	-	0	0	0	0	3,590	3,590
Aceh	KKPD Aceh Tamiang	MMAF	-	0	0	0	0	2,797	2,797
Aceh	TL Pulau Weh Sabang	MoEF	I	0	4,527	2,035	8	0	6,570
Aceh	SAP Pesisir Timur Pulau Weh	MMAF	A	66	0	111	3,054	0	3,231
Aceh	TWA Kepulauan Banyak	MoEF	I	0	0	0	0	227,500	227,500
Bali	KKPD Karangasem	MMAF	-	0	0	0	0	5,856	5,856
Bali	KKPD Jembrana	MMAF	P	0	0	0	0	3,533	3,533
Bali	KKM Teluk Benoa	MMAF	-	0	0	0	1,273	0	1,273
Bali	KKPD Buleleng	MMAF	I	0	0	0	0	14,041	14,041
Bali	TWP Perairan Nusa Penida	MMAF	A	477	47	2,568	17,283	0	20,375
Banten	KKPD Pandeglang	MMAF	P	0	0	0	0	7,391	7,391
Banten	KKM Hmas Perth	MMAF	-	1	0	0	100	0	101
Banten	TWA Pulau Sangiang	MoEF	D	0	0	0	0	720	720

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Bengkulu	KKPD Mukomuko	MMAF	P	0	0	0	0	0	0
Bengkulu	KKPD Kaur (Linau, Merpas, dan Sekunyit)	MMAF	P	0	0	0	0	50,308	50,308
Bengkulu	KKPD Enggano	MMAF	-	0	0	0	0	37,167	37,167
DI Yogyakarta	KKPD Bantul	MMAF	D	0	0	0	0	182	182
DI Yogyakarta	KKPD Gunungkidul	MMAF	P	0	0	0	0	3,388	3,388
DKI Jakarta	SM Pulau Rambut dan Perairan	MoEF	P	0	0	0	0	90	90
DKI Jakarta	TNL Kepulauan Seribu	MoEF	A	5,833	26,279	59,745	17,050	0	108,907
Gorontalo	KKPD Pantai Olele	MMAF	D	0	0	0	0	490	490
Gorontalo	KKPD Biluhu Timur	MMAF	-	0	0	0	0	105	105
Gorontalo	KKPD Botubarani	MMAF	-	0	0	0	0	35	35
Gorontalo	KKPD Dulangka	MMAF	-	0	0	0	0	3,419	3,419
Gorontalo	KKPD Mabasar Maruangi	MMAF	-	0	0	0	0	1,164	1,164
Gorontalo	KKPD Maruagi-Mabasar	MMAF	-	0	0	0	0	6,866	6,866
Gorontalo	KKPD Monduli	MMAF	P	0	0	0	0	7,380	7,380
Gorontalo	KKPD Popaya	MMAF	-	0	0	0	0	1,267	1,267
Gorontalo	KKPD Pulau Mohinggito	MMAF	P	0	0	0	0	469	469
Gorontalo	KKPD Sumalata	MMAF	-	0	0	0	0	14,308	14,308

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Gorontalo	KKPD Tanjung Panjang	MMAF	-	0	0	0	0	2,952	2,952
Gorontalo	KKPD Tolinggula	MMAF	-	0	0	0	0	2,097	2,097
Jambi	KKPD Bungo	MMAF	P	0	0	0	0	2	2
Jambi	KKPD Arwana Kutur	MMAF	P	0	0	0	0	28	28
Jambi	PUD Lubuk Gerinjing Sungai Batang Tembesi	MMAF	-	0	0	0	0	28	28
Jambi	PUD Lubuk Potai Sungai Batang Limun	MMAF	-	0	0	0	0	16	16
Jawa Barat	CAL Leuwung Sancang	MoEF	-	0	0	0	0	1,150	1,150
Jawa Barat	CAL Pananjung Pangandaran	MoEF	D	0	0	0	0	470	470
Jawa Barat	TP Pantai Penyu Pangumbahan	MMAF	A	509	60	83	2,087	0	2,739
Jawa Barat	KKPD Pangandaran	MMAF	D	0	0	0	0	29,824	29,824
Jawa Barat	KKPD Pulau Biawak	MMAF	P	0	0	0	0	720	720
Jawa Barat	SM Sindangkerta	MoEF	-	0	0	0	0	90	90
Jawa Tengah	KKPD Karang Jeruk	MMAF	P	0	0	0	0	53,460	53,460
Jawa Tengah	KKPD Pulau Panjang	MMAF	P	0	0	0	0	180	180
Jawa Tengah	SP Waduk Malahayu dan Waduk Penjalin	MMAF	-	0	0	0	0	0	0
Jawa Tengah	Taman Nasional Karimun Jawa	MoEF	A	2,046	2,704	4,201	112,872	0	121,823

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Jawa Tengah	TP Ujungnegoro-Roban	MMAF	I	587	115	36	3,337	0	4,074
Jawa Timur	KKPD Situbondo	MMAF	P	0	0	0	0	123	123
Jawa Timur	KKPD Banyuwangi	MMAF	-	0	0	0	0	111	111
Jawa Timur	KKPD Sumenep	MMAF	P	0	0	0	0	72,026	72,026
Jawa Timur	KKPD Pasuruan	MMAF	P	0	0	0	0	4,074	4,074
Jawa Timur	KKPD Tulungagung	MMAF	-	0	0	0	0	217	217
Jawa Timur	KKPD Pulau Pitu Timur	MMAF	P	0	0	0	0	72	72
Jawa Timur	KKPD Pulau Gili Ketapang	MMAF	-	0	0	0	0	374	374
Kalimantan Barat	CAL Kepulauan Karimata	MoEF	D	0	0	0	0	77,000	77,000
Kalimantan Barat	KKPD Pulau Randayan	MMAF	P	0	0	0	0	149,079	149,079
Kalimantan Barat	KKPD Kubu Raya	MMAF	-	0	0	0	0	301,846	301,846
Kalimantan Barat	KKPD Paloh	MMAF	-	0	0	0	0	105,253	105,253
Kalimantan Barat	KKPD Kendawangan	MMAF	-	0	0	0	0	188,458	188,458
Kalimantan Selatan	TWP Kotabaru	MMAF	P	0	0	0	0	160,908	160,908
Kalimantan Selatan	KKPD Tanah Bumbu	MMAF	P	0	0	0	0	18,752	18,752
Kalimantan Tengah	TWP Kotawaringin Barat	MMAF	D	1,335	0	2,335	57,920	0	61,590
Kalimantan Timur	KKPD Kota Bontang	MMAF	D	0	0	0	0	5,121	5,121

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Kalimantan Timur	TP dan TPK Kepulauan Derawan	MMAF	I	10,528	0	0	274,787	0	285,316
Kalimantan Timur	SM Pulau Semama	MoEF	D	0	0	0	0	220	220
Kalimantan Timur	TL Pulau Samama Sangalaki	MoEF	D	0	0	0	0	280	280
Kalimantan Utara	KKPD Gugusan Pulau Sinliak	MMAF	P	0	0	0	0	0	0
Kalimantan Utara	KKPD Sebatik barat	MMAF	P	0	0	0	0	74	74
Kalimantan Utara	KKPD Tanjung Cantik	MMAF	-	0	0	0	0	200	200
Kepulauan Bangka Belitung	TWP Momparang	MMAF	I	3,138	0	11,370	109,947	0	124,456
Kepulauan Bangka Belitung	KKPD Bangka Barat	MMAF	P	0	0	0	0	2,162	2,162
Kepulauan Bangka Belitung	KKPD Bangka Selatan	MMAF	P	0	0	0	0	186	186
Kepulauan Bangka Belitung	KKPD Bangka Tengah	MMAF	-	0	0	0	0	0	0
Kepulauan Bangka Belitung	KKPD Belitung	MMAF	P	0	0	0	0	447,785	447,785
Kepulauan Bangka Belitung	KKPD Suaka Perikanan Tuing	MMAF	-	0	0	0	0	9,810	9,810
Kepulauan Riau	KKPD Lingga	MMAF	D	0	0	0	0	371,085	371,085
Kepulauan Riau	KKPD Batam	MMAF	D	0	0	0	0	65,868	65,868
Kepulauan Riau	KKPD Bintan	MMAF	I	0	0	0	0	1,210,346	1,210,346

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Kepulauan Riau	KKPD Natuna	MMAF	D	0	0	0	0	152,224	152,224
Kepulauan Riau	TWP Kepulauan Anambas	MMAF	A	30,442	0	15,791	1,221,201	0	1,267,433
Lampung	KKPD Ngambur dan Betuah	MMAF	D	0	0	0	0	15,460	15,460
Lampung	KKPD Pulau Batang Segama	MMAF	-	0	0	0	0	14,569	14,569
Lampung	TWP Teluk Kiluan	MMAF	P	8,922	0	4,824	59,269	0	73,016
Lampung	CA Pulau Anak Krakatau	MoEF	I	0	0	0	0	11,200	11,200
Maluku	TW Pulau Kasa	MoEF	D	0	0	0	0	1,100	1,100
Maluku	KKPD Ay-Rhun	MMAF	-	0	0	0	0	47,969	47,969
Maluku	KKPD Kepulauan Tanimbar	MMAF	D	0	0	0	0	783,806	783,806
Maluku	KKPD Kepulauan Lease	MMAF	-	0	0	0	0	81,573	81,573
Maluku	TPK Kei Kecil	MMAF	A	8,600	0	18,177	124,655	0	151,432
Maluku	SAP Kepulauan Aru Tenggara	MMAF	I	2,383	0	7,991	99,975	0	110,348
Maluku	TWP Taman Laut Banda	MMAF	I	85	29	194	2,208	0	2,516
Maluku	KKPD Baeer	MMAF	-	0	0	0	0	82	82
Maluku	KKPD Pulau Koon	MMAF	D	0	0	0	0	9,901	9,901
Maluku Tengah	TW Pulau Pombo	MoEF	D	0	0	0	0	998	998
Maluku Tengah	TWA Pulau Marsegu	MoEF	D	0	0	0	0	11,000	11,000

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Maluku Utara	KKPD Pulau Widi	MMAF	P	0	0	0	0	7,690	7,690
Maluku Utara	KKPD Kepulauan Guraici	MMAF	P	0	0	0	0	6,386	6,386
Maluku Utara	KKPD Tidore Kepulauan	MMAF	P	0	0	0	0	2,810	2,810
Maluku Utara	KKPD Kepulauan Sula	MMAF	-	0	0	0	0	117,960	117,960
Maluku Utara	KKPD Pulau Makian	MMAF	-	0	0	0	0	42,799	42,799
Maluku Utara	KKPD Morotai	MMAF	P	0	0	0	0	65,521	65,521
Maluku Utara	KKPD Pulau Jiew	MMAF	P	0	0	0	0	192	192
Nusa Tenggara Barat	KKPD Penyu Tatar Sepang-Lunyuk	MMAF	P	0	0	0	0	72,415	72,415
Nusa Tenggara Barat	KKPD Pulau Lipan dan Pulau Rakit	MMAF	-	0	0	0	0	26,641	26,641
Nusa Tenggara Barat	KKPD Teluk Cempi	MMAF	P	0	0	0	0	22,387	22,387
Nusa Tenggara Barat	KKPD Gili Balu	MMAF	I	0	0	0	0	6,005	6,005
Nusa Tenggara Barat	KKPD Kabete	MMAF	I	0	0	0	0	2,000	2,000
Nusa Tenggara Barat	TWP Gili Matra	MMAF	I	97	35	212	1,978	0	2,322
Nusa Tenggara Barat	KKPD Gili Banta	MMAF	P	0	0	0	0	40,500	40,500

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Nusa Tenggara Barat	TWP Gili Sulat Lawang	MMAF	I	352	0	419	9,449	0	10,221
Nusa Tenggara Barat	TWP Gita Nada	MMAF	I	507	0	1,843	19,289	0	21,639
Nusa Tenggara Barat	KKPD Liang dan Ngali	MMAF	-	0	0	0	0	33,461	33,461
Nusa Tenggara Barat	KKPD Teluk Bumbang	MMAF	P	0	0	0	0	6,310	6,310
Nusa Tenggara Barat	TL Pulau Moyo	MoEF	D	0	0	0	0	6,000	6,000
Nusa Tenggara Barat	TWA Pulau Satonda	MoEF	D	0	0	0	0	2,600	2,600
Nusa Tenggara Timur	CA Riung	MoEF	P	0	0	0	0	2,000	2,000
Nusa Tenggara Timur	KKPD Sikka	MMAF	D	0	0	0	0	42,250	42,250
Nusa Tenggara Timur	KKPD Flores Timur	MMAF	D	0	0	0	0	150,000	150,000
Nusa Tenggara Timur	SAP Selat Pantar	MMAF	I	8,585	0	17,556	250,967	0	277,108
Nusa Tenggara Timur	KKPD Lembata	MMAF	P	0	0	0	0	225,624	225,624
Nusa Tenggara Timur	TNP Laut Sawu	MMAF	A	82,378	0	1,343,473	2,037,398	0	3,463,249
Nusa Tenggara Timur	TWA Tujuh Belas Pulau	MoEF	D	0	0	0	0	9,900	9,900

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Nusa Tenggara Timur	TWAL Teluk Maumere	MoEF	D	0	0	0	0	59,450	59,450
Nusa Tenggara Timur	TWL Teluk Kupang	MoEF	-	0	0	0	0	50,000	50,000
Papua	KKPD Biak Numfor	MMAF	D	0	0	0	0	46,984	46,984
Papua	TWP Padaido	MMAF	I	3,957	0	1,731	171,792	0	177,480
Papua Barat	TWP Raja Ampat	MMAF	A	6,369	0	552,729	466,961	0	1,026,058
Papua Barat	KKPD Kepulauan Fam	MMAF	P	0	0	0	0	360,000	360,000
Papua Barat	KKPD Laut Seribu Satu Sungai Teo Enobikia	MMAF	P	0	0	0	0	338,323	338,323
Papua Barat	SM Pulau Sabuda Tataruga	MoEF	-	0	0	0	0	5,000	5,000
Papua Barat	SAP Kepulauan Raja Ampat	MMAF	I	2,666	0	15,374	39,763	0	57,803
Papua Barat	SAP Kepulauan Waigeo Sebelah Barat	MMAF	I	5,929	0	261,195	0	0	267,124
Papua Barat	TNL Teluk Cenderawasih	MoEF	D	32,333	111,320	924,599	408,634	0	1,476,886
Papua Barat	TP Jeen Womom	MMAF	A	2,249	122	1,134	28,718	0	32,223
Papua Barat	TWP Kaimana	MMAF	D	18,576	0	63,301	420,488	0	502,365
Papua Barat	KKPD Fakfak	MMAF	I	0	0	0	0	350,000	350,000
Riau	KKPD Suaka Perikanan Ikan Terubuk	MMAF	-	0	0	0	0	40,742	40,742

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Riau	KKPD Kepulauan Aruah	MMAF	-	0	0	0	0	23,481	23,481
Riau	KKPD Rupat Utara	MMAF	P	0	0	0	0	15,547	15,547
Riau	KKPD Solop	MMAF	-	0	0	0	0	205,596	205,596
Sulawesi Barat	KKPD Polewali Mandar	MMAF	P	0	0	0	0	33,880	33,880
Sulawesi Barat	KKPD Majene	MMAF	P	0	0	0	0	49,000	49,000
Sulawesi Barat	KKPD Mamuju	MMAF	-	0	0	0	0	67,000	67,000
Sulawesi Selatan	KKPD Barru	MMAF	P	0	0	0	0	606	606
Sulawesi Selatan	KKPD Liukang Tangaya	MMAF	-	0	0	0	0	500,738	500,738
Sulawesi Selatan	KKPD Liukang Tupabiring	MMAF	D	0	0	0	0	66,870	66,870
Sulawesi Selatan	KKPD Luwu Utara	MMAF	P	0	0	0	0	0	0
Sulawesi Selatan	KKPD Pulo Kauna Kayuadi	MMAF	D	0	0	0	0	3,983	3,983
Sulawesi Selatan	KKPD Pulo Pasi Gusung	MMAF	D	0	0	0	0	5,018	5,018
Sulawesi Selatan	KKPD Teluk Bone Bagian Selatan	MMAF	-	0	0	0	0	423,942	423,942
Sulawesi Selatan	TNL Taka Bone Rate	MoEF	A	10,342	29,873	9,607	488,496	0	538,319
Sulawesi Selatan	TWP Kapoposang	MMAF	I	1,092	43	6,156	42,973	0	50,264
Sulawesi Tengah	TNL Kepulauan Togean	MoEF	D	0	0	0	0	362,605	362,605

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Sulawesi Tengah	TP dan TPD Banggai Dalaka	MMAF	D	42,958	68,010	60,144	686,985	0	858,097
Sulawesi Tengah	KKPD Doboto	MMAF	D	3,471	1,187	270	55,076	0	60,005
Sulawesi Tengah	KKPD Morowali	MMAF	P	8,824	20,381	6,707	258,138	0	294,050
Sulawesi Tengah	KKPD Teluk Tomini	MMAF	D	3,512	8,756	3,302	113,041	0	128,611
Sulawesi Tenggara	KKPD Buton Selatan	MMAF	P	0	0	0	0	35,699	35,699
Sulawesi Tenggara	KKPD Buton	MMAF	D	0	0	0	0	10,130	10,130
Sulawesi Tenggara	KKPD Buton Tengah	MMAF	D	0	0	0	0	109,070	109,070
Sulawesi Tenggara	KKPD Bombana	MMAF	P	0	0	0	0	19,177	19,177
Sulawesi Tenggara	KKPD Kolaka Utara	MMAF	P	0	0	0	0	37,320	37,320
Sulawesi Tenggara	KKPD Muna	MMAF	D	0	0	0	0	76,417	76,417
Sulawesi Tenggara	KKPD Pulau Wawonii	MMAF	P	0	0	0	0	28,340	28,340
Sulawesi Tenggara	KKPD Selat Tiworo	MMAF	P	0	0	0	0	27,936	27,936
Sulawesi Tenggara	KKPD Provinsi Sultra	MMAF	D	0	0	0	0	21,786	21,786
Sulawesi Tenggara	KKPD Kolaka	MMAF	P	0	0	0	0	60,400	60,400
Sulawesi Tenggara	TNL Wakatobi	MoEF	A	1,560	38,993	1,316,206	45,295	0	1,402,054
Sulawesi Tenggara	TWA Teluk Lasolo	MoEF	D	0	16,569	33,958	30,309	0	80,836
Sulawesi Tenggara	TWAL Padamarang	MoEF	D	0	6,670	27,095	2,472	0	36,237
Sulawesi Utara	KKPD Minahasa Selatan	MMAF	P	0	0	0	0	26,000	26,000

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Sulawesi Utara	KKPD Minahasa	MMAF	P	0	0	0	0	0	0
Sulawesi Utara	KKPD Kota Bitung	MMAF	D	0	0	0	0	9,647	9,647
Sulawesi Utara	KKPD Minahasa Utara	MMAF	D	0	0	0	0	26,525	26,525
Sulawesi Utara	TNL Bunaken	MoEF	D	2,643	141	73,253	2,593	0	78,630
Sulawesi Utara	PUD Danau Moaat	MMAF	-	0	0	0	0	617	617
Sulawesi Utara	TPK Tatoareng	MMAF	D	0	0	0	0	164,252	164,252
Sulawesi Utara	KKPD Kepulauan Sitaro	MMAF	-	0	0	0	0	44,110	44,110
Sumatera Barat	KKPD Pariaman	MMAF	I	0	0	0	0	11,526	11,526
Sumatera Barat	KKPD Agam	MMAF	P	0	0	0	0	12,000	12,000
Sumatera Barat	KKPD Solok	MMAF	P	0	0	0	0	2	2
Sumatera Barat	KKPD Payau Jorong Maligi	MMAF	P	0	0	0	0	6,796	6,796
Sumatera Barat	KKPD Kota Padang	MMAF	P	0	0	0	0	2,275	2,275
Sumatera Barat	KKPD Batang Gasan	MMAF	P	0	0	0	0	684	684
Sumatera Barat	KKPD Pesisir Selatan	MMAF	D	0	0	0	0	174,899	174,899
Sumatera Barat	PUD Sungai Batang Pelangai	MMAF	P	0	0	0	0	0	0
Sumatera Barat	TWP Pulau Pieh	MMAF	A	805	1,017	108	35,142	0	37,072
Sumatera Barat	TWP Selat Bunga Laut	MMAF	I	2,740	0	20,770	106,298	0	129,808
Sumatera Utara	KKPD Nias Selatan	MMAF	P	0	0	0	0	56,000	56,000

Province	MPA Name	Ministry	*Stage of Establishment*	*Level of Protection* (ha)				Not zoned area (ha)	Total MPA area (ha)
				Fully	Highly	Lightly	Minimally		
Sumatera Utara	KKPD Tapanuli Tengah	MMAF	P	0	0	0	0	81,243	81,243
Sumatera Utara	KKPD Serdang Bedagai	MMAF	P	0	0	0	0	1,240	1,240
Sumatera Utara	TWP Sawo Laweha	MMAF	I	610	178	821	27,763	0	29,372

Note: Ministry represents whether the MPA is under Ministry of Marine Affairs and Fisheries (MMAF) or Ministry of Environment and Forestry (MoEF) governance. *Stage of Establishment* indicates the establishment stage based on *Actively Managed* (A), *Implemented* (I), *Designated* (D), and *Proposed* (P). MPAs include CA (*Cagar Alam;* Strict Nature Reserve), CAL (*Cagar Alam Laut;* Marine Strict Nature Reserve), KKPD (*Kawasan Konservasi Perairan Daerah;* Provincial MPAs), PUD (*Perairan Umum Daratan*; Mainland Public Water), SAP (*Suaka Alam Perairan;* Water Sanctuary), SM (*Suaka Margasatwa;* Wildlife Sanctuary), TL (*Taman Laut;* Marine Park), TNL (*Taman Nasional Laut;* Marine National Park), TNP (*Taman Nasional Perairan;* Aquatic National Park), TP (*Taman Pesisir;* Coastal Park), TPK (*Taman Pulau Kecil;* Small Island Park), TW (*Taman Wisata;* Recreation Park), TWA (*Taman Wisata Alam;* Nature Recreation Park), TWL (Taman Wisata Laut; Marine Recreation Park), TWAL (*Taman Wisata Alam Laut;* Marine Nature Recreation Park), and TWP (*Taman Wisata Perairan;* Aquatic Tourism Park).


Masyarakat
Kapasitas SDM
Pengelola / Pemerintah
Aparat Pemerintah
Kesadaran Kelestarian Lingkungan
Masyarakat / Pengguna
Usaha
Penguatan Kapasitas Aparat pemerintah dlm hal Kesadaran Lingk (penutan)
Surat edaran / instruksi Kep. daerah (buku saku / e-book)
Pengembangan Usaha Ramah Lingk.
Kampanye di berbagai Media Cetak / elektronik
Nelayan Penangkap Paus
Mendorong Lamalera mjd Kawasan Konservasi Maritim (KKM)

Summary Considerations for Coastal and Marine Conservation in Indonesia

The previous chapters have showcased Indonesia's large number and extent of marine protected areas (MPAs), their management and governance structures, status and trends of ecological and social indicators, as well as highlights of current and exploratory mechanisms and approaches in influencing sectors, such as fisheries and tourism – including possibilities beyond MPA boundaries. In closing, we emphasize that the success of coastal and marine conservation should not only measured in terms of extent, but also by how effective these management approaches are in achieving MPA objectives. Many MPAs in Indonesia are still in an early stage of establishment and do not yet have adequate management tools, such as monitoring protocols, resource use assessments, standard operating procedures, zoning plans, etc. Regulatory mechanisms applied beyond formal MPAs, such as recognition of Other Effective Conservation Measures (OECMs), has not been widely nor consistently implemented, or do not yet have an established framework or guidelines. Coastal and marine conservation is a long-term investment, so the government and partners need to continue this effort in a consistent and adaptive manner, considering lessons learned from both failures and successes.

There is opportunity here, particularly for the government and relevant ministries and agencies, for real ownership, engagement, and commitment, with support from non-governmental organizations (NGOs) and private sector partners, to develop effective MPAs in Indonesia using adaptive management for conservation and sustainable use. This report also emphasizes the need for inclusion of indigenous/community voices in management decision-making. Indonesia's wealth of traditional knowledge and centuries-old track record of community-based management are a great asset for capable area-based conservation. Our key findings from this review include:

1. Optimizing MPA design

MPAs should meet basic ecological and biodiversity needs so that they can provide long-term ecological benefits and impacts; for example, providing protection for important marine ecosystems and species, increasing the biomass of target fisheries, and increasing the larval spill-over rate from inside to outside the MPA. Significant factors such as these need to be considered by the government and/or managers when planning and designing MPAs. Three high-level actions, some already underway, are proposed to reach this goal:

a. *Increase the extent of MPA area in Indonesia*
   The addition of new MPAs in the future can be focused (1) in provinces that have a relatively low number and small size of MPAs, and (2) in areas that have high conservation value and resilience to climate change. These MPAs should also align with the recently approved Zoning Plan for Coastal and Small Island Areas (RZWP3K) and PP No. 32/2019 (10% Indonesian waters are conservation areas) in regard to marine spatial planning.

b. *Enhance the protection of important marine habitats within MPAs, especially in no-take zone*
   Currently, 47% of coral reefs, 25% of mangrove forests, and 37% of seagrass beds that have been mapped in Indonesia are included within national protected areas. However, only 7% of coral reefs, <1% of mangrove forests, and 7% of seagrass beds are contained within non-extractive zone. Considering the importance of mangrove forests ecosystem functions, especially as nursery areas for reef fish, and that mangrove forests area within MPAs in Indonesia is far under optimal protection levels (20-30%), increased mangrove forests protection is needed. MPA

managers also need to ensure there is adequate representation, extent, and connectivity of important marine habitats that are protected within no-take zone.

c. *Implement effective zoning systems* To achieve the national MPA target in 2030, the national and provincial governments need to accelerate designation and implementation of zones for existing MPAs and develop long-term management plans. On paper, the Ministry of Marine Affairs and Fisheries (MMAF) requires an MPA to have at least 2% of its area designated as a core zone (non-extractive) and for its zoning system to align with RZWP3K. The optimal size and design of zones need to be developed using scientific evidence and an understanding of MPA objectives for biodiversity protection and increased fisheries productivity. This may include: (1) protection of 20-30% of important marine habitat in the non-extractive zones; (2) allocation and strict enforcement of 20-30% of fishing areas within the non-extractive zones which may increase amount and extent of larval dispersal to other zones that support increased fisheries productivity; and (3) achieving a diameter of at least 2-10 km (individually or through well-networked sites) to protect some marine megafauna.

2. Operationalizing MPA management

Though the number of MPAs in Indonesia has rapidly increased in the last two decades, the challenge now facing authorities is to improve the effectiveness of MPA management. While most MPAs are still in an early stage of establishment, inadequate sustainable funding and resource capacity, the complexity of governance hierarchies and management jurisdiction, and low compliance from MPA user group are the biggest challenges to achieve effective MPA management. Going forward, several actions can be further applied to operationalize and improve MPA management:

a. *Focus on improving efforts based on the Management Effectiveness of Aquatic, Coasts and Small Islands Conservation Areas (Evaluasi Efektivitas Pengelolaan Kawasan Konservasi Perairan, Pesisir dan Pulau-Pulau Kecil/E-KKP3K) and Management Effectiveness Tracking Tool (METT) evaluation results* to allocate resources effectively and efficiently. This includes supporting regular monitoring efforts (ecological and social) to establish an impact evaluation portfolio.

b. *Ensure adequate staffing (scale and competency) for practicable MPA management*, regionally and at the site level, and continue to *promote partnerships and co-management for MPA management*, especially to improve management capacity, with other line ministries, NGOs, private sector parties, academics, and community groups.

c. *Diversify sources for funding and further promote sustainable financing schemes* for MPA implementation.

3. Strengthening other management mechanisms

Beyond formal MPA establishment, there are additional promising management mechanisms that are primarily focused on other modes of area-based conservation, such as OECMs, sustainable fisheries management, responsible marine tourism, and others:

a. *Build a framework and legal basis for OECM implementation in Indonesia* so existing practices can be recognized and legitimized by the government. The OECM framework can also encourage the revitalization of old practices that have been lost and the development of new initiatives to support conservation, which can diversify approaches to support coastal and marine conservation in Indonesia.
b. *Strengthen fisheries management inside and outside MPAs* through

several strategies, including but not limited to: (1) strengthen collaboration between the National Commission on Fish Resource Assessment (KOMNAS KAJISKAN) and MPA managers in each Fisheries Management Area (FMA) to synergize conservation and fisheries activities; (2) strengthen the MPA network within each FMA to support fisheries stock recovery; and (3) expand and replicate the Fisheries Area Access Management and rights-based fisheries management in other MPAs in Indonesia – especially in MPAs with strong customary governance.

c. *Encourage responsible marine tourism management.* To achieve this, MPA managers can apply strategies such as (1) strengthening the efforts to build, reproduce, and socialize various guidelines or codes of conduct for nature-based tourism, (2) continuing to legitimize and replicate marine ecotourism efforts initiated by local communities, (3) avoiding and limiting mass tourism activities by applying environmental carrying capacity standards, and (4) building mechanisms to synergize tourism activities within the sustainable funding scheme as well as with the needs of the local community and tourists.

d. *Continue to strengthen MPA network collaboration at the regional and national levels* to promote shared learning and joint efforts, as well as to strengthen the efficacy of the MPA network.

To emphasize how MPAs and other protected area methods can continue to serve as effective and efficient building blocks for coastal and marine conservation, several key areas are further explored in MMAF's "MPA Vision 2030 and Roadmap to MPA Management – Securing 10% of marine waters in Indonesia towards biodiversity protection and sustainable use"[1]. This vision for the next decade will be communicated and positioned in the coming year with other national and international MPA initiatives as well as with provincial governments and stakeholders in Indonesia to influence a comprehensive framework for guiding future investments in MPAs. The Vision document, embodying seven areas of work, is a *shared* vision, jointly developed by the government and NGO partners, and while recognizing existing regulatory frameworks and mechanisms, illuminates areas for strengthening and scaling efforts, with a detailed plan of action for achieving the country's target of establishing 32.5 million ha of MPAs by 2030, with at least 20 million ha effectively managed. The information contained within the preceding chapters here in "Management of Marine Protected Areas in Indonesia: Status and Challenges" has served to help inform this Vision and Roadmap document, also providing a compelling case to advance current efforts. Both are complementary, providing the foundation for increased alignment among key partners on a path towards achieving a 10-year MPA vision.

As a final note, nearly 8% of Indonesian waters are now formally protected, with new commitments and stronger efforts to expand marine conservation in the coming decade, creating opportunity for improvement and innovation in area-based conservation. Evidence and lessons learned from past experiences in designing, establishing, and implementing MPAs and other tools to support conservation illustrate that there is no single pattern or standard that can be applied to all MPAs. MPA managers should apply adaptive management mechanisms, considering local needs and context, and regularly evaluate the implementation of their MPAs against MPA objectives. Marine conservation, especially through the implementation of MPAs in Indonesia, is critical not just for protecting explicit marine areas, but also biodiversity, culture, or social aspects. It is essential for Indonesia to safeguard marine ecosystems – Indonesia's sea full of treasures – to ultimately help its own people thrive.

[1]Kementerian Kelautan dan Perikanan. (2020). MPA Vision 2030 and Roadmap to MPA Management: Securing 10% of marine waters in Indonesia towards biodiversity protection and sustainable use. Ministry of Marine Affairs and Fisheries, Republic of Indonesia.

Annexes

Annex 1. List of MPAs in Indonesia as of December 2019, MPA official/common names, extent (ha), year of initiation and year of zoning

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
Region: SUMATRA						
01 Aceh	1	KKPD Aceh Barat Daya	KKPD Aceh Barat Daya	16,017.34	2018	
	2	KKPD Aceh Besar	KKPD Aceh Besar	29,615.63	2010	
	3	KKPD Aceh Jaya	KKPD Aceh Jaya	50,041.43	2010	
	4	KKPD Aceh Selatan	KKPD Aceh Selatan	3,590.34	2018	
	5	KKPD Aceh Tamiang	KKPD Aceh Tamiang	2,797.21	2018	
	6	KKPD Simeulue	KKPD Simeulue	69,053.78	2006	
	7	KKPD Pesisir Timur Pulau Weh - Sabang	SAP Pesisir Timur Pulau Weh	3,207.98	2010	2013
	8	TL. Pulau Weh Sabang	TL Pulau Weh Sabang	3,900.00	1982	2016
	9	TWA. Kepulauan Banyak	TWA Kepulauan Banyak	227,500.00	1996	2016
02 Sumatra Utara	10	KKPD Nias Selatan	KKPD Nias Selatan	56,000.00	2008	
	11	KKPD Serdang Bedagai	KKPD Serdang Bedagai	1,240.40	2008	
	12	KKPD Tapanuli Tengah	KKPD Tapanuli Tengah	81,243.00	2007	
	13	KKPD Sawo Lahewa - Nias Utara	TWP Sawo Lahewa	29,230.80	2015	2017
03 Sumatra Barat	14	KKPD Agam	KKPD Agam	12,000.00	2012	
	15	KKPD Batang Gasan - Padang Pariaman	KKPD Batang Gasan	684.00	2010	
	16	KKPD Kota Padang	KKPD Kota Padang	2,274.96	2011	
	17	KKPD Pariaman	KKPD Pariaman	11,525.89	2006	
	18	KKPD Payau Jorong Maligi - Pasaman Barat	KKPD Payau Jorong Maligi	6,795.80	2007	
	19	KKPD Pesisir Selatan	KKPD Pesisir Selatan	174,899.30	2003	

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
	20	KKPD Solok	KKPD Solok	2.00	2013	
	21	Sungai Batang Pelangai - Pesisir Selatan	PUD Sungai Batang Pelangai	-	2011	
	22	TWP Pulau Pieh	TWP Pulau Pieh	39,900.00	2000	2014
	23	KKPD Selat Bunga Laut - Kep. Mentawai	TWP Selat Bunga Laut	129,566.00	2006	2018
04 Riau	24	KKPD Kepulauan Aruah - Rokan Hilir	KKPD Kepulauan Aruah	23,481.32	2017	
	25	KKPD Rupat Utara	KKPD Rupat Utara	15,547.00	2019	
	26	KKPD Solop - Indragiri Hilir	KKPD Solop	205,595.64	2017	
	27	KKPD Suaka Perikanan Ikan Terubuk	KKPD Suaka Perikanan Ikan Terubuk	40,741.80	2010	
05 Kepulauan Riau	28	KKPD Batam	KKPD Batam	65,868.44	2007	
	29	KKPD Bintan	KKPD Bintan	1,210,345.57	2007	
	30	KKPD Lingga	KKPD Lingga	371,085.02	2014	
	31	KKPD Natuna	KKPD Natuna	152,223.97	2007	
	32	TWP Kepulauan Anambas	TWP Kepulauan Anambas	1,262,686.20	2011	2014
06 Kepulauan Bangka Belitung	33	KKPD Bangka Barat	KKPD Bangka Barat	2,161.70	2013	
	34	KKPD Bangka Selatan	KKPD Bangka Selatan	186.00	2012	
	35	KKPD Bangka Tengah	KKPD Bangka Tengah	-	2007	
	36	KKPD Belitung	KKPD Belitung	447,785.25	2014	
	37	KKPD Suaka Perikanan Tuing - Bangka	KKPD Suaka Perikanan Tuing	9,809.56	2018	
	38	KKPD Gugusan Pulau-Pulau Momparang - Beltim	TWP Momparang	124,320.70	2014	2017
07 Jambi	39	KKPD Arwana Kutur - Sarolangun	KKPD Arwana Kutur	28.00	2011	
	40	KKPD Bungo	KKPD Bungo	2.27	2013	
	41	Lubuk Gerinjing Sungai Batang Tembesi	PUD Lubuk Gerinjing Sungai Batang Tembesi	28.05	2018	

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
	42	Lubuk Potai Sungai Batang Limun	PUD Lubuk Potai Sungai Batang Limun	15.90	2018	
09 Bengkulu	43	KKPD Enggano - Bengkulu Utara	KKPD Enggano	37,167.39	2010	
	44	KKPD Kaur (Linau, Merpas, dan Sekunyit)	KKPD Kaur (Linau, Merpas, dan Sekunyit)	50,308.39	2007	
	45	KKPD Mukomuko	KKPD Mukomuko	-	2010	
10 Lampung	46	Cagar Alam P. Anak Krakatau	CA Pulau Anak Krakatau	11,200.00	1990	
	47	KKPD Ngambur dan Betuah - Lampung Barat	KKPD Ngambur dan Betuah	15,459.68	2007	
	48	KKPD Pulau Batang Segama - Lampung Timur	KKPD Pulau Batang Segama	14,569.30	2015	
	49	KKPD Teluk Kiluan - Tanggamus	TWP Teluk Kiluan	72,211.68	2014	2019
Region: JAWA						
11 DKI Jakarta	50	SM. Pulau Rambut dan Perairan	SM Pulau Rambut dan Perairan	90.00	1999	2016
	51	Taman Nasional Laut Kepulauan Seribu	TNL Kepulauan Seribu	107,489.00	2002	2004
12 Jawa Barat	52	CAL. Leuwung Sancang	CAL Leuwung Sancang	1,150.00	1990	
	53	CAL. Pananjung Pangandaran	CAL Pananjung Pangandaran	470.00	1990	2015
	54	KKPD Pangandaran	KKPD Pangandaran	29,823.99	2008	
	55	KKPD Pulau Biawak - Indramayu	KKPD Pulau Biawak	720.00	2004	
	56	SM. Sindangkerta	SM Sindangkerta	90.00	2002	
	57	KKPD Pantai Penyu Pangumbahan - Sukabumi	TP Pantai Penyu Pangumbahan	2,706.09	2008	2016
13 Banten	58	KKM HMAS Perth - Serang	KKM HMAS Perth	99.94	2018	2018
	59	KKPD Pandeglang	KKPD Pandeglang	7,391.00	2007	
	60	TWA. Pulau Sangiang	TWA Pulau Sangiang	720.00	1991	1996

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
14 Jawa Tengah	61	KKPD Karang Jeruk - Tegal	KKPD Karang Jeruk	53,460.00	2010	
	62	KKPD Pulau Panjang - Jepara	KKPD Pulau Panjang	180.13	2013	
	63	SP Waduk Malahayu dan Waduk Penjalin - Brebes	SP Waduk Malahayu dan Waduk Penjalin	-	2007	
	64	Taman Nasional Laut Karimun Jawa	TNL Karimun Jawa	110,117.30	2001	2005
	65	KKPD Ujungnegoro Roban - Batang	TP Ujungnegoro Roban	4,015.20	2005	2012
15 DI Yogyakarta	66	KKPD Bantul	KKPD Bantul	182.00	2014	
	67	KKPD Gunungkidul	KKPD Gunungkidul	3,388.46	2013	
16 Jawa Timur	68	KKPD Banyuwangi	KKPD Banyuwangi	111.10	2018	
	69	KKPD Pasuruan	KKPD Pasuruan	4,073.74	2012	
	70	KKPD Pulau Gili Ketapang - Probolinggo	KKPD Pulau Gili Ketapang	374.07	2018	
	71	KKPD Pulau Pitu Timur - Sidoarjo	KKPD Pulau Pitu Timur	72.32	2012	
	72	KKPD Situbondo	KKPD Situbondo	123.18	2012	
	73	KKPD Sumenep	KKPD Sumenep	72,026.14	2010	
	74	KKPD Tulungagung	KKPD Tulungagung	217.00	2018	
Region: SUNDA KECIL						
17 Bali	75	KKM Teluk Benoa	KKM Teluk Benoa	1,243.41	2019	2019
	76	KKPD Buleleng	KKPD Buleleng	14,041.13	2011	
	77	KKPD Jembrana	KKPD Jembrana	3,532.52	2013	
	78	KKPD Karangasem	KKPD Karangasem	5,856.31	2017	
	79	KKPD Nusa Penida - Klungkung	TWP Nusa Penida	20,057.00	2010	2014
18 Nusa Tenggara Barat	80	KKPD Gili Balu - Sumbawa Barat	KKPD Gili Balu	6,005.20	2014	
	81	KKPD Gili Banta - Bima	KKPD Gili Banta	40,500.00	2005	
	82	KKPD Keramat, Bedil dan Temudong - Sumbawa	KKPD Kabete	2,000.00	2014	

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
	83	KKPD Pulau Liang dan Pulau Ngali - Sumbawa	KKPD Liang dan Ngali	33,461.00	2015	
	84	KKPD Penyu Tatar Sepang-Lunyuk - Sumbawa	KKPD Penyu Tatar Sepang-Lunyuk	72,415.29	2014	
	85	KKPD Pulau Lipan dan Pulau Rakit - Sumbawa	KKPD Pulau Lipan dan Pulau Rakit	26,640.76	2018	
	86	KKPD Teluk Bumbang - Lombok Tengah	KKPD Teluk Bumbang	6,310.00	2013	
	87	KKPD Teluk Cempi - Dompu	KKPD Teluk Cempi	22,387.31	2014	
	88	TL. P. Moyo	TL Pulau Moyo	6,000.00	2001	
	89	TWA. Pulau Satonda	TWA Pulau Satonda	2,600.00	1998	2006
	90	TWP Gili Ayer, Gili Meno, Gili Trawangan	TWP Gili Matra	2,954.00	2001	2014
	91	KKPD Gili Sulat dan Lawang - Lombok Timur	TWP Gili Sulat Lawang	10,000.00	2014	2018
	92	KKPD Gili Tangkong, Gili Nanggu, dan Gili Sudak - Lombok Barat	TWP Gita Nada	21,132.82	2014	2018
19 Nusa Tenggara Timur	93	Cagar Alam Riung	CA Riung	2,000.00	1996	
	94	KKPD Flores Timur	KKPD Flores Timur	150,000.00	2013	
	95	KKPD Lembata	KKPD Lembata	225,624.00	2012	
	96	KKPD Sikka	KKPD Sikka	42,250.00	2010	
	97	KKPD Selat Pantar - Alor	SAP Selat Pantar	276,693.38	2006	2015
	98	TNP Laut Sawu	TNP Laut Sawu	3,355,352.82	2009	2014
	99	TWA. Tujuh Belas Pulau	TWA Tujuh Belas Pulau	9,900.00	1996	2016
	100	TWAL. Teluk Maumere	TWAL Teluk Maumere	59,450.00	1987	2016
	101	TWL. Teluk Kupang	TWL Teluk Kupang	50,000.00	1993	
Region: KALIMANTAN						
20 Kalimantan Barat	102	CAL. Kep. Karimata	CAL Kepulauan Karimata	77,000.00	1985	

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
	103	KKPD Kendawangan - Ketapang	KKPD Kendawangan	188,458.29	2017	
	104	KKPD Kubu Raya	KKPD Kubu Raya	301,845.94	2017	
	105	KKPD Paloh - Sambas	KKPD Paloh	105,252.79	2017	
	106	KKPD Pulau Randayan - Bengkayang	KKPD Pulau Randayan	149,079.00	2004	
21 Kalimantan Tengah	107	KKPD Senggora Sepagar - Kotawaringin Barat	TWP Kotawaringin Barat	61,362.24	2015	2019
22 Kalimantan Selatan	108	KKPD Pulau Laut, P. Sembilan, P. Samber Gelap - Kotabaru	KKPD Kotabaru	160,908.13	2005	
	109	KKPD Satui, Angsa, Sungai Loban - Tanah Bumbu	KKPD Tanah Bumbu	18,751.68	2011	
23 Kalimantan Timur	110	KKPD Kota Bontang	KKPD Kota Bontang	5,121.38	2011	
	111	SM. Pulau Semama	SM Pulau Semama	220.00	1982	
	112	TL. Pulau Samama Sangalaki	TL Pulau Samama Sangalaki	280.00	1982	2014
	113	KKPD Kepulauan Derawan - Berau	TP dan TPK Kepulauan Derawan	285,548.95	2013	2016
24 Kalimantan Utara	114	KKPD Gugusan Pulau Sinilak - Nunukan	KKPD Gugusan Pulau Sinilak	-	2007	
	115	KKPD Sebatik Barat - Nunukan	KKPD Sebatik Barat	74.00	2012	
	116	KKPD Tanjung Cantik - Nunukan	KKPD Tanjung Cantik	200.00	2007	
Region: SULAWESI						
25 Sulawesi Utara	117	KKPD Kepulauan Sitaro	KKPD Kepulauan Sitaro	44,110.11	2018	
	118	KKPD Kota Bitung	KKPD Kota Bitung	9,647.00	2014	
	119	KKPD Minahasa	KKPD Minahasa	-	2013	
	120	KKPD Minahasa Selatan	KKPD Minahasa Selatan	26,000.00	2007	
	121	KKPD Minahasa Utara	KKPD Minahasa Utara	26,524.87	2014	

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
26 Gorontalo	122	Danau Moaat - Bolaang Mongondow	PUD Danau Moaat	617.00	2008	
	123	Taman Nasional Laut Bunaken	TNL Bunaken	89,065.00	1991	2008
	124	KKPD Tatoareng - Kep Sangihe	TPK Tatoareng	164,251.94	2017	
	125	KKPD Biluhu Timur	KKPD Biluhu Timur	104.75	2019	
	126	KKPD Botubarani	KKPD Botubarani	35.00	2019	
	127	KKPD Dulangka	KKPD Dulangka	3,418.52	2019	
	128	KKPD Mabasar Maruangi	KKPD Mabasar Maruangi	1,164.01	2019	
	129	KKPD Maruagi-Mabasar	KKPD Maruagi-Mabasar	6,866.17	2019	
	130	KKPD Monduli	KKPD Monduli	7,380.05	2019	
	131	KKPD Pantai Olele	KKPD Pantai Olele	490.49	2012	
	132	KKPD Popaya	KKPD Popaya	1,266.67	2019	
	133	KKPD Pulau Mohinggito	KKPD Pulau Mohinggito	469.11	2019	
	134	KKPD Sumalata	KKPD Sumalata	14,307.93	2019	
	135	KKPD Tanjung Panjang	KKPD Tanjung Panjang	2,952.47	2019	
	136	KKPD Tolinggula	KKPD Tolinggula	2,097.00	2019	
27 Sulawesi Tengah	137	KKPD Doboto	KKPD Doboto	60,042.72	2017	2019
	138	KKPD Morowali	KKPD Morowali	292,910.12	2017	2019
	139	KKPD Parigi Moutong, Poso, Tojo Una-Una	KKPD Teluk Tomini	128,689.86	2017	2019
	140	Taman Nasional Laut Kepulauan Togean	TNL Kepulauan Togean	362,605.00	2004	
	141	KKPD Banggai Dalaka	TP dan TPK Banggai Dalaka	856,649.13	2017	2019
28 Sulawesi Tenggara	142	KKPD Bombana	KKPD Bombana	19,176.98	2011	
	143	KKPD Buton	KKPD Buton	10,129.60	2005	
	144	KKPD Buton Selatan	KKPD Buton Selatan	35,698.73	2016	

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
	145	KKPD Buton Tengah	KKPD Buton Tengah	109,069.55	2016	
	146	KKPD Kolaka	KKPD Kolaka	60,400.00	2013	
	147	KKPD Kolaka Utara	KKPD Kolaka Utara	37,320.33	2015	
	148	KKPD Muna	KKPD Muna	76,417.16	2014	
	149	KKPD Provinsi Sultra	KKPD Provinsi Sultra	21,786.14	2014	
	150	KKPD Pulau Wawonii - Konawe Kepulauan	KKPD Pulau Wawonii	28,340.00	2016	
	151	KKPD Selat Tiworo - Muna Barat	KKPD Selat Tiworo	27,936.00	2004	
	152	Taman Nasional Laut Wakatobi	TNL Wakatobi	1,390,000.00	2002	2007
	153	TWA. Teluk Lasolo	TWA Teluk Lasolo	81,800.00	1999	2016
	154	TWAL. Kepulauan Padamarang	TWAL Padamarang	36,000.00	2003	2016
29 Sulawesi Selatan	155	KKPD Barru	KKPD Barru	605.94	2014	
	156	KKPD Liukang Tangaya - Pangkep	KKPD Liukang Tangaya	500,737.77	2018	
	157	KKPD Liukang Tupabiring - Pangkep	KKPD Liukang Tupabiring	66,870.00	2015	
	158	KKPD Luwu Utara	KKPD Luwu Utara	-	2010	
	159	KKPD Pulo Kauna Kayuadi - Selayar	KKPD Pulo Kauna Kayuadi	3,983.00	2011	
	160	KKPD Pulo Pasi Gusung - Selayar	KKPD Pulo Pasi Gusung	5,018.00	2011	
	161	KKPD Teluk Bone Bagian Selatan	KKPD Teluk Bone Bagian Selatan	423,942.00	2018	
	162	Taman Nasional Laut Taka Bone Rate	TNL Taka Bone Rate	530,765.00	2001	2012
	163	TWP Kapoposang	TWP Kapoposang	50,000.00	1996	2014
30 Sulawesi Barat	164	KKPD Majene	KKPD Majene	49,000.00	2012	
	165	KKPD Mamuju	KKPD Mamuju	67,000.00	2016	
	166	KKPD Polewali Mandar	KKPD Polewali Mandar	33,880.00	2013	

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
Region: MALUKU						
31 Maluku	167	KKPD Pulau Ay-Pulau Rhun, Banda - Maluku Tengah	KKPD Ay-Rhun	47,968.74	2016	
	168	KKPD Pulau Baeer - Tual	KKPD Baeer	82.00	2016	
	169	KKPD Kepulauan Lease - Maluku Tengah	KKPD Kepulauan Lease	81,573.48	2016	
	170	KKPD Yamdena - MTB Tanimbar	KKPD Kepulauan Tanimbar	783,806.00	2016	
	171	KKPD Pulau Koon - Seram Bagian Timur	KKPD Pulau Koon	9,901.00	2011	
	172	SAP Kepulauan Aru Tenggara	SAP Kepulauan Aru Tenggara	114,000.00	1991	2014
	173	KKPD Pulau Kei Kecil - Maluku Tenggara	TPK Kei Kecil	150,000.00	2012	2016
	174	TW. Pulau Kasa	TW Pulau Kasa	1,100.00	1978	
	175	TW. Pulau Pombo	TW Pulau Pombo	998.00	1996	
	176	TWA. P. Marsegu	TWA Pulau Marsegu	11,000.00	1999	
	177	TWP Taman Laut Banda	TWP Taman Laut Banda	2,500.00	1977	2014
32 Maluku Utara	178	KKPD Kepulauan Guraici - Halmahera Selatan	KKPD Kepulauan Guraici	6,386.46	2012	
	179	KKPD Kepulauan Sula	KKPD Kepulauan Sula	117,959.88	2018	
	180	KKPD Pulau Rao-Tanjung Dehegila - Pulau Morotai	KKPD Morotai	65,520.75	2012	
	181	KKPD Pulau Jiew - Halmahera Tengah	KKPD Pulau Jiew	192.00	2013	
	182	KKPD Pulau Makian - Halmahera Selatan	KKPD Pulau Makian	42,799.00	2018	
	183	KKPD Pulau Widi - Halmahera Selatan	KKPD Pulau Widi	7,690.00	2015	
	184	KKPD Kota Tidore Kepulauan	KKPD Tidore Kepulauan	2,810.00	2012	
Region: PAPUA						
33 Papua	185	KKPD Biak Numfor	KKPD Biak Numfor	46,983.62	2015	
	186	TWP Pulau Padaido	TWP Padaido	183,000.00	1997	2014

Province	No	MPA official names	MPA common names*	MPA extent (ha)	Year of initiation	Year of zoning
34 Papua Barat	187	KKPD Teluk Berau & Teluk Nusalasi - Fakfak	KKPD Fakfak	350,000.00	2017	
	188	KKPD Kepulauan Fam - Raja Ampat	KKPD Kepulauan Fam	360,000.00	2017	
	189	KKPD Laut Seribu Satu Sungai Teo Enobikia	KKPD Laut Seribu Satu Sungai Teo Enobikia	338,323.00	2019	
	190	SAP Kepulauan Raja Ampat	SAP Kepulauan Raja Ampat	60,000.00	1993	2014
	191	SAP Kepulauan Waigeo Sebelah Barat	SAP Kepulauan Waigeo Sebelah Barat	271,630.00	2009	2014
	192	SM. Pulau Sabuda Tataruga	SM Pulau Sabuda Tataruga	5,000.00	1993	
	193	Taman Nasional Laut Teluk Cendrawasih	TNL Teluk Cendrawasih	1,453,500.00	2002	2009
	194	KKPD Jeen Womom - Tambrauw	TP Jeen Womom	32,250.86	2015	2017
	195	KKPD Kaimana	TWP Kaimana	499,804.13	2008	2019
	196	KKPD Kepulauan Raja Ampat - Raja Ampat	TWP Raja Ampat	1,026,540.00	2007	2014

Note: CA (Cagar Alam; Nature Reserve), CAL (Cagar Alam Laut; Marine Nature Reserve), KKM (Kawasan Konservasi Maritim; Maritime Conservation Area), KKPD (Kawasan Konservasi Perairan Daerah; Provincial Marine Protected Areas), PUD (Perairan Umum Daratan; Mainland Public Waters), SAP (Suaka Alam Perairan; Aquatic Nature Reserve), SM (Suaka Margasatwa; Wildlife Reserve), SP (Suaka Perikanan; Fisheries Reserve), TL (Taman Laut; Nature Recreational Park), TNL (Taman Nasional Laut; Marine National Park), TNP (Taman Nasional Perairan; Aquatic National Park), TP (Taman Pesisir; Coastal Park), TPK (Taman Pulau Kecil; Small Islands Park), TW (Taman Wisata; Nature Recreational Park), TWA (Taman Wisata Alam; Nature Recreational Park), TWL (Taman Wisata Laut; Nature Recreational Park), TWP (Taman Wisata Perairan; Aquatic Tourism Park)

* MPA common names are the shortened version of full MPA official names and used in the report to simplify the MPA names. Official MPA names remain the official version.

Annex 2. List of Protected Areas in Indonesia that include the protection of marine ecosystems as of December 2019, extent (ha), year of initiation and year of zoning

Province	No	PA Official names	PA common names*	PA extent (ha)**	Marine area extent (ha)***	Year of initiation	Year of zoning
Region: SUMATRA							
01 Aceh	1	Suaka Margasatwa Rawa Singkil	SM Rawa Singkil	81,802.22	1.22	1998	-
02 Sumatra Utara	2	Taman Buru Pulau Pini	TB Pulau Pini	8,350.00	505.70	1996	-
	3	Suaka Margasatwa Karang Gading dan Langkat Timur Laut	SM Karang Gading dan Langkat Timur Laut	15,765.00	8,682.83	1980	-
03 Sumatra Barat	4	Suaka Margasatwa Pagai Selatan	SM Pagai Selatan	4,000.00	45.21	1999	-
	5	Taman Wisata Alam Saibi Sarabua	TWA Saibi Sarabua	3,220.99	585.87	1993	-
	6	Taman Nasional Siberut	TN Siberut	190,500.00	8.81	1993	2015
05 Kepulauan Riau	7	Taman Buru Pulau Rempang	TB Pulau Rempang	16.000.00	989.02	1986	2013
06 Kepulauan Bangka Belitung	8	Taman Nasional Gunung Maras	TN Gunung Maras	16,806.91	2,218.57	2012	-
	9	Taman Wisata Alam Jering Menduyung	TWA Jering Menduyung	1209.70	2087.61	2014	-
07 Jambi	10	Taman Nasional Berbak	TN Berbak	142,750.00	15.49	1992	2014
	11	Cagar Alam Kelompok Hutan Bakau Pantai Timur	CA Kelompok Hutan Bakau Pantai Timur	4,126.60	2,594.91	2003	2016
08 Sumatra Selatan	12	Taman Nasional Sembilang	TN Sembilang	205,750.00	85,830.30	2003	2011
09 Bengkulu	13	Cagar Alam Sungai Bahewo Reg 57	CA Sungai Bahewo Reg 57	496.06	363.36	1985	-
	14	Cagar Alam Teluk Klowe Reg 96	CA Teluk Klowe Reg 96	331.23	282.63	1985	-

Province	No	PA Official names	PA common names*	PA extent (ha)**	Marine area extent (ha)***	Year of initiation	Year of zoning
	15	Cagar Alam Tanjung Laksaha Reg 98	CA Tanjung Laksaha Reg 98	3,450.00	122.70	1985	-
	16	Taman Buru Gunung Nanu'ua	TB Gunung Nanu'ua	7,814.00	415.84	2011	-
10 Lampung	17	Taman Nasional Bukit Barisan Selatan	TN Bukit Barisan Selatan	355,511.00	44.69	1982	2014
	18	Taman Nasional Way Kambas	TN Way Kambas	125,621.3	1,190.42	1999	2011
Region: JAWA							
13 Banten	19	Taman Nasional Ujung Kulon	TN Ujung Kulon	122,956.00	51,677.40	1992	2011
	20	Cagar Alam Pulau Dua	CA Pulau Dua	30.00	16.11	2014	-
14 Jawa Tengah	21	Cagar Alam Nusakambangan Barat	CA Nusakambangan Barat	667.00	0.17	2014	-
16 Jawa Timur	22	Cagar Alam Pulau Saobi (Kangean)	CA Pulau Saobi (Kangean)	430.00	23.75	1999	2016
	23	Taman Nasional Baluran	TN Baluran	25,000.00	232.18	1997	2016
	24	Taman Nasional Alas Purwo	TN Alas Purwo	43,420.00	639.88	1993	2015
Region: SUNDA KECIL							
17 Bali	25	Taman Nasional Bali Barat	TN Bali Barat	77,000.00	4,551.30	1995	2010
	26	Taman Hutan Raya Ngurah Rai	THR Ngurah Rai	1,373.50	908.81	1992	2015
18 Nusa Tenggara Barat	27	Taman Wisata Alam Bangko-bangko	TWA Bangko-bangko	2,169.00	30.15	1992	2010
	28	Cagar Alam Pulau Panjang	CA Pulau Panjang	1,641.25	1,455.96	1986	-
	29	Cagar Alam Toffo Kota Lambu	CA Toffo Kota Lambu	3,340.00	27.57	1999	-
19 Nusa Tenggara Timur	30	Cagar Alam Wae Wuul	CA Wae Wuul	1,484.84	0.92	1996	-
	31	Taman Wisata Alam Pulau Lapang	TWA Pulau Lapang	97.27	6.75	1999	-

Province	No	PA Official names	PA common names*	PA extent (ha)**	Marine area extent (ha)***	Year of initiation	Year of zoning
	32	Taman Wisata Alam Tuti Adagae	TWA Tuti Adagae	5,537.88	1.70	1981	-
	33	Taman Nasional Komodo	TN Komodo	173,300.00	124,275.00	1999	2012
	34	Suaka Margasatwa Perhatu	SM Perhatu	472.00	24.02	1993	-
	35	Suaka Margasatwa Danau Tuadale	SM Danau Tuadale	986.00	290.74	1993	-
	36	Cagar Alam Maubesi (RTK 189)	CA Maubesi (RTK 189)	3,246.00	2,846.01	1981	-
	37	Taman Wisata Alam Pulau Manipo	TWA Pulau Manipo	2,449.50	1,294.15	1992	-
	38	Suaka Margasatwa Harlu	SM Harlu	2,262.00	2.82	1993	-
	39	Taman Buru Dataran Bena (Rtk 190)	TB Dataran Bena (Rtk 190)	11,000.00	92.58	1978	-
Region: KALIMANTAN							
20 Kalimantan Barat	41	Cagar Alam Muara Kendawangan	CA Muara Kendawangan	150,000.00	512.87	1982	2016
	42	Taman Wisata Alam Asuansang	TWA Asuansang	1,142.00	65.41	2000	-
	43	Taman Wisata Alam Gunung Melintang	TWA Gunung Melintang	21,172.00	55.65	2000	2016
	44	Taman Wisata Alam Tanjung Belimbing	TWA Tanjung Belimbing	810.30	439.65	2000	-
	45	Taman Wisata Alam Sungai Liku	TWA Sungai Liku	821.30	468.10	2000	2016
21 Kalimantan Tengah	46	Taman Nasional Sebangau	TN Sebangau	568,700.00	59.43	2004	2016
	47	Taman Nasional Tanjung Puting	TN Tanjung Puting	270,040.00	145.72	1996	2013
22 Kalimantan Selatan	48	Cagar Alam Sungai Bulan dan Sungai Lulan	CA Sungai Bulan dan Sungai Lulan	3,017.53	954.42	2009	-

Province	No	PA Official names	PA common names*	PA extent (ha)**	Marine area extent (ha)***	Year of initiation	Year of zoning
	49	Cagar Alam Teluk Kelumpang Selat Laut Selat Sebuku	CA Teluk Kelumpang Selat Laut Selat Sebuku	59,074.00	28,430.00	1987	-
	50	Suaka Margasatwa Pleihari Tanah Laut	SM Pleihari Tanah Laut	500.00	411.36	1991	2016
	51	Suaka Margasatwa Kuala Lupak	SM Kuala Lupak	3,308.00	417.97	1999	2017
	52	Suaka Margasatwa Pulau Kaget	SM Pulau Kaget	292.44	69.30	1999	2017
	53	Cagar Alam Teluk Pamukan	CA Teluk Pamukan	20,618.84	8,865.71	1982	-
	54	Cagar Alam Batu Tunau-Tanjung Pengharapan	CA Batu Tunau-Tanjung Pengharapan	1,264.00	247.25	2009	-
	55	Cagar Alam Pulau Kapak Besar	CA Pulau Kapak Besar	29.00	17.48	2009	-
	56	Kawasan Suaka Alam/Kawasan Pelestarian Alam Pulau Padamaian	KSA/KPA Pulau Padamaian	14.00	3.53	2009	-
	57	Kawasan Suaka Alam/Kawasan Pelestarian Alam Pulau Tempurung	KSA/KPA Pulau Tempurung	126.07	3.07	2009	-
23 Kalimantan Timur	58	Taman Nasional Kutai	TN Kutai	198,629.00	4,812.00	1995	2014
	59	Cagar Alam Teluk Apar	CA Teluk Apar	46,900.00	6,268.69	1993	-
	60	Cagar Alam Teluk Adang	CA Teluk Adang	61,900.00	13,691.80	2001	-
	61	Taman Hutan Raya Bukit Soeharto	THR Bukit Soeharto	61,850.00	41.11	1991	-
Region: SULAWESI							
26 Gorontalo	62	Cagar Alam Tanjung Panjang	CA Tanjung Panjang	3,174.10	919.37	1995	2016
	63	Cagar Alam Panua	CA Panua	45,575.00	183.68	1992	2015

Province	No	PA Official names	PA common names*	PA extent (ha)**	Marine area extent (ha)***	Year of initiation	Year of zoning
27 Sulawesi Tengah	64	Cagar Alam Morowali	CA Morowali	225,000.00	4,358.88	1999	2017
	65	Taman Wisata Alam Danau Towuti	TWA Danau Towuti	62,133.52	59.51	1979	-
	66	Suaka Margasatwa Bakiriang	SM Bakiriang	12,500.00	125.02	1998	2017
	67	Suaka Margasatwa Pati Pati	SM Pati Pati	3,103.79	66.82	1999	-
	68	Suaka Margasatwa Tanjung Santigi	SM Tanjung Santigi	3,500.00	41.99	1987	2017
28 Sulawesi Tenggara	69	Suaka Margasatwa Buton Utara	SM Buton Utara	82,000.00	357.78	1979	2017
	70	Suaka Margasatwa Tanjung Batikolo	SM Tanjung Batikolo	4,060.00	16.25	1995	2017
	71	Suaka Margasatwa Tanjung Peropa	SM Tanjung Peropa	38,937.00	73.70	1986	2015
	72	Taman Nasional Rawa Aopa Watumohai	TN Rawa Aopa Watumohai	105,000.00	5,831.32	1990	2016
	73	Suaka Margasatwa Tanjung Amolengo	SM Tanjung Amolengo	850.00	274.25	1999	2017
30 Sulawesi Barat	74	Suaka Margasatwa Lampoko dan Mampie	SM Lampoko dan Mampie	2,000.00	24.35	1978	-
Region: MALUKU							
31 Maluku	75	Cagar Alam Pulau Larat	CA Pulau Larat	4,505.00	37.03	1995	-
	76	Suaka Margasatwa Tanimbar	SM Tanimbar	65,671.00	486.18	1985	-
	77	Cagar Alam Pulau Nuswotar	CA Pulau Nuswotar	2052.00	88.23	1988	-
	78	Suaka Margasatwa Pulau Baun	SM Pulau Baun	13,000.00	3,875.36	1974	-

Province	No	PA Official names	PA common names*	PA extent (ha)**	Marine area extent (ha)***	Year of initiation	Year of zoning
	79	Suaka Margasatwa Pulau Kobror	SM Pulau Kobror	61,657.75	2775.94	1999	-
	80	Taman Nasional Manusela	TN Manusela	189,000.00	827.29	1997	2013
	81	Cagar Alam Pulau Angwarmase	CA Pulau Angwarmase	295.00	0.36	1988	-
	82	Cagar Alam Pulau Nustaram	CA Pulau Nustaram	2,420.00	0.96	1988	-
	83	Cagar Alam Tafermaar	CA Tafermaar	3,039.30	33.05	1999	-
32 Maluku Utara	84	Cagar Alam Pulau Obi	CA Pulau Obi	1,250.00	9.78	1995	-
Region: PAPUA							
33 Papua	85	Taman Wisata Alam Nabire	TWA Nabire	82.88	9.24	1980	-
	86	Suaka Margasatwa Mamberamo Foja	SM Mamberamo Foja	1,770,138.00	11,601.80	1982	-
	87	Taman Nasional Lorentz	TN Lorentz	2,400,000.00	163,315.00	1997	2013
	88	Taman Nasional Wasur	TN Wasur	413,800.00	1,036.02	1997	2011
	89	Suaka Margasatwa Pulau Dolok	SM Pulau Dolok	720,558.00	115,010.00	1998	-
	90	Suaka Margasatwa Pulau Komolon	SM Pulau Komolon	69,838.00	13,728.10	1982	-
	91	Suaka Margasatwa Pulau Pombo	SM Pulau Pombo	168.00	89.09	2012	-
	92	Suaka Margasatwa Savan	SM Savan	7,683.00	3,644.71	2012	-
	93	Taman Wisata Alam Teluk Youtefa	TWA Teluk Youtefa	1,675.00	58.32	1978	2015
34 Papua Barat	94	Cagar Alam Pegunungan Fakfak	CA Pegunungan Fakfak	34,391.10	2.05	1999	-

Province	No	PA Official names	PA common names*	PA extent (ha)**	Marine area extent (ha)***	Year of initiation	Year of zoning
	95	Cagar Alam Pulau Batanta Barat	CA Pulau Batanta Barat	16,749.08	58.12	1991	-
	96	Cagar Alam Pulau Salawati Utara	CA Pulau Salawati Utara	57,000.00	185.79	1982	-
	97	Cagar Alam Pulau Waigeo Barat	CA Pulau Waigeo Barat	95,200.00	573.19	1996	-
	98	Cagar Alam Pulau Waigeo Timur	CA Pulau Waigeo Timur	119,500.00	82.87	1996	-
	99	Cagar Alam Pantai Sausapor	CA Pantai Sausapor	62,660.00	21.00	1999	-
	100	Cagar Alam Pulau Kofiau	CA Pulau Kofiau	7,747.00	5.71	1999	-
	101	Cagar Alam Pulau Misool Selatan	CA Pulau Misool Selatan	84,000.00	1,379.84	1982	-
	102	Cagar Alam Pulau Supiori	CA Pulau Supiori	41,990.00	25.36	1988	-
	103	Cagar Alam Teluk Bintuni	CA Teluk Bintuni	124,850.90	83,567.10	1999	-
	104	Cagar Alam Wagura Kote	CA Wagura Kote	19,410.00	1,018.40	2010	-
	105	Taman Wisata Alam Beriat	TWA Beriat	9,193.75	2.50	1992	2017

Note: CA (Cagar Alam; Nature Reserve), KPA (Kawasan Pelestarian Alam; Nature Conservation Area), KSA (Kawasan Suaka Alam; Nature Reserva Area), SM (Suaka Margasatwa; Wildlife Reserve), TB (Taman Buru; Wildlife Hunting Park), TAHURA (Taman Hutan Raya/Grand Forest Park), TN (Taman Nasional; National Park), TWA (Taman Wisata Alam; Nature Recreational Park)

* MPA common names are the shortened version of full MPA official names and used in the report to simplify the MPA names. Official MPA names remain the official version.

** Protected Area extent (ha) includes the terrestrial and marine areas that are officially protected by the Protected Area

*** Marine area extent (ha) is the marine areas within the Protected Areas, measured from the coastlines to the protected areas' outer boundary and calculated spatially using the QGis software. These marine area extents are used for all spatial analysis in this report.


KEMENTERIAN KELAUTAN DAN PERIKANAN