Food and Agriculture Organization of the United Nations

The Indonesian Seas Large Marine Ecosystem:

strategic action programme

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Cover photo: Coastal community in Wangiwangi in Southeast Sulawesi ©FAO.

The Indonesian Seas Large Marine Ecosystem: strategic action programme

Food and Agriculture Organization of the United Nations
Jakarta, 2024

Contents

Tables

Figures

Foreword

The sustainable management of the Indonesian Seas Large Marine Ecosystem (ISLME) is a collaborative effort between Indonesia and Timor-Leste. It aims to address the interrelated challenges faced by coastal ecosystems and communities to foster both human well-being and ecosystem well-being. The development of the strategic action programme (SAP) for the ISLME went through several stages including a series of regional and national workshops in each of the two countries. The achievement of this required substantial support from external resources, informed local participation, and joint actions.

The SAP document has a very broad scope with prioritized issues that were mainly identified during the transboundary diagnostic analysis (TDA) in the ISLME region. The focus of the SAP covers a wide range of challenges, including declining productivity and sustainability of fishery and aquaculture, degradation and loss of marine habitats, marine and land-based pollution, increasing biodiversity loss and, in particular, loss of key marine species, and impacts of climate change. The strategies and actions contained in this document will be implemented in the future, demonstrating the persistent commitment of both nations to navigate the complexity of coastal ecosystems and human well-being in a coordinated and significant way.

This collaborative project is a significant step forward in cooperative efforts to promote efficient sustainable development and conservation in marine and coastal resource management within the ISLME region. The SAP document serves as a comprehensive roadmap created through research, in-depth analysis and extensive consultations with various stakeholders. It embodies a shared vision for a future where the many people living in coastal areas depend on maintained ecological balance, sustainable marine habitats, prosperous livelihoods, thriving economies and improved social welfare.

Our deepest gratitude goes to all the contributors who have devoted their expertise, time and unwavering commitment to shaping this SAP. The collective dedication shown by the Government of Indonesia, the Government of Timor-Leste, institutions, communities, and individuals from both countries has been remarkable. With strong commitment, we look forward to a future where our marine ecosystems thrive and our coastal communities prosper.

Jakarta, 16 January 2024.

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Abbreviations

ALKI	*Alur Laut Kepulauan Indonesia* - Indonesian archipelagic sea lanes
ASEAN	The Association of Southeast Asian Nations
BAPPENAS	*Badan Perencanaan Pembangunan Nasional* – National Development Planning Agency (Indonesia)
BSC	binational steering committee
CBIB	*Cara Budidaya Ikan yang Baik* - good fish cultivation practices
CCA	causal chain analysis
EAA	ecosystem approach to aquaculture
EAFM	ecosystem approach to fisheries management
EBM	ecosystem-based management
EIA	environmental impact assessment
ESV	ecosystem value
ETP	endangered, threatened, and protected (in relation to species)
FAO	Food and Agriculture Organization of the United Nations
FGD	focus group discussion
FMA	fisheries management area
FPIC	free, prior, and informed consent
FPU	fish processing units
GAP	good aquaculture practices
GDP	gross domestic product
GEF	Global Environment Facility
GFW	Global Fishing Watch
GVA	gross value added
GVP	gross value of production
ICM	integrated coastal management
IOTC	Indian Ocean Tuna Commission
ISLME	Indonesian Seas Large Marine Ecosystem
M&E	monitoring and evaluation
MCS	monitoring, controlling, and surveillance
ITF	Indonesian Throughflow
IUU	illegal, unreported, and unregulated (fishing)
LME	large marine ecosystem
LMMA	locally-managed marine areas
MMAF	Ministry of Marine Affairs and Fisheries (Indonesia)
MALFF	Ministry of Agriculture, Livestock, Fisheries, and Forestry (Timor-Leste)
MoEF	Ministry of Environment and Forestry (Indonesia)
MPA	marine protected areas
NAP	national action plan
NGO	non-governmental organization
NSAG	national scientific advisory group
NSC	national steering committee
NPOA	National Plan of Action
PEC	priority environmental concern or challenge
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
SAP	Strategic action programme
SDGs	Sustainable Development Goals
SIDs	Small Island Developing States
SNI	*Standar Nasional Indonesia* - Indonesian national standard
SSF	small-scale fisheries
TDA	Transboundary diagnostic analysis
UN	United Nations
UNDP	United Nations Development Programme
UV	use value
WCPFC	Western and Central Pacific Fisheries Commission

Executive summary

The uniqueness of the Indonesian Seas Large Marine Ecosystem

The Indonesian Seas Large Marine Ecosystem (ISLME) (LME 38) offers economic potential and essential natural resources for coastal communities in Indonesia and Timor-Leste. The dynamic nature of the ISLME region, characterized by the Indonesian Throughflow (an ocean current that is important for global climate), plays a significant role in temperature, salinity, and nutrient distribution within the ISLME which, in turn, affect the availability of food and larval resources for marine organisms. This diverse underwater topography, combined with the position of Indonesia and Timor-Leste at the crossroads of the Pacific and Indian oceans, makes the region a primary driver for the entire global ocean circulation system. Part of the recognized Coral Triangle, the ISLME encompasses approximately 10.8 percent of the world's coral reefs, making it the epicentre of marine life diversity, with over 600 species of reef-building corals. Indonesia serves as both a home and a worldwide migratory area for marine biota, including 118 shark species, 63 seabird species (including 56 protected seabird species), six out of the seven sea turtle species, cetacean, and the dugong. There are five challenges and priority problems facing the ISLME region:

- Declining productivity and sustainability of the ISLME fishery and aquaculture
- Degradation and loss of marine habitats
- Marine and land-based pollution
- Decline of biodiversity and key marine species
- Impacts of climate change.

Vision, goals, priority actions and objectives

The SAP for the ISLME is designed to address the environmental challenges facing the region. It focuses on three main, high-level goals, five priority actions and objectives to promote sustainable fisheries and ensure healthy oceans within the ISLME region:

Vision

> Sustainable fisheries and healthy oceans in the ISLME region that provide ecosystem benefits for long-term prosperity of the communities.

Goals

Ecosystem well-being:

- Responsible, traceable fisheries and aquaculture in the ISLME following an ecosystem approach, complying with regulations, and supported by reliable data.
- Improved water quality, controlling all sources of pollution and improved health of all critical habitats and better conservation status of endangered, threatened and protected species in the ISLME.

Human well-being:

More resilient and empowered ISLME dependent communities, enjoying sustainable and equitable benefits of well-being with improved socioeconomic status.

Good governance:

Governance of ISLME based on inclusive participatory management and improved transboundary cooperation.

Priority actions and objectives

- Priority Action 1. Maintain sustainable fisheries
    - Recover and manage resources sustainably
    - Strengthen of sustainable aquaculture (mariculture) practices, including the ecosystem approach to aquaculture (EAA) and good aquaculture practices (GAP)
- Priority Action 2. Restore marine habitat biodiversity
    - Restore and conserve marine habitats (mangroves, seagrass and coral reefs ecosystems)
- Priority Action 3. Reduce marine pollution
    - Improve water quality
- Priority Action 4. Conserve endangered, threatened and protected (ETP) and other key marine species
    - Recover and maintain biodiversity of marine and coastal ecosystems
- Priority Action 5. Respond to impacts of climate change
    - Strengthen resilience of coastal and marine ecosystems to impacts of climate change.

Governance, cooperation and coordination

The SAP proposes various solutions as priority actions in the form of continuous programmes to address each priority environmental concern highlighted by the ISLME TDA document. Strengthening coordination at the local, national, and

regional levels is crucial to achieving better governance. This includes improving the best management practices for marine resources and promoting the ecosystem approach to fisheries management (EAFM) and the ecosystem approach to aquaculture (EAA) as capture fisheries and aquaculture management approaches respectively with suitable monitoring and evaluation tools.

The SAP highlights the importance of monitoring and evaluation through indicators and mechanisms. By implementing these solutions, the SAP aims to address the specific challenges faced by the ISLME region, promote sustainable development, and protect the unique marine ecosystems within the region. The SAP's value lies in its comprehensive approach, which considers the interrelated nature of environmental challenges, human well-being, and good governance. Through effective implementation, the SAP contributes to the long-term sustainability and prosperity of the ISLME region. The SAP is implemented jointly by Indonesia and Timor-Leste and embodies a holistic strategy for managing their shared marine resources in the ISLME region. This programme leverages a spectrum of initiatives that address the multifaceted challenges facing the region. Central to its approach is governance, cooperation, and coordination on regional, national, and local levels. Both nations have established national action plans (NAP) that provide detailed strategies to guide the sustainable management of natural resources. This cooperative effort extends to both intraministerial and interministerial collaboration, encompassing other government bodies and key stakeholders in a coordinated approach. The collaborative nature of the SAP, facilitated through the binational and national steering committees, is pivotal for streamlining efforts and maximizing the efficiency of public policies and services in the ISLME.

Social, political, and economic considerations of the ISLME

The ISLME SAP takes a comprehensive view of societal aspects, with a strong emphasis on gender equality and customary community engagement. These approaches ensure that the project respects local values and is aligned with the needs of communities. The SAP also prioritizes the economic values within the ISLME to foster informed decisions regarding resource management. Over the last 30 years, the ISLME region has witnessed significant losses in vital ecosystems. Indonesia has suffered a devastating 28 percent loss of its mangroves, which have been severely fragmented and reduced. The economic toll of mangrove loss is substantial and is estimated at USD 4 to USD 10 per ton of CO_2 in potential emissions and USD 41 in social cost per ton of additional CO_2 in the atmosphere. Seagrass areas, valued at USD 659 million, have declined annually by approximately 2 percent to 5 percent.

Coral reefs in the ISLME region have also deteriorated over the past 50 years, with a 10 percent to 50 percent increase in degraded reefs. Additionally, over 80 percent of Indonesia's reefs are expected to experience bleaching events five years out of ten by the 2030s, with specific areas such as FMA 713, FMA 714, and FMA 573 being highly vulnerable to climate-related stressors. These areas are in Eastern Indonesia, and similar vulnerability can be expected to exist in Timor-Leste. These findings highlight the urgent need for the conservation and sustainable management of these precious marine ecosystems. In addition, the ISLME SAP focuses on applying best practices in resource management. Concepts such as EAA and EAFM already have been effectively implemented in some locations, with a keen focus on specific areas and commercial commodities in the ISLME region. Overall, the SAP represents a significant step forward in the sustainable management of the ISLME, with a broad perspective that spans governance, socioeconomic dimensions, resource management practices, and collaboration among stakeholders to foster sustainable development in the region. The SAP implementation cost is estimated to be approximately USD 49 million in total over a five-year period. Approximately USD 44 million is allocated for the action plans of Indonesia, whereas Timor-Leste's action plans are estimated to cost about USD 5 million. There will be a total of 185 programmes implemented over five years and carried out in both countries.

Monitoring and evaluation

Critical to the success of SAP implementation are the robust monitoring and evaluation mechanisms it has put in place. They include annual reporting, mid-term evaluations, and a concluding evaluation, ensuring that the SAP remains on track. In terms of sustainability and risk management, the programme acknowledges potential challenges. These include financial support, political stability, and donor priorities. By identifying these risks, the SAP takes proactive steps to mitigate them and ensure the sustainability of this critical programme that promises to shape the future of marine resource management in the ISLME.

In summary, the SAP serves as a comprehensive and well-integrated management plan that is specifically developed to address environmental, socioeconomic, and governance issues within the ISLME. The SAP covers four vital areas: sustainable fisheries, human well-being, ecosystem well-being, and good governance. It outlines the challenges and proposed actions in each sector. The programme focuses on the recovery and sustainable management of fisheries, strengthening aquaculture, gender mainstreaming, community involvement, habitat rehabilitation, reducing pollution, and good governance through effective collaboration between Indonesia

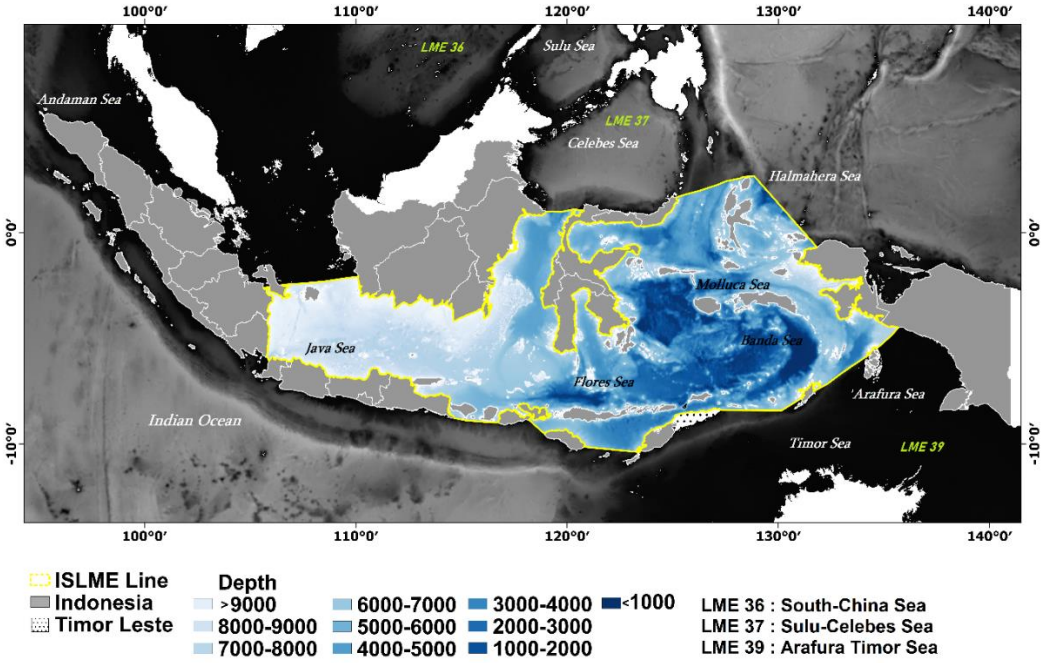
and Timor-Leste. This SAP strongly supports the United Nations' Sustainable Development Goals (SDGs), with a special focus on SDG 14, but it also works toward achieving SDG 3, SDG 5, SDG 10, SDG 13, and SDG 17. Additionally, the SAP actively promotes the development of the blue economy for both countries and encourages the use of an ecosystem-based approach to fisheries and aquaculture.

1 Introduction

1.1 Origin of the Indonesian Seas Large Marine Ecosystem project and rationale

Large marine ecosystems (LMEs) are relatively large areas of the coastal oceans and characterized by the following features: (1) bathymetry; (2) hydrography; (3) productivity; and (4) trophically-dependent populations. Effective ocean governance in LMEs requires coordination at various levels (Fanning *et al*., 2007; GEF IW:LEARN, 2020). This encompasses community-based management at the local scale and recognizes the vital role of local communities in shaping sustainable environmental policies (Degger *et al.,* 2021). Currently, there are 66 LMEs recognized worldwide, and one of them is the Indonesian Seas Large Marine Ecosystem (ISLME). The ISLME occupies a strategic position at the convergence of the Pacific and Indian Oceans, flanked by the territories of Indonesia and Timor-Leste. Covering a vast area of 232 million hectares, the majority of the ISLME lies within Indonesia's maritime boundaries, constituting approximately 98 percent of its total area (Figure 1). The remaining 2 percent falls under the jurisdiction of Timor-Leste demonstrating an intricate interplay of international maritime jurisdictions (PEMSEA, 2019a).

Figure 1. Geographic locations of the Indonesian Seas Large Marine Ecosystem region overlayed with bathymetry and other surrounding large marine ecosystems



Source: Adapted from PEMSEA. 2019a. National state of oceans and coasts 2018: blue economy growth of Indonesia. Quezon City, Philippines. http://pemsea.org/sites/default/files/NSOC%20Indonesia%202018%20(FINAL)%2001082021.pdf

The ISLME waters encompass the Java Sea, Bali Sea, Flores Sea, Sawu Sea, Timor Sea, Banda Sea, Seram Sea, Maluku Sea, Halmahera Sea and Arafura Sea, and the Makassar Strait, including the northern coastal waters of Timor-Leste. There are five fisheries management areas (FMAs) spread across 21 provinces within the Indonesian waters of the ISLME—FMA 712, FMA 713, FMA 714, FMA 715, and a small part of FMA 573. It also encompasses important coastlines in Timor-Leste, such as in the municipalities of Bobonaro (35 388 km), Liquica (63 806 km), and Dili (115 123 km) (MAP, 2018). The small islands of Rote, Leti, Tanimbar, Moa, and Kei located off the north coast of Timor-Leste and the west of the Pacific Ocean are also part of the ISLME. The ISLME is in the centre of the Coral Triangle. Thus, the region plays an important role in the complex of global marine systems. Its strategic location contributes to the unique ecological world that characterizes the region, fostering a rich diversity of marine life and habitats. The ISLME encompasses a range of captivating marine environments, including vibrant coral reefs, mangrove forests, and seagrass beds, as well as a rich biodiversity of marine fauna.

The ISLME has been a centre of intricate cultural, historical, and socioeconomic dynamics across generations. Approximately 60 percent of the ISLME's population (over 120 million inhabitants) live in coastal areas distributed across 12 000 seaside villages (Widayatun, 2016; BPS, 2022). These communities rely heavily on the region's abundant marine resources, which serve not only as sources of livelihood but also integral components of daily life, with an average income of USD 90 to USD 400/month and a consumption value average of USD 90 to USD 300/month (Bagja, Suzy and Nia, 2016; Lubis, 2014, Chandriyanti and Fahrati, 2020; BPS, 2022). Producing approximately 12 million tonnes of marine fish resources per year (BAPPENAS, 2023), the ISLME holds significant economic promise. The potential of the ISLME strengthens the rationale for both countries to optimize the blue economy, as part of a transformational agenda (BAPPENAS, 2023).

The ISLME provides major contributions to the economy and food security of its inhabitants. However, the ISLME is also impacted by anthropogenic influences such as the overexploitation of fisheries, degradation of coastal habitats, pollution, declining biodiversity, and climate change (Kaczan *et al.*, 2023). Issues related to illegal, unreported, and unregulated (IUU) fishing are one of the priority concerns in the ISLME. IUU fishing practices are prevalent in the ISLME as the region is vulnerable to various uncontrolled fishing activity because of its permeability to fishing vessels under foreign beneficial ownership and also illegal fishing by domestic fleets (Mubarok, 2019). Several criminal practices associated with IUU fishing include document forgery, double flagging and double registration of vessels, unauthorized

fishing, unapproved vessel modifications, the utilization of foreign captains and crew members, false registration, tampering with vessel transmitters, illegal mid-sea transhipment of catches, falsification of fishing catch reports, fishing outside designated zones, employing prohibited fishing equipment, and failing to collaborate with Fish Processing Units (FPU) (Ambarsari *et al*., 2023; BPS, 2022).

Another issue in the ISLME is marine pollution including marine debris. In the ISLME, marine pollution is derived from various sources, including municipal, agricultural, industrial, and maritime activities. Municipal sources contribute to pollution through residential and commercial solid waste, untreated wastewater, and runoff from urban areas and landscapes. Land-based agriculture pollutes oceans with plastic, pesticides, nutrient runoff, and waste from animal agriculture. Ocean-based aquaculture produces pollutants such as antibiotics, antifoulants containing heavy metals, and fish waste. The industrial sector releases plastic waste, chemicals, heavy metals, pharmaceuticals, and oil- and gas-related pollution. Maritime pollution arises from shipping, cruises, fishing industries, as well as recreational boating, introducing litter, food waste, sewage, and accidental debris.

Addressing these diverse pollution sources is essential to protect the health of the ISLME and its ecosystems. Mitigating these stresses on ocean systems is necessary to ensure the long-term sustainability of the ISLME and the services they yield. In addition, the boundary areas between the two countries face several sustainability threats, such as transboundary fishing and marine conservation issues. For example, uncontrolled transboundary pelagic fishing activities on the northern coast of Timor-Leste not only pose a threat to the biological health of fish stocks, but also to social and political relationships between the two countries as well as economic and national security (Da Fonseca, Cabral and Soares, 2023). The transboundary management of small pelagic fish particularly on the Ombai Strait, Wetar Island, and Liran near Atauro Island requires collective action and coordination. These bodies of water are migratory routes and habitats for small pelagic fish and tuna species. In addition, cultural practices at the local level between Timor-Leste and Indonesia on the border need to be well-considered when facilitating future fishery management plans (Gigentika, 2017).

It is against this background that the ISLME project supported by the Global Environment Facility (GEF) and implemented by the FAO of the United Nations in close partnership with Indonesia and Timor-Leste, is designed to strengthen regional cooperation and support the effective and sustainable management of the ISLME. The project plays a catalytic role in addressing transboundary concerns by assisting Indonesia and Timor-Leste to restore and sustain coastal and marine fish stocks and

associated biodiversity through the collaborative development of the strategic action programme (SAP), to be followed by its implementation. The implementation of this current phase of the project (the SAP development phase) is undertaken through three interlinked components supported by cross-cutting activities on project management:

- Component 1: Identifying and addressing threats to the marine environment including unsustainable fisheries, which involves the development of the SAP, is underpinned by a detailed transboundary diagnostic analysis (TDA) that collates existing information and identifies both transboundary and shared threats to the marine ecosystems within the ISLME.
- Component 2: Strengthening capacity for regional and subregional cooperation in marine resources management which focuses on the ecosystem-based approach.
- Component 3: Coordination with regional information networks, monitoring of project impacts, and dissemination and exchange of information. The strategic action programme (SAP) functions as the core document that outlines the collective development priorities of Indonesia and Timor-Leste for the ISLME. An important benefit of SAP is its ability to guide all involved parties regarding the developmental focus required to effectively oversee the ISLME for the betterment of both human societies and the ecosystem and its resources. The objective is to tackle issues that have already been identified and analyzed in the (TDA) and to synchronize the efforts of all stakeholders, aligning them with a unified vision in terms of development policy trajectory. Effective ocean governance in LMEs requires coordination at various levels (Fanning *et al*., 2007; GEF IW:LEARN, 2020). This encompasses community-based management at the local scale and recognizes the vital role of local communities in shaping sustainable environmental policies (Degger *et al.,* 2021).

1.2 Indonesian Seas Large Marine Ecosystem

The significance of the Indonesian Seas Large Marine Ecosystem (ISLME) extends beyond its ecological and cultural dimensions. It plays an integral role on a global level, influencing meteorological patterns, oceanic currents, and marine biodiversity on a grand scale. The confluence of the Pacific and Indian Oceans in this region contributes to the intricate interplay of currents that circulate heat and nutrients around the globe, regulating climatic systems, and supporting the delicate equilibrium of marine life. The importance of the ISLME lies in the following functions:

- The dynamic nature of pelagic environments is characterized by currents, eddies, monsoon, the Indonesian Throughflow (an ocean current that is important for global climate) and upwelling which in turn affects the availability of food and larval resources for marine organisms.
- This diverse underwater topography, combined with the position of Indonesia and Timor-Leste at the crossroads of the Pacific and Indian Oceans, makes the region one of the primary drivers for the entire global ocean circulation system.
- The Indonesian Throughflow as a "heat engine" plays a significant role as a current system linking the Pacific and Indian Oceans, with regard to temperature, salinity, and nutrient distributions within the ISLME (see Box 1 and Figure 2).
- It is part of the recognized Coral Triangle (see Box 2 and Figure 3), the most biodiverse marine region on Earth. The Coral Triangle in the ISLME represents approximately 10.8 percent of the world's coral reefs. A significant part of the world's most extensive and diverse coral reef ecosystems, it is renowned for its high coral reef biodiversity, with over 500 species of reef-building corals, making it the epicentre of global marine life diversity. The region is also home to over 26 000 km^2 of mangroves and 8 500 km^2 of seagrasses (Antony and Mumby, 2021).
- It is both a home and a worldwide migratory area for important marine megafauna, among them endangered, threatened, and protected (ETP) species. It is identified as the habitat for 118 shark species and 63 seabird species, including 56 protected seabird species. It also serves as a migratory zone for various marine species, encompassing six out of the seven sea turtle species, 34 species of cetaceans (whales and dolphins), and the dugong.
- Beneficial ecosystem resources in the ISLME region have been estimated to be worth USD 16 billion in terms of economic potential (PEMSEA, 2018). Thus, the oceans are a cornerstone of prosperity for Indonesia and potentially for Timor-Leste and represent a vital resource for the two states. The region is home to approximately 75 million living in coastal areas (Antony and Mumby, 2021; FAO, 2020). The region provides a vital contribution both on a regional and global level. As an example, between 1950 and 2010 in central and eastern Indonesia alone, capture fisheries yielded approximately 117 million tonnes of produce (Budimartono *et al*., 2015). Tourism in the region also provides significant economic value, amounting to 10 percent of Indonesia's national GDP (PEMSEA, 2019a). The region also provides livelihoods to millions of people. For instance, in the island of Ataúro in Timor-Leste, 41 percent of

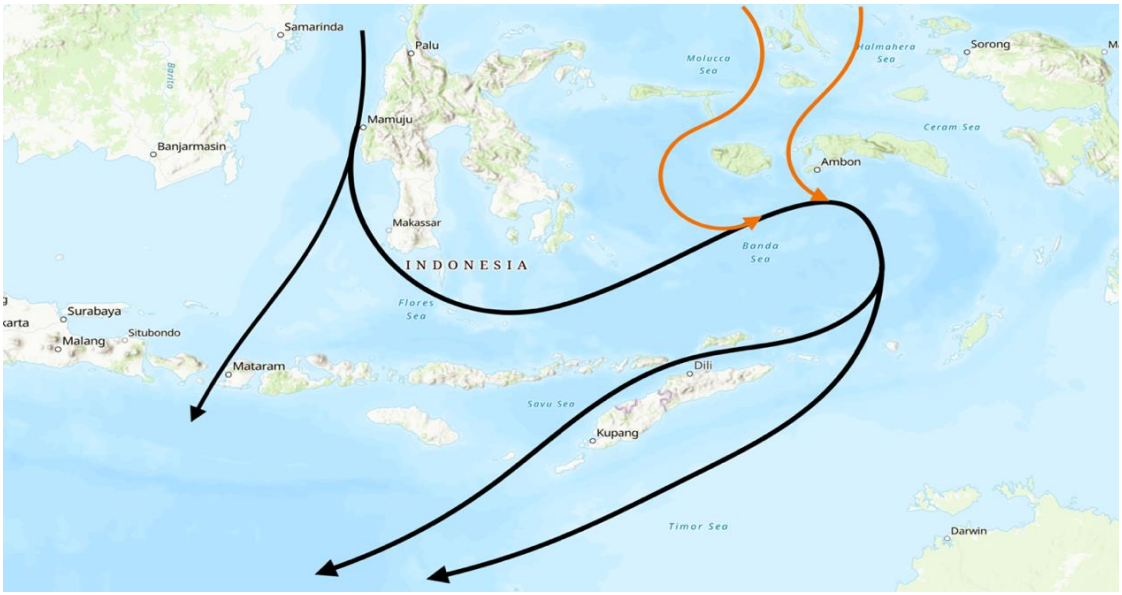
households fish, with half of them having fishing as their primary livelihood (Mills *et al*., 2017).

BOX 1: The Indonesian Throughflow (ITF)

The ITF is a vital ocean current that influences the regional and global climate by facilitating the exchange of water between the Pacific and Indian Oceans region, the intricate network of straits and passages located within the ISLME. This significant flow is driven by the difference in sea levels between the Pacific and Indian Oceans, caused by prevailing atmospheric pressure and wind patterns in the region. The ITF plays a pivotal role in regulating oceanic circulation, as warm and fresh waters from the Pacific Ocean flow into the Indian Ocean, affecting weather patterns and marine biodiversity. Its impact extends beyond the region, influencing climate systems worldwide, making it a subject of continuous scientific study and monitoring to understand its complex dynamics and potential implications for global climate change.

Indonesia and Timor-Leste, as key components of the ITF pathway, have a crucial role in shaping this ocean current's behaviour and its broader consequences. The Makassar Strait, located between the Indonesian islands of Sulawesi and Kalimantan, serves as the primary conduit for the flow of water connecting the Celebes Sea to the Java Sea. Additionally, the Timor Passage, situated between Timor-Leste and Australia, is another critical pathway that links the Savu Sea to the Indian Ocean. The movement of water through these straits is influenced by the prevailing winds and atmospheric pressure, creating a delicate balance that drives the Indonesian Throughflow. The impact of this flow extends beyond regional climate and biodiversity, affecting global ocean circulation patterns and contributing to the Earth's overall climate dynamics. Understanding and monitoring the ITF's behaviour in the context of Indonesia and Timor-Leste is crucial to comprehending its broader implications on climate and oceanic systems worldwide.

Figure 2. Indonesian Throughflow in the Indonesian Seas Large Marine Ecosystem



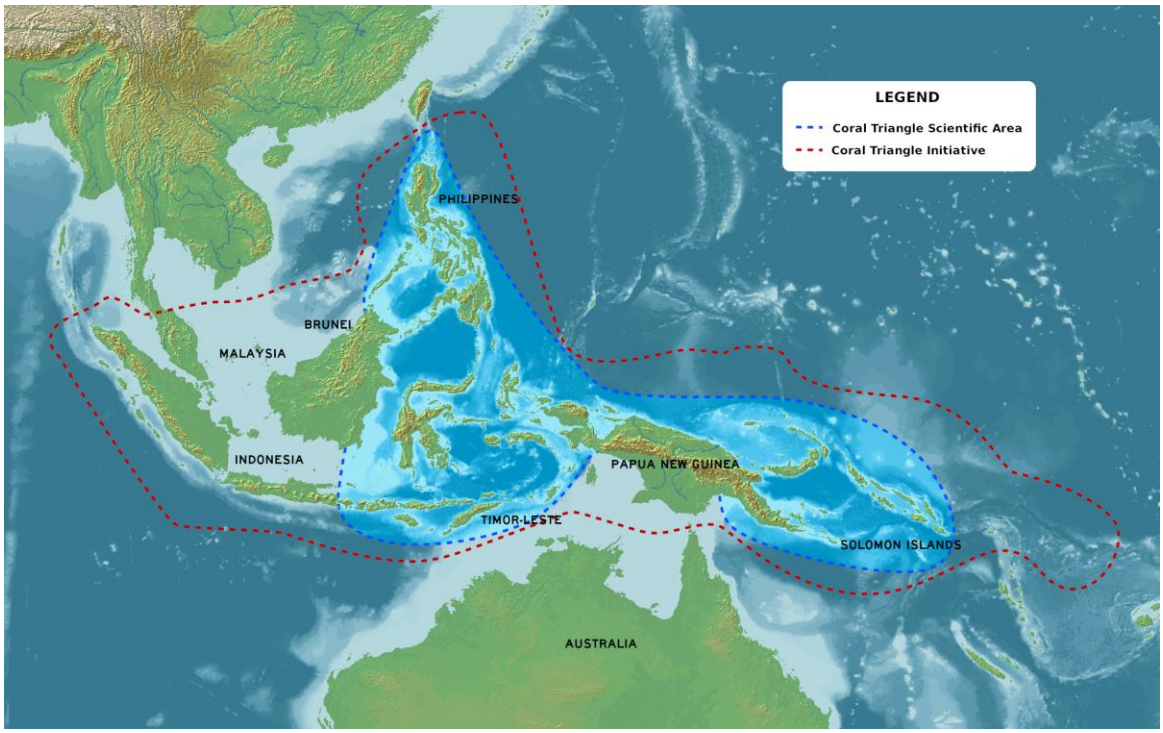
Note: the black line represents the water mass from Makassar Strait and the orange line represents the water mass from the Halmahera and Maluku Seas.

Source: Adapted from Fieux, M., Andrie, C., Charriaud, E., Ilahude, A.G., Metzl, N., Molcard, R., & Swallow, J.C. 1996. Hydrological and chlorofluoromethane measurements of the Indonesian throughflow entering the Indian Ocean. *Journal of Geophysics Research*, 101(5): 12433–12454; Gordon, A.L. 2005. Oceanography of the Indonesian Seas and their throughflow. *Oceanography*, 18(4): 14–27.

BOX 2: Coral Triangle

The region surrounding these oceans includes some or all of the land and seas of six countries, Indonesia, Malaysia, Papua New Guinea, the Philippines, the Solomon Islands, and Timor-Leste. The Coral Triangle (CT) is an area of 5.5x106 km^2 of ocean territory of the aforementioned countries (Figure 3) – less than 1.6 percent of the world's total ocean area. Although the CT boundary was determined based on coral diversity, this delineation does not provide new biogeographic insights. Indonesia has the largest coral reef area in Southeast Asia. Estimates of the extent of these coral reefs vary, but they likely total about 51 000 km^2. Indonesia's coral reefs are among the most biologically rich in the world. More than 590 species of corals have been identified in Indonesian waters. The archipelago is estimated to harbour over 75 percent of the world's coral species. At least 553 species of Scleractinian corals are found in Raja Ampat, which has one of the world's richest coral reef fish fauna, consisting of at least 1 320 species, the highest count in the world for an area of that size. At the end of 2008, about 5 percent of the reefs were in excellent condition, 25 percent in good condition, 37 percent in moderate condition, and 32 percent in bad condition.

Figure 3. The Coral Triangle



Note: This covers an area between the Indian and Pacific oceans that represents the global epicentre of abundant marine life and diversity.

Source: Weeks, R., Aliño, P. M., Atkinson, S., Beldia, P., Binson, A., Campos, W. L., Djohani, R., Green, A. L. *et al*. 2014. Developing marine protected area networks in the Coral Triangle: good practices for expanding the Coral Triangle marine protected area system. *Coastal Management* 42(2): 183–205. doi:10.1080/08920753.2014.877768. S2CID 154967174.

The ISLME is a region of great global ecological significance. Its waters play a crucial role in fisheries production, biodiversity preservation, and climate regulation. The ISLME's ecosystems range from the shallows of the Java Sea to deeper waters in the Banda Sea, Savu Sea, Celebes Sea, Bali Sea, and the Sulawesi Sea. Its large area and wide ecological variance grant the ISLME various unique characteristics that allow both marine life and the 185 million people whose livelihoods depend on it to thrive (Figure 4).

Figure 4. Summary of the unique characteristics of the Indonesian Seas Large Marine Ecosystems

Sources: **Antony, G. & Mumby, P.J.** 2021. *Value of ecosystem services provided by the Indonesian Seas Large Marine Ecosystem.* Enabling transboundary cooperation for sustainable management of the Indonesian Seas Large Marine Ecosystem (ISLME) project (GCP/RAS/289/GFF).

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Siaila S. & Rumerung D. 2022. Analysis of the profitability of small pelagic capture fisheries in Ambon City, Indonesia. *AACL Bioflux* 15(2): 608–620.

Simanjorang, J.E., Pranowo, W.S., Sari, L.P., Purba, N.P. & Syamsuddin, M.L. 2018. Building up the database of the Level-2 Java Sea Ecoregion based on physical oceanographic parameters. *IOP Conf. Ser: Earth and Environmental Science* 176.

The ISLME, positioned within the Indonesian Archipelagic Sea Lanes (ALKI), serves as a crucial international shipping route. Its distinct hydrodynamics, shaped by various natural forces such as ocean currents, swirling eddies, and upwelling, have transformed it into a biodiversity hotspot. The region is home to various marine species, including sharks, sea turtles, whales, and dolphins and is a migratory area for them. Covering 2.3 million km^2 and spanning Indonesia and Timor-Leste, it lies at the heart of the Coral Triangle, featuring over 26 000 km^2 of mangroves and hosting 500 coral species, equivalent to 10.8 percent of global coral reefs (GEF IW:LEARN, 2019). With over 2 500 marine fish species, including indigenous and migratory species, and a flourishing ecosystem providing valuable resources and services, such as fisheries, aquaculture, and marine tourism, the ISLME holds an estimated gross value of production (GVP) of USD 20.8 billion (Antony and Mumby, 2021). It encompasses five FMAs in Indonesia and the northern waters of Timor-Leste, along with 118 marine protected areas (MPAs), with plans for further expansion of additional conservation zones (Marine Conservation Institute, 2023). The management of the ISLME involves various stakeholders, including ministries, NGOs, industries, academic institutions, and local communities that heavily rely on its resources.

Benefit to government, society, and ecosystem

The ecosystem services of the ISLME offer a range of potential benefits to the government, society, and the ecosystem itself. These benefits encompass ecological, economic, cultural, and scientific dimensions, highlighting the interconnectedness of these three aspects.

1. Government

- **Resource management** The ISLME's diverse marine resources offer opportunities for sustainable resource management. Governments can implement policies and regulations to ensure the responsible use of fisheries, marine habitat management, minerals, and other natural resources, which can in turn support long-term economic growth by capturing benefits from these ecosystem services. The annual value of Indonesia's marine resources exceeds USD 256 billion, constituting more than a quarter of the nation's economy (World Bank, 2023). Moreover, the estimated value of Timor-Leste's coastal and marine ecosystems (namely mangroves, seagrass, coral reefs, and tidal swamps) amounts to USD 5.25 billion, coastal fisheries and aquaculture is about USD 7 million, coastal and marine tourism is about USD 19.6 million, and ports and shipping is about USD 66.7 million, and offshore oil and gas is about USD 1.5 billion in 2015. In addition, ocean-related economic activities

amounted to 87 percent of Timor-Leste's gross domestic product (GDP) in 2015 with a gross value added (GVA) of USD 1.96 billion (PEMSEA, 2019b).

- **International cooperation** The shared maritime borders of the ISLME encourage cross-border collaboration between governments. Joint management and conservation efforts can strengthen diplomatic ties and enhance regional stability, allowing for the collective capture of benefits from ecosystem services. Given the global benefits from biodiversity conservation within the ISLME, there are also opportunities to enhance collaboration with other international and multilateral development partners.

2. Society

- **Livelihoods** Approximately 60 percent (over 120 million people) of the ISLME's population live in coastal areas distributed across 12 000 seaside towns and villages (Widayatun, 2016; BPS, 2022). Sustainable practices can ensure these communities have a stable source of income and maintain their way of life.
- **Food security** The abundant marine life within the ISLME supports local and regional food security, providing a vital source of protein for communities in the area. Indonesia boasts immense marine biodiversity and ranks as the world's second-largest fish producer, at an estimated 14.4 million tonnes per year, and stands among the top ten fish-dependent nations with an annual per capita fish consumption of 46.49 kg (FishStat, 2016; MMAF, 2018).
- **Cultural heritage** The ISLME holds cultural significance for local communities. These cultures are often intertwined with the ocean, and maintaining the health of the ecosystem is essential for preserving their cultural heritage. Coastal communities around the world have developed unique traditions, knowledge, and practices that are intricately linked to the sea. The distinct ways in which different cultures interact with and rely on marine ecosystems showcase the incredible diversity of human societies and their deep connections to the ocean. Customary communities, for instance, have intricate relationships with marine ecosystems. For many cultures, the ocean holds deep spiritual and religious significance. The vastness and timeless nature of marine ecosystems inspires a sense of awe and reverence, leading to rituals, ceremonies, and practices that honour and respect the natural world. These values may be particularly important among customary communities in rural areas, as they see their culture, heritage, and traditional knowledge as closely intertwined with the surrounding environment (Fletcher *et al*., 2014; Henderson, 2019).

3. Ecosystem

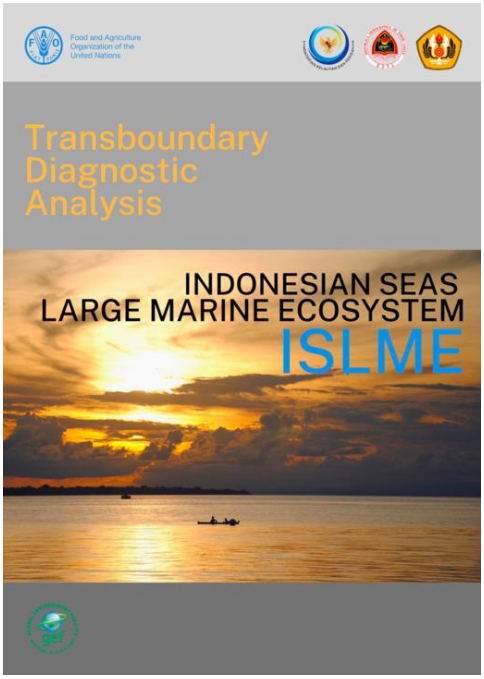
- **Biodiversity** The ISLME is a home to marine species and habitats including 557 species of Echinodermata, 309 species of crustaceans, 569 species of corals (Hadi *et al*., 2018), 3 476 species of marine fish, 15 species of seagrass, 981 species of algae, and 48 species of mangrove. Preserving its biodiversity ensures the continued existence of unique and valuable species, contributing to global biodiversity conservation efforts. Marine biodiversity can prevent the extinction of one species from causing wider negative impacts on a marine ecosystem (Asch, Cheung and Reygondeau, 2018). Efforts that can be taken include supporting coastal ecosystem conservation and restoration measures, as well as evaluation and establishment of potential new MPAs.
- **Ecosystem services** Marine ecosystems provide various additional services, such as carbon sequestration, nutrient cycling, and coastal protection. These services have broad implications for global climate regulation and maintain the health of adjacent coastal areas.
- **Scientific research** The ISLME serves as a living laboratory for scientific research. Studying its ecology, marine species, and oceanic processes can yield insights into broader marine and climatic systems. Marine ecosystems unite diverse knowledge systems, merging traditional ecological wisdom with scientific research, enhancing our understanding and fostering innovative conservation and sustainable management solutions (Barbier, 2016).

1.3 Brief methodology

The SAP provides a framework or plan that outlines the strategies and actions required to address specific challenges or achieve certain goals. It aims to establish and execute a regional strategy for safeguarding the environment and promoting sustainable development of coastal and marine resources. The SAP process is highly participatory and collaborative, encourages stepwise consensus building, and fully engages all key stakeholder groups. To ensure that the SAP adheres to these principles, "strategic thinking" as a collaborative process serves as the starting point. In general, based on the GEF TDA-SAP methodology, the ISLME SAP establishes clear priorities for action to resolve the priority problems and shared concerns identified in the ISLME TDA (GEF IW:LEARN, 2020).

The SAP is a negotiated policy document that is validated at the highest level of all relevant sectors. The preparation of the ISLME SAP is a highly cooperative and collaborative process among the countries of the region (Indonesia and Timor-Leste)

throughout the regional workshops and national meetings in 2023. The SAP process is designed to produce a negotiated policy document, and it establishes clear priorities such as policy reforms and investments to resolve transboundary challenges.

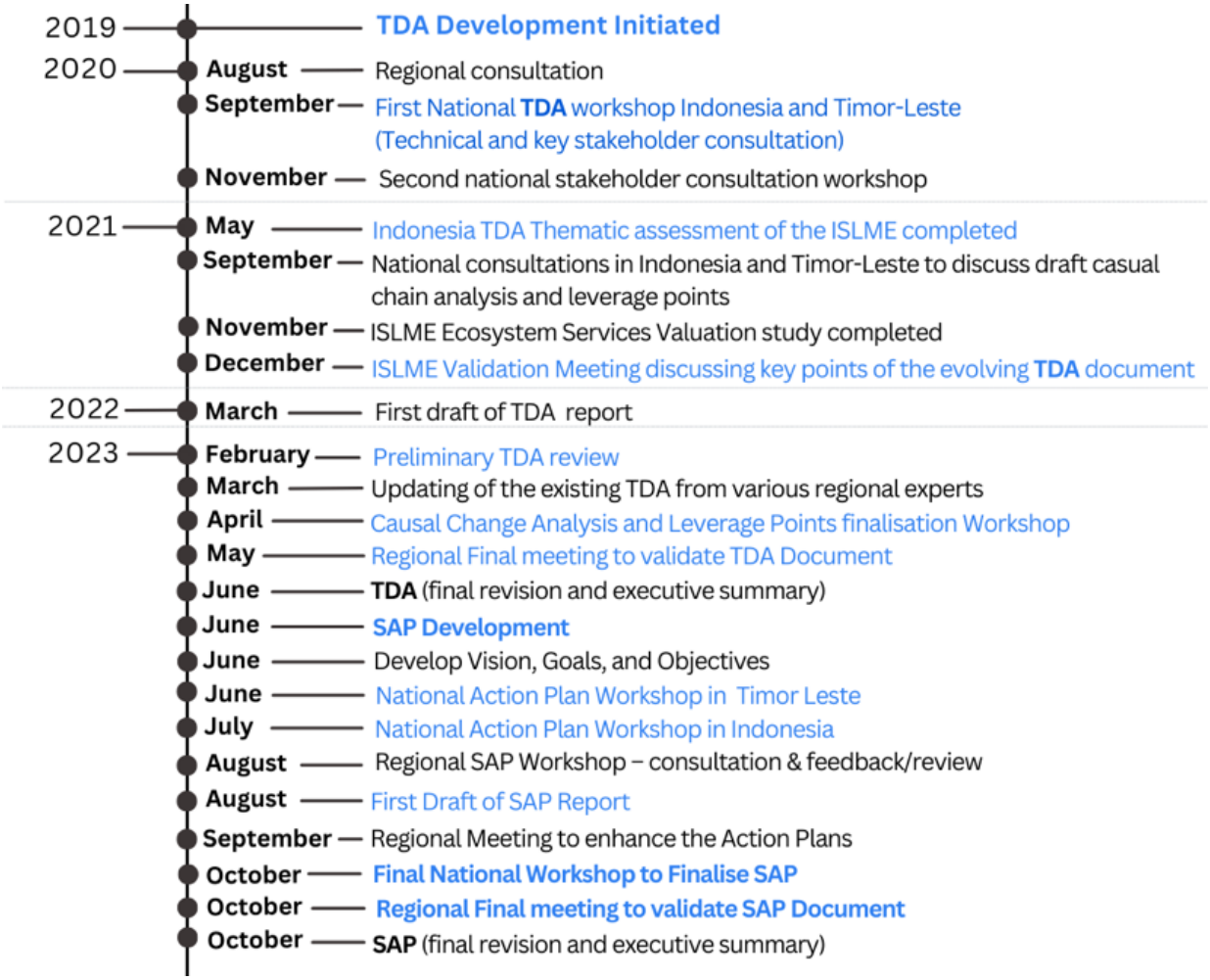


1. **Preparatory phase (Planning)** This activity involves the development of a comprehensive work plan for the SAP process. When planning and creating a SAP, literature studies are also conducted to examine existing knowledge, research, and experiences related to the specific domain or issue at hand, with the TDA as the main resource document (as shown in the accompanying photograph).
2. **Phase 1 (Strategic thinking)** To ensure effective collaboration and comprehensive documentation for the SAP process, it is crucial to consult with relevant stakeholders and prepare the SAP, along with a consultation report. This collaborative approach involves conducting workshops, meetings, and focus group discussions (FGDs) to gather valuable input, exchange ideas, and foster engagement among stakeholders. These activities play a pivotal role in facilitating meaningful collaboration and generating well-informed outcomes for the SAP process. Main outputs of this phase are the defined vision, goals, and objectives of the SAP.
3. **Phase 2 (Strategic planning):** The process includes consultation and discussion activities over several weeks. The outputs include the endorsement of a vision, goals, and objectives the review of options and opportunities, the setting of strategies for implementation, and most importantly, the identification of an agreement on actions suitable to achieve the objectives and goals.
4. **Phase 3 (Drafting and finalization)** A crucial step is the organization of a national workshop, where relevant stakeholders come together to discuss and contribute to the document's refinement. Subsequently, a regional workshop takes place, providing an opportunity for broader engagement, wider participation, and the gathering of additional insights. Throughout this process, the SAP development team works diligently to draft the document, ensuring its comprehensive coverage and alignment with the established goals and strategies, as well as adherence to good practices in SAP development.

The SAP represents a logical continuation of the planning process following the development of the TDA document. The SAP is strategically tailored to focus on the formulation of actionable plans aimed at addressing the interrelated challenges faced by coastal ecosystems and communities, in order to foster both human well-being and ecosystem well-being. The inception of the ISLME TDA-SAP development plan was in 2019 and has been marked by a sequence of milestones. These include the inaugural regional consultation, which was succeeded by the introduction and subsequent progress reports on the TDA ISLME initiative (Figure 5).

The first national TDA workshops were convened in both Indonesia and Timor-Leste, serving as focal points for technical discussions and engagement with key stakeholders. The collaborative process between the two countries was underpinned by a series of regional and national workshops. These workshops served to gather critical input for the iterative development and refinement of the TDA document. A concerted effort was undertaken by expert groups from Indonesia and Timor-Leste to draft, update, and validate the document, encompassing multidimensional insights and perspectives. From 2020 to 2022, the project encountered unprecedented challenges as a result of the global COVID-19 pandemic. Despite these challenges, TDA development adapted by moving toward online meetings, enabling the steadfast review of the TDA document development.

Figure 5. Main activities during transboundary diagnostic analysis-strategic action programme development

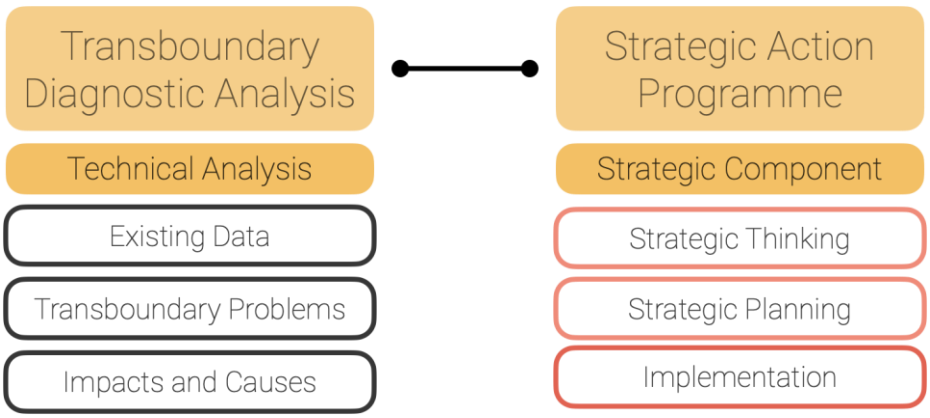


The year 2023 marked the finalization of the TDA document, setting the stage for the commencement of the ISLME SAP development phase. The TDA document consists of six comprehensive chapters, encompassing an introductory overview, an exposition of ecosystem status, socioeconomic evaluations of coastal communities, stakeholder analyses specific to the ISLME region, and a corpus of recommendations. Integral to the TDA document is the causal chain analysis (CCA) (see Annex 1), an analytical foundation for addressing the five identified priority environmental concerns (PEC) in the ISLME region. The period spanning May to September 2023 witnessed the formulation of the SAP document, marked by a succession of national and regional meetings. These gatherings were dedicated to the drafting, rigorous review, validation, and ultimate endorsement of the SAP document. The SAP is anticipated to foster dynamic coordinated action, underscoring the commitment of both countries to navigating the challenges of coastal ecosystems and human well-being in a unified and impactful manner.

1.4 Connectivity between the transboundary diagnostic analysis and the strategic action programme

The primary objective of developing a TDA is to compile and analyse information on ecosystem status and threats and then from the initial drawing up of transboundary problems to identify, quantify, and prioritize environmental challenges. The TDA for the ISLME establishes a factual groundwork for shaping the SAP. Constructing both the TDA and SAP hinges on involving and consulting a diverse range of stakeholders thus turning them into a vital part of the TDA and SAP process (Figure 6). The TDA does not only involve data analysis, but it is also a potent process that fosters confidence among all participants.

Figure 6. Transboundary diagnostic analysis and the strategic action programme process



Source: Reproduced from GEF IW:LEARN. 2018. *GEF Transboundary Diagnostic Analysis / Strategic Action Programme Manual: TDA-SAP Methodology*. [Cited 15 September 2023]. https://iwlearn.net/resolveuid/2cc6db95-cc24-46e6-8f18-8c894c156a27

The SAP is a comprehensive document outlining actionable steps that stakeholders collectively negotiate to achieve a consensus for implementation agreements that are then authorized across governmental sectors. Drawing from the data-driven actions proposed by the TDA, the SAP builds a robust foundation for addressing priority actions aimed at resolving transboundary environmental issues. A pivotal element of the SAP lies in creating a distinct benchmark, which helps differentiate actions with national benefits from those tackling transboundary concerns for global gains. Additionally, a key aspect entails establishing institutional frameworks at regional and national levels to effectively implement the SAP, alongside mechanisms for monitoring and evaluating the effectiveness of the process outcomes.

The SAP is a crucial part of adaptive management for addressing transboundary issues in shared and international waters. It follows a four-step process, including problem assessment and analysis (TDA), strategic planning (SAP), action implementation, and outcome monitoring (TDA and SAP revision) (GEF IW:LEARN, 2020).

1. The ISLME SAP prioritizes and addresses the identified problems and shared concerns in the ISLME through various means, such as policy reforms, legal measures, institutional changes, and investments. The SAP aims to establish clear action priorities to effectively resolve the issues identified in the ISLME TDA.
2. The SAP approach involves collaboration and combines strategic thinking, planning, and implementation to approach priority transboundary problems and their root causes, including governance issues. The TDA focuses on identifying these problems and proposes leverage points, where relatively modest interventions could lead to significant positive changes. The SAP, a negotiated policy document, establishes clear action priorities such as policy reforms and investments to resolve transboundary challenges.
3. The TDA and SAP process is iterative, meaning that outcomes and progress are continuously monitored and evaluated, leading to potential revisions and updates to the TDA and SAP to ensure adaptive management and improvement over time.

Structurally, the SAP document begins with an introduction (Chapter 1) that provides an overview of the factual foundation of the ISLME. This includes an exploration of the ISLME's unique components, the interrelation between SAP and the previously crafted TDA, and a comprehensive account of the steps taken during the SAP development process. Subsequently, Chapter 2 titled “Challenges and priority problems of ISLME” outlines the transboundary priority issues identified during the TDA's developmental phase. The SAP encompasses vital aspects, including its vision, goals, objectives and priority actions, and guiding principles selected to tackle the identified problems are provided in Chapter 3. Chapter 4 titled “SAP implementation considerations and arrangements” addresses the methodology employed to assess the effectiveness and accomplishments of SAP implementation, which involves monitoring, review arrangements, and comprehensive reporting. It also discusses the economic values of the ISLME ecosystem services and benefits and provides the economic argument and justification for investing in SAP implementation. Additionally, the rationale and prospects for regional collaboration, institutional setups, strategies for public involvement, as well as potential risks, its mitigations, and the sustainability of SAP implementation, are thoroughly addressed.

2 The challenges and priority problems of the Indonesian Seas Large Marine Ecosystem

The ISLME region is a complex oceanographic area composed of various seascapes and is distinguished by a unique current system, high levels of biodiversity, and fisheries production. Because of its critical role in tropical regions, the ISLME plays a vital role in supporting economic and ecological systems. Currently, the ISLME is facing five major challenges, namely: (i) declining productivity and sustainability of the ISLME fishery and aquaculture; (ii) degradation and loss of marine habitats; (iii) marine and land-based pollution; (iv) decline of biodiversity and key species; and (v) the impacts of climate change.

2.1 Declining productivity and sustainability of the Indonesian Seas Large Marine Ecosystem fisheries and aquaculture

The delicate ecological balance between coastal and marine ecosystems and continual human exploitation faces escalating threats as a result of the declining productivity and sustainability of fisheries and aquaculture. Small-scale fisheries sustain livelihoods and food security, yet they face poverty and vulnerability issues because of ecosystem decline and climate change. Many Indonesian boats fish in overexploited areas, further depleting fish stocks. Bycatch disrupts ecosystems and communities, altering the marine food web structure and impacting fishers' livelihoods. Growing food demand (domestic and export) drives aquaculture practices, often neglecting ecosystem, environment, and multiresource user requirements. Carnivorous fish farming escalates the demand for fish-based aquaculture feeds. Existing fisheries regulations are often complex, not fully complied with, and also difficult to enforce (Table 1).

Table 1. Declining productivity and sustainability of the Indonesian Seas Large Marine Ecosystem fisheries and aquaculture problem identification

1	Declining Productivity and Sustainability of ISLME Fishery and Aquaculture
CHALLENGES	1. Illegal, unreported and unregulated (IUU) fishing including destructive fishing and catching of immature fish 2. Very high level of artisanal, subsistence, and small-scale fishers 3. High feed price for fish farms and limited aquaculture practices 4. Excess fishing capacity, multi-species & multi-gear fisheries (non-selective fishing gear) 5. High level of fisheries bycatch & discards
WHATS THE PROBLEM	1. Unsustainable fishing practices, including IUU fishing and catching immature fish and destructive fishing methods 2. IUU fishing is a significant issue in ISLME region because of limited monitoring capacity, involving Indonesian boats 3. Small-scale fisheries face challenges from declining ecosystem health and climate changes, leading to high poverty rates for coastal community
IMPACT ON ECOSYSTEM SERVICES AND HUMAN	1. Environmental impacts encompass declining water quality, reduced fish populations, coral reef damage, and biodiversity loss 2. Ecosystem functions suffer, affecting livelihoods, tourism, and overall resource sustainability 3. Unsustainable practices result in poverty and community displacement, and impact marine diversity and inadequate socioeconomic stability
KEY PRIORITIES, GAPS, AND POTENTIAL INDICATORS	1. Addressing the issue requires effective legal frameworks, coordinated efforts, and community-based planning 2. Gaps include weak enforcement, insufficient incentives for improvement, and lack of consideration for ecosystem services 3. Potential indicators such as species-specific data and evidence-based metrics (e.g. improved catch per unit effort) can aid in tracking progress toward sustainable fisheries management

The declining productivity and sustainability of fisheries and aquaculture is mostly a result of illegal, unregulated, and unreported (IUU) fishing, which is dominated by overfishing, destructive fishing, and catching of immature fish. The Ministry of Marine Affairs and Fisheries (MMAF) has estimated losses from IUU fishing in Indonesian waters at USD 20 billion per year. These losses are estimated to cost several billion dollars annually in lost tax revenues as a result of IUU activity of some 5 000 unlicensed foreign vessels. Unsustainable fishing and aquaculture practices continue in the ISLME region, with most incidents occurring in FMA 712, including overfishing of snapper and grouper trawling with no restriction on net size. Numerous local fishers are unwilling to report to authorities because of fear of retaliation, reluctance to cooperate with authorities, and familiarity with the guilty party. Beside the fishing sector, unsustainable practices, especially improper cultivation activities, also occur in the aquaculture sector and cause significant environmental damage. Fast demographic changes, yet slowness in adopting technological developments, has led to an inability to keep up with the pace of export competitiveness. Lack of effective coordination and complexity in collaboration among stakeholders increase the

challenge in aquaculture. Furthermore, rising consequences of climate change give additional challenges to fishing and aquaculture operations. These challenges, closely related to environmental issues, include decreases in water quality, declining populations of fish and marine wildlife, damage to marine ecosystem, and loss of biodiversity, which then are followed by socioeconomic issues, such as difficulty in meeting basic needs, loss of potential in tourism and related job sectors, thus increased poverty, food crises, and malnutrition.

Another challenge is the transboundary threats of IUU fishing within the ISLME region. This poses a persistent challenge and there are well-documented impacts on fisheries within the ISLME region. Much of the IUU catch from the neighbouring Arafura-Timor Sea is transshipped or transported through the ISLME region, indicating the permeability of the region to fishing vessels from East Asia and Southeast Asia (ATSEA, 2011). These vessels, although nominally flagged to ISLME countries, often have beneficial ownership outside the region, engaging in substantial illegal transshipping and other IUU-related fishing activities.

Timor-Leste, a nation facing limited capacity to control its waters, has been significantly impacted by IUU fishing activities, especially in its northern coasts which are included in the ISLME region. The Global Fishing Watch (GFW) data reveals that numerous Indonesian boats have been operating illegally within Timor-Leste's exclusive economic zone (EEZ), causing substantial economic losses, estimated at an average of USD 84 million per year. Despite efforts by the Directorate of Fisheries, Aquaculture and Marine Resources Management (DFAMRM) in collaboration with Australia and Indonesia to monitor and curb IUU fishing since 2018, the challenge persists. Indonesia and Timor-Leste must formalize their existing relationship through diplomatic channels to collaborate closely in controlling and managing all marine and coastal resources. Cooperation between the two countries is essential to monitor IUU fishing, assess its impacts, identify hotspots along the border area, and implement proper risk assessment instruments.

To address these pressing issues, both countries need to work together closely. Indonesia has taken significant steps in combating IUU fishing, implementing international principles and standards, reforming regulations, and strengthening marine patrol forces. The use of monitoring technology, such as the vessel monitoring system (VMS), has become crucial in this effort, in order to ensure compliance with regulations for vessels operating in Indonesian waters. The Indonesian government's firm actions, including sinking ships caught engaging in IUU fishing activities, demonstrate its commitment to curbing illegal fishing. In addition, Indonesia has also

established the regulated capture fisheries policy as stated in Government Regulation No. 11 of 2023 as an effort to reduce unreported fishing practices. However, communication and social acceptance are needed at various levels of stakeholders. SAP will facilitate these needs by designing an action plan. As a further effort to enhance the collaboration, Timor-Leste and Indonesia need to exchange information in order to develop effective strategies to combat unsustainable fishing practices in the ISLME region.

2.2 Degradation and loss of marine habitats

Unregulated expansion of human settlements and activities in coastal regions contributes to the loss of crucial habitats such as mangroves, coral reefs, and seagrass beds. The need for land for anthropogenic activities such as housing, aquaculture, and mining contributes significantly to the alteration of already degraded coastal habitats, including mangrove deforestation and coral bleaching. The primary concerns affecting marine habitat degradation include high levels of development in coastal regions, continuous IUU fishing practices such as unreported fishing in each FMA and in the transboundary waters in the ISLME. Much of the IUU catch of the neighbouring Arafura-Timor Sea is transshipped or transported through the ISLME region (ATSEA, 2011).

Heavy reliance on marine resources in Indonesia has led to their overexploitation and degradation, particularly near populous areas (ADB, 2014). For instance, almost 95 percent of Indonesia's coral reefs face threats from local human activities, with over 35 percent at high risk from overfishing, destructive fishing, pollution, and coastal development (Burke *et al*., 2012). These resources include materials such as wood and construction materials (e.g. mangroves or coral reefs). Mangroves and seagrass beds have lost their vital significance as nursery and feeding grounds for fish and marine animals in large regions. Seagrass in the ISLME has been estimated at a value of USD 659 million in marine ecosystems (Anthony and Mumby, 2021). This value consists of ecosystem value (ESV) from capture fisheries, aquaculture, and CO_2 sequestration (Table 2).

Table 2. Degradation and loss of marine habitats problem identification

2	Degradation and Loss of Marine Habitats
CHALLENGES	1. The high level of development in coastal areas 2. The ongoing practice of illegal, unreported, and unregulated fishing (IUU fishing) 3. The worsening phenomenon of climate change 4. Excess fishing capacity, multi-species & multi-gear fisheries (non-selective fishing gear) 5. The high level of anthropogenic activities
WHATS THE PROBLEM	1. Degradation and loss of coastal and marine habitats stem from uncontrolled coastal development and climate change impacts 2. Coastal development for housing, aquaculture, mining, and agriculture leads to habitat destruction, particularly affecting mangroves, coral reefs, and seagrass 3. Land-use conversion exacerbates demand for resources, such as wood and building materials from coastal areas, leading to habitat degradation 4. Destructive fishing methods contribute to the decline of fish populations, water quality, and coral reef health, further aggravated by climate change effects
IMPACT ON ECOSYSTEM SERVICES AND HUMAN WELL-BEING	1. Environmental impacts result in habitat and biodiversity degradation because of anthropogenic and natural factors 2. Critical habitat degradation such as mangroves, seagrass, and coral reefs leads to declining ecosystem services, impacting carbon storage and marine biota sustenance 3. Socioeconomic consequences include difficulty meeting community needs, loss of tourism potential, lack of income diversification and decreased job opportunities because of ecosystem degradation
KEY PRIORITIES, GAPS, AND POTENTIAL INDICATORS	1. High anthropogenic pressure on coastal resources for food, housing, and infrastructure requires addressing 2. Adaptive management for environmental damage and climate change impacts is crucial for mitigation and adaptation 3. Legal clarity and improved institutional coordination are vital to avoid policy overlap and failures in habitat management 4. Stakeholder capacity-building to understand ecosystem services is essential for effective ecosystem-based management

The ISLME region has witnessed a significant loss of seagrass area over recent decades, with annual rates of decline estimated at approximately 2 percent to 5 percent (McKenzie and Yoshida, 2015; Duarte *et al.*, 2008). Mangrove ecosystems have been fragmented and reduced on a vast scale. Over the past 30 years, more than 28 percent of Indonesia's mangrove cover has been destroyed. Sasmito *et al.* (2023) mapped the accumulation of mangrove loss area in Indonesia between 2001 and 2020. The most severe mangrove area losses of over 7 500 ha were recorded in North, East, and South Kalimantan, as well as in South Sumatra and the Bangka Belitung islands. Mangrove area losses of between 5 000 ha and <7 500 ha were also recorded in West Kalimantan, Riau, and Aceh. Moderate mangrove area losses (2 500 ha to <5 000 ha) were also found in the islands of Sulawesi and Papua. This includes potential emissions resulting from mangrove loss estimated at USD 4 to USD 10 per ton of CO_2 and the social cost or marginal value of an additional ton of CO_2 in the atmosphere

caused by mangrove conversion, which stands at USD 41 (Pendleton *et al*., 2012; Siikamäki, Sanchirico and Jardine, 2012).

Additionally, IUU fishing continues, directly impacting both economically valuable fish species and the quality of water and coral reef environments. The use of illegal fishing gear in IUU activities, such as destructive bottom trawling or cyanide fishing, can directly damage coral reefs and other critical habitats in coastal ecosystems. These practices are leading to habitat destruction, increased sedimentation, and the release of harmful chemicals into the water, all of which contribute to a decline in water quality and the health of coral reef environments. The fraction of deteriorated reefs in the ISLME has risen from 10 percent to 50 percent in the last 50 years (Hadi *et al*., 2020). The use of explosives and poisons causes severe damage to coral reefs. Cyanide fishing has a substantial impact on coral reefs since the reefs are also bleached by the cyanide.

This situation is aggravated by the effects of climate change. One of the most evident consequences of climate change on coral reefs is coral bleaching. Increased water temperatures driven by climate change stress coral reefs, leading to coral bleaching events. It is estimated that over 80 percent of Indonesia's reefs are expected to experience bleaching five years out of ten by the 2030s. These bleaching events have been documented in various regions across Indonesia. In terms of specific areas, the vulnerability assessment at several FMA identifies hotspots of climate concern. FMA 713, FMA 714, and FMA 573 are particularly vulnerable as a result of high rates of species turnover, projected marine heatwave intensity and duration, and an elevated presence of climate disasters (Kaczan *et al*., 2023). These areas in Eastern Indonesia and adjacent to Timor-Leste are likely to experience the most significant ecological changes, further emphasizing the urgency of protecting marine and coastal ecosystems in these regions. Climate stressors and land-use changes, such as deforestation for agriculture and urbanization, impact numerous species and trophic levels in both terrestrial and marine ecosystems, leading to significant biodiversity loss in tropical regions. Deforestation can indirectly affect the resilience of tropical forests and reef ecosystems to climate disturbances, creating unfavourable landscapes and ocean conditions that hinder the ability of species to adapt and migrate to more suitable environments (Newbold *et al*., 2019; Eigenbrod *et al*., 2015).

In Indonesia, the issue of waste management in aquaculture, particularly in silvofishery practices, presents a complex challenge (e.g. floating net cages, seaweed and shrimp farming in mangrove areas). The Ministry of Environment and Forestry (MoEF) of the Republic of Indonesia issued Regulation Number 6 in 2021, which addresses procedures and requirements for managing hazardous and toxic waste

materials. The problems that occur can be categorized into two categories: problems that impact the environment and problems that impact the socioeconomic conditions of the surrounding communities. It can be summarized that the degradation of habitats and biodiversity is caused by both anthropogenic and natural factors.

Anthropogenic activities have become drivers that further exacerbate the situation, where efforts to meet economic needs through development activities and overfishing are not properly managed. Land-use conversion compromises the coastal area's ability to retain sediment and nutrient inputs, which further triggers a decline in environmental quality. These environmental problems underlie existing socioeconomic problems. These include the increasing difficulty in fulfilling the basic needs of the community, including food and daily necessities that depend on natural resources.

2.3 Marine and land-based pollution

Massive amounts of solid waste, especially plastics, enter the ISLME from both land and sea-based sources and dissolved waste (Purba *et al.*, 2021). Outside of the surrounding seas and islands, debris in this region also originate from surrounding countries. Other key pollutants that affect coastal and marine ecosystems result from human activities that lead to the discharge of contaminants into the marine environment. Inadequate waste and wastewater treatment, control, disposal, and management are some of the primary causes of this pollution. In addition, improper land use, inadequate catchment, and agricultural practices such as slash-and-burn and deforestation, as well as a lack of watershed management, all contribute to this issue. Compounding this issue further, polluting activities on a small scale, such as artisanal mining, aquaculture, and recreation, are not sufficiently monitored, controlled, or managed (Table 3).

Table 3. Marine and land-based pollution problem identification

3	Marine and Land-Based Pollution
CHALLENGES	1. Huge volumes of garbage, including plastics, entering the ISLME from both land and sea-based sources on a continuous basis 2. The decline in water quality and its impact on coastal and marine ecosystems 3. Improper land use, limited catchment, and agricultural practices
WHATS THE PROBLEM	1. Marine and land pollution is a major concern as a result of significant debris and plastic waste from both land and sea 2. Water quality decline and habitat impact result from human activities releasing pollutants, mainly as a result of inadequate waste and wastewater treatment 3. Improper land use, agricultural practices, and unregulated small-scale activities such as mining and aquaculture contribute to pollution 4. Industrial growth in maritime and oil sectors worsens pollution, amplified by harmful subsidies and insufficient improvement incentives
IMPACT ON ECOSYSTEM SERVICES AND HUMAN	1. Environmental degradation affects coastal communities, causing increased poverty, food insecurity, malnutrition, and threat to cultural practices 2. Decreased fish populations disrupt livelihoods, aquaculture, and tourism, prompting higher operational costs and economic burden 3. Marine contamination risks human health and harms marine life through ingestion, entanglement, and toxicity, impairing biodiversity and fisheries
KEY PRIORITIES, GAPS, AND POTENTIAL INDICATORS	1. High pollution levels demand immediate action, emphasizing best practices for nutrient reduction, waste management, and sustainable resource utilization 2. Legal enhancement, effective policy enforcement, and increased funding are vital for successful waste management 3. Community awareness and industry engagement are crucial aspects, along with proper industry regulation to curb pollution 4. National action plan on marine debris implementation and monitoring through collaboration with local and national partners

Climate change, plastic waste pollution, oil pollution, and purposeful and unintentional damage to ecosystems such as coral reefs, seagrass beds, and mangroves all pose serious challenges to marine ecosystems in the ISLME region. Infrastructure projects and changing land use patterns have also impacted coastal and marine ecosystems throughout the ISLME region. Oil spills are also a source of pollution for the ISLME waters. Oil spill components are often discovered a long distance away from the original place of spillage (Abimanyu *et al.*, 2021). The spill's progress is mostly controlled by the wind's direction and the movement of the ocean currents. However, oil leaks also result from causes other than oil platforms, such as ship collisions and other incidents. This results in poverty, food insecurity, and health issues, disrupting livelihoods and traditions. Loss of income and fishing grounds leads to migration, especially among males and youth, straining communities. Urgent action is needed to address unsustainable practices and support affected areas. Water quality decline harms ecosystems and marine life, and marine debris and contaminants pose risks. Habitat loss and invasive species exacerbate the issue. Restoration efforts and sustainable fishing practices are crucial. In Timor-Leste,

pollution and destructive fishing harm water quality, biodiversity, and socioeconomics, impacting jobs, income, and nutrition.

2.4 Decline of biodiversity and key marine species

The ISLME houses a wide array of marine species and derives from these essential ecosystem services such as fisheries, tourism, and carbon sequestration (Goreau, 2019). The region faces declining biodiversity and key marine species. Turtles, for instance, face threats from bycatch in trawlers, longlines, and gill nets, as well as habitat destruction driven by coastal tourism and the impacts of climate change (WWF Indonesia, 2012). Additionally, the extensive shark trade in Indonesia, which has a considerable presence both in international and domestic markets, poses a significant challenge (Nurlaili, 2018). Notably, Benoa Port in Bali reports a high catch rate of blue sharks (*Prionace glauca*), constituting about 80 percent of bycatch composition, with most originating from the southern part of the Java Indian Ocean (Jatmiko, Rochman and Wujdi, 2018). Furthermore, there are reports of several protected shark species, including *Sphyrna lewini, Sphyrna mokarran, Carcharhinus longimanus, Alopias pelagicus, and Alopias superciliosus*, being landed at the Tanjung Luar fish landing site on Lombok Island (Damayanti *et al*., 2018). These factors collectively contribute to the challenges faced by the region's marine biodiversity and key species.

Navigating the implementation of the blue economy alongside the expansion of marine conservation areas encapsulates Indonesia's strategic approach to harnessing the potential of its seas, and a similar approach will be taken in Timor-Leste. However, the intricate marine biodiversity faces grave challenges, largely stemming from human activities. Concerning the annual mangrove deforestation rate of 6 percent (Mudiyarso *et al*., 2015) and a substantial 71.2 percent of coral reefs in suboptimal conditions (Hadi *et al*., 2020), the urgency to act becomes evident (Table 4).

Table 4. Decline of biodiversity and key marine species problem identification

4	Decline of Biodiversity and Key Species
CHALLENGES	1. Unsustainable and destructive fisheries practices 2. The legal and illegal trade of marine species 3. Degradation and loss of critical habitats of key marine species
WHATS THE PROBLEM	1. The ISLME region, known for its rich marine biodiversity, faces a critical issue of declining biodiversity and the endangerment of protected marine animals 2. Destructive fishing practices, bycatch, illegal trade, marine pollution, and habitat degradation lead to declining key species, loss of biodiversity, endangering protected species and degraded marine ecosystems
IMPACT ON ECOSYSTEM SERVICES AND HUMAN WELL-BEING	1. Decline in marine biodiversity affects ecosystem health, leading to reduced fisheries, carbon sequestration, and nutrient cycling 2. Loss of critical habitats and marine species impairs ecosystem structure, impacting various services 3. Coastal communities face increased poverty, food insecurity, and economic decline because of lost livelihoods from decreased fisheries and tourism 4. Loss of marine tourism assets affects economies, and illegal activities negatively impact marine ecosystems and community well-being
KEY PRIORITIES, GAPS, AND POTENTIAL INDICATORS	1. Effective coordination, strengthened legal frameworks, and heightened environmental awareness are key to prevent further degradation. Sustainable development practices and robust regulations are essential 2. Empowering coastal subsistence communities, balancing development with conservation, and promoting education for sustainable practices are vital. Poverty reduction and resource management must align 3. Addressing challenges requires a coordinated effort among government agencies, private sectors, and the public, focusing on governance, socioeconomic development, and sustainable resource management

To address these concerns, Indonesia has formulated policies geared towards expanding marine conservation areas. The Ombai-Wetar Strait located between the islands of Alor, Timor, and Wetar, and the adjacent Savu Sea, has been identified as a major Indo-Pacific transboundary migration corridor and critical habitat for cetaceans and other endangered, threatened, and protected marine megafauna species such as the sperm whale (*Physeter macrocephalus*), pygmy blue whale (*Balaenoptera musculus*), beaked whale (Ziphiidae), marine turtles (Cheloniidae), the whale shark (*Rhincodon typus*), and mantas (*Manta birostris*) (Kahn, 2017)

Degradation and loss of critical marine species habitats, such as those impacted by plastics waste and vessel noise disruption, have a detrimental impact on marine mammals. Furthermore, the reduction in the number of higher-order predators such as sharks and rays also severely influence the health and function of marine ecosystems (Sherman *et al*., 2023). The decrease of biodiversity and key marine species (e.g. sea turtles, sharks and rays, cetaceans, and crocodiles – the latter particularly in Timor-Leste) in the ISLME have significant environmental and

socioeconomic impacts, such as on fisheries, marine tourism, carbon sequestration, and nutrient cycling. These combined factors contribute to the declining biodiversity observed in key marine populations. Furthermore, underlining the importance of the ISLME, many of these habitats are essential for breeding, feeding, and other critical life cycle stages of marine life (Kaczan *et al.*, 2023).

2.5 Impacts of climate change

Climate variability holds increasing significance in the ISLME. Rising temperatures and prolonged droughts affect agriculture, water resources, and health, leading to reduced productivity and economic strain. Reports from Indonesia's Ministry of Environment and Forestry (MoEF) project further temperature increases and higher sea levels. The Indonesian range of increase rates across locations is approximately 0.01 °C–0.06 °C per year, with an average of 0.03 °C per year (BMKG, 2019). In general, average air temperature has increased by nearly 0.9 °C in the last 30 years. In Timor-Leste, temperature increases are projected to be in the range of 0.5 °C–1.1 °C. Moreover, sea level has risen near Timor-Leste by nearly 9 mm per year since 1993, which is larger than the global average of 2.8 mm to 3.6 mm per year (PACCSAP, 2011). Climate change is also leading to more frequent heavy rainfall events, river flooding, droughts, and other phenomenon such as the El Niño event that occurred in 1997/1998, and several times thereafter. Rainfall shifts can disrupt agriculture and water availability, consequently negatively affecting lives. Vulnerability to natural disasters such as extreme weather events compounds the region's challenges, causing destruction and loss of life (Kaczan *et al.*, 2023).

Climate change alters ocean conditions and processes, impacting marine life and livelihoods. Altered upwelling is typically observed in areas of the southern Sulawesi Sea, the southeastern Java and Bali Seas, the Savu Sea, the southern Ambon Sea, and the southern West Papua Sea (Purba and Khan, 2019). Ocean circulation and dynamically rising temperatures affect organisms, marine biodiversity, and coral reefs (Gusviga *et al.*, 2021). Additionally, ocean acidification and sea level rise threaten coastlines, resources, and the aquaculture industry, endangering the region's infrastructure and communities (Table 5).

Table 5. Impacts of climate change problem identification

5	Impacts of Climate Change
CHALLENGES	1. Climate variability (rising of temperature, greater heat stress, prolonged droughts) 2. Change in precipitation pattern (more intense rainfall events, riverine flooding, and droughts 3. Extreme weather events (strong winds, storms, storm surges, and cyclones) 4. Change in ocean conditions (change in oceanographic processes) 5. Ocean acidification and sea level rise (SLR)
WHATS THE PROBLEM	1. The ISLME is experiencing rising temperatures, extended droughts, and increased heat stress, are projected to continue, with potentially severe impacts on ecosystems and biodiversity 2. Sea levels are rising near Timor-Leste, leading to coastal erosion, loss of habitats, and increased vulnerability to extreme events 3. Altered precipitation patterns have caused more intense rainfall, riverine flooding, and droughts
IMPACT ON ECOSYSTEM SERVICES AND HUMAN WELL-BEING	1. Coastal degradation because of climate change leads to the loss of habitats, affecting marine life, fisheries, and local communities 2. Climate-related stresses reduce freshwater resources, damage shellfish populations, and increase riverine flooding and landslides 3. Impacts on coastal communities include increased poverty, food insecurity, malnutrition, loss of livelihoods, and negative effects on culture 4. Economic impacts encompass losses in foreign exchange earnings, increased operational costs for fishing, and higher risks for fishermen
KEY PRIORITIES, GAPS, AND POTENTIAL INDICATORS	1. Reducing greenhouse gases (GHG) emissions, promoting sustainable land-use practices, building resilience, transitioning to renewable energy, and addressing health impacts including on psychological well-being 2. Insufficient data on climate impacts on vulnerable populations, weak governance, low environmental awareness, and limited understanding of social and economic impacts 3. Renewable energy production, effectiveness of adaptation programmes, and deforestation rates

The ISLME has undergone ocean warming because of global anthropogenic climate change. Climate change's environmental consequences in the ISLME include widespread flooding, changes to shorelines, and a rise in wave height, which affects ship routes. Effects on ecosystem health, coral reefs (bleaching), and organisms, such as larval and adult fish migration, have also been recorded. Climate change is altering the strength and duration of upwelling, which has an impact on primary output. Furthermore, dry seasons become longer than wet seasons.

Climate change is anticipated to have an increasing influence on the ISLME's ecosystems and biodiversity. Many vital habitats have been impacted by the detrimental effects of global climate change. The ISLME region's coastal and marine ecosystems are being degraded and lost, including the destruction of critical coral reefs regions (Gusviga *et al.*, 2021).

Climate change's socioeconomic consequences include changes in distribution and maritime transportation logistics. Weather unpredictability also raises concerns about the safety of sea traffic. Furthermore, unpredictable weather poses a challenge for fishers conducting their fishing activities using predominantly relatively small fishing crafts.

3 Strategic action programme

The vision, goals, and objectives represent a long-term perspective that outlines the desired future for the ISLME as envisioned by Indonesia and Timor-Leste. This vision is grounded in the commitment of the governments of the two countries to address the most pressing environmental issues identified in the transboundary diagnostic analysis (TDA). Experts from both Indonesia and Timor-Leste work closely with the respective authorities including the Ministry of Maritime Affairs and Fisheries (MMAF) from Indonesia and the Ministry of Agriculture, Fisheries, and Forestry (MALFF) from Timor-Leste. Important intraministerial parties and stakeholders are also involved to enhance the goals. This process was defined by extensive collaboration, marked by valuable inputs, assessments, and productive discussions among all stakeholders.

The development of the vision, goals, and objectives was facilitated by several national and regional meetings and fully utilized the knowledge and expertise of everyone involved.

3.1 Vision

A vision for the ISLME region was agreed upon by SAP participants and is produced in Figure 7.

Figure 7. The vision for the Indonesian Seas Large Marine Ecosystem region

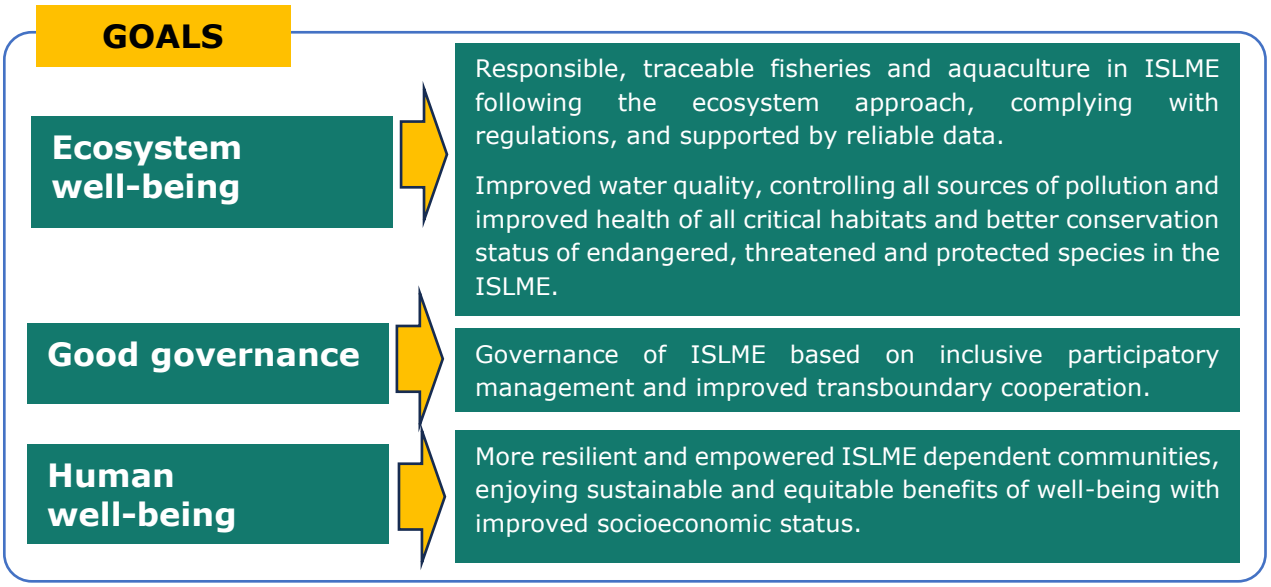
VISION

Sustainable fisheries and healthy ocean in the ISLME area, providing ecosystem benefits for the long-term prosperity of the communities.

3.2 Goals

The brainstorming, drafting and validation of the identified goals (Figure 8) were strongly guided by the principles of ecosystem-based management or the ecosystem approach and is closely aligned with its three major pillars. The EAF is well established and adopted in Indonesia and the wider Southeast Asian region, and EAF capacity development has already started in Timor-Leste.

Figure 8. Goals for the Indonesian Seas Large Marine Ecosystem region



3.3 Objectives

Indonesia and Timor-Leste have formulated five SAP priority actions, objectives and targets to address the primary environmental concerns (PECs) starting with maintaining sustainable fishery and aquaculture (Table 6).

3.3.1 Maintaining sustainable fisheries

Table 6. Objectives and targets for fishery and aquaculture in the ISLME region

	OBJECTIVES	TARGET: INDONESIA	TARGET: TIMOR-LESTE
TDA PEC 1: Declining productivity and sustainability of ISLME fishery and aquaculture	**1. Recovery and sustainable management of fisheries resources**	• EAFM concept incorporated into government regulations • Monitoring, control and surveillance (MCS) effectiveness increased • National Plan of Action (NPOA) for small-scale fishers (SSF) developed	• Improved status of selected fish stocks • Stable income from fishing
	1.1. Strengthening the implementation of EAFM (for specific fisheries and fisheries management areas)	Amendment of at least four Fisheries Management Plans (FMP) based on EAFM, and development of competent human resources and mechanisms for the implementation of EAFM at all levels	Comprehensive EAFM plan for north coast of Timor-Leste developed and implemented
	1.2. Reduction of illegal, unreported and unregulated (IUU) fishing and increasing compliance with fisheries regulation	• The increase of MCS effectiveness, specifically for human resource capacity and optimal inter- and intra-agency coordination • 40 percent decrease of IUU fishing and destructive fishing practices in fisheries management areas (FMAs) • 20 percent increase in catch reporting	Functional enforcement, MCS, and conflict resolution lead to a significant reduction of IUU fishing in entire project area
	1.3. Support to the implementation of the Sustainable Small-Scale Fishers (SSF) Guidelines as per NPOA and regional strategy of SSF	The Sustainable Small-Scale Fishers (SSF) Guidelines as per NPOA and regional strategy of SSF adopted and key actions implemented	Municipalities co-management plan for the north coast, developed and implemented
	2. Strengthening of sustainable aquaculture (mariculture) practices, including ecosystem approach to aquaculture (EAA), good aquaculture practice (GAP)	EAA and GAP guidelines disseminated and implemented in four provinces	Improved status of selected fish stocks and stable income from fishing

3.3.2 Restoring marine habitat biodiversity

To restore marine habitats and enhance fisheries resources, both countries have proposed objectives and targets to address degradation and loss of marine habitats (Table 7).

Table 7. Objectives and targets to improve heath of marine habitats

	OBJECTIVES	TARGET: INDONESIA	TARGET: TIMOR-LESTE
TDA PEC 2: Degradation and loss of marine habitat	**Restoration and conservation of marine habitats (mangroves, seagrass and coral reefs ecosystems)**	Improvement in habitat status of mangroves, seagrass and coral reefs based on national indicators	• Mangrove areas increased by 20 percent • Area of coral reefs and seagrass maintained and status measurably improved
	Strengthening of marine habitat conservation measures for example of marine protected areas (MPAs)	Significant increase of MPAs area towards Indonesia's target of 30 percent by 2045 and an increase of five percent in management effectiveness (using EVIKA – an evaluation tool for the management effectiveness of marine conservation areas)	Existing MPAs and future MPA network managed effectively including The Peace Park

3.3.3 Reducing marine pollution

Pollution is a growing concern in the ISLME region that threatens its valuable goods and services. Both countries set objectives and targets to address marine and land-based pollution (Table 8).

Table 8. Objectives and targets to reduce land-based pollution

	OBJECTIVES	TARGET: INDONESIA	TARGET: TIMOR-LESTE
TDA PEC 3: Marine and land-based pollution	**Improving of water quality**	Reduction of marine debris and other key pollutants	Solid waste contamination reduced in selected sites of the north coast and reduction of wastewater effluents in pilot areas improved
	Reduction of marine litter (including ghost-nets) and prevention of plastic waste entering coastal and marine waters	Reduction of marine debris by 25 percent in up to ten fishing ports, mariculture areas, and five MPAs in the ISLME	Behavioural changes regarding the use of plastic by coastal communities lead to the significant reduction of plastics used and improvements in solid waste disposal focused in three selected municipalities
	Prevention and reduction of eutrophication from agriculture/ aquaculture runoff	Reduction of eutrophication in selected mariculture areas	Sustainable aquaculture/mariculture of selected commodities practiced, enabling stable incomes
	Prevention and reduction of other forms of marine pollution from wastewater (including hydrocarbon/fuel waste, sedimentation, abrasion, intrusion, and mine tailings)	Watershed management for sedimentation guidelines produced and implementation supported in three selected areas	Three integrated coastal management (ICM) plans, with a focus on pollution reduction, developed and implemented in three municipalities (Bobonaro, Liquica, and Manatuto)

3.3.4 Conserving endangered, threatened and protected species; and other key marine species

To protect ETP and key species, both countries set the following objectives and targets (Table 9).

Table 9. Objectives and targets to arrest the decline of biodiversity and key species

	OBJECTIVES	TARGET: INDONESIA	TARGET: TIMOR-LESTE
TDA PEC 4: Decline of biodiversity and key species	**Biodiversity of coastal and marine ecosystems recovered and maintained**	Local community awareness and local government skills regarding biodiversity conservation raised, and collaboration mechanism (e.g. joint data centre) established	Biodiversity status of marine habitats assessed and improved
	Conservation measures for ETP species and migratory marine species promoted, implemented, and strengthened	Five new ETP species conservation centres established, functioning effectively, and improved conservation status of key ETP species based on regular monitoring information	Crocodile management plan developed and implemented, including management plans for turtle, dugong, and other marine mammals

3.3.5 Responding to impacts of climate change

The following objectives and targets are proposed to boost resilience and adaptation to tackle climate change (Table 10).

Table 10. Objectives and targets to mitigate impacts of climate change

	OBJECTIVES	TARGET: INDONESIA	TARGET: TIMOR-LESTE
TDA PEC 5: Impacts of climate change	**Resilience of coastal and marine ecosystems to impacts of climate change strengthened**	Awareness and knowledge of climate change increased and vulnerability map for all coastal areas updated	Municipal development plans that include climate change resilience drafted and implemented with a focus on livelihoods and basic infrastructure
	Reduced vulnerability of coastal communities to impacts of climate change	Annual national and regional coordination meetings on climate change held leading to adaptive climate resilient fisheries management	Eight north coast municipalities drafted and implemented climate change vulnerability reduction plans which focused on climate change knowledge and livelihood
	Adaptation measures to climate change identified, promoted, and adopted	Local community awareness and skills on climate change adaptation increased in four priority locations and benefiting from adopted measures such as resilient livelihoods	North coast communities of Timor-Leste benefit from infrastructure, skills, and knowledge that improved and secured their livelihoods

3.4 Priority actions

The ISLME region is home to a diverse range of species and ecosystems that are essential for the livelihoods of millions of people in coastal areas. Considering the importance of the ecosystems, both countries involved in this project have set objectives, and agreed on strategic actions to achieve these objectives, such as recovery and sustainability of fisheries resources, improving water quality, restoration, and conservation of marine habitats. Continuing from the ISLME TDA document, with the vision of promoting sustainable fisheries and ensuring a healthy ocean within the ISLME region, actions have been formulated to address five key environmental priorities based on the five PECs identified:

Maintain sustainable fisheries

- Enhance the application of EAFM in all fisheries sectors, which also involves improving the monitoring, control, and surveillance (MCS) systems to ensure that the fisheries regulations and policies are complied with and enforced (Indonesia).
- Implement the quota-based fisheries management as a measure to combat the IUU fishing in the ISLME, which is a serious threat to the fish stocks and the marine environment (Indonesia).
- Apply the best management practices for priority commodities, such as lobsters, lemuru sardines, mud crabs, flying fish, blue swimming crabs, snappers, and groupers, which have high economic and ecological value in the ISLME (Indonesia).
- Update and harmonize the fisheries laws in Timor-Leste, which are currently outdated and inconsistent with the international standards and conventions (Timor-Leste).
- Develop the Indonesia National Standards (SNI) on mariculture and brackish aquaculture primary commodities, such as shrimp, milkfish, seaweed, and grouper, to ensure the quality, safety, and sustainability of the aquaculture products, and guided by the EAA (Indonesia).
- Familiarize the related stakeholders with the fisheries laws, such as fish farmers, traders, processors, and consumers, to raise their awareness and understanding of the legal and regulatory framework for aquaculture in the ISLME (Indonesia and Timor-Leste).
- Provide training on the implementation of fish cultivation best practices (*Cara budidaya ikan yang baik* / CBIB) as part of the EAA approach, which aims to minimize the negative impacts of aquaculture on the environment and society

and to optimize the benefits and efficiency of the aquaculture systems (Indonesia).

Restore marine habitat biodiversity

- Expand the new MPAs in the ISLME to a total of 30 percent by 2045 and evaluate the effectiveness of the existing MPAs in the ISLME region (Indonesia).
- Rehabilitate marine habitats, especially the seagrass and coral reef ecosystems, in the north coast of Timor-Leste (Timor-Leste).
- Improve interministerial level coordination to support marine spatial planning (MSP) in the north coast of Timor-Leste (Timor-Leste).

Reduce marine pollution

- Encourage behavioural change for plastic reduction in marine tourism areas and coastal communities (e.g. marine litter and discarded fishing nets) in the ISLME region (Indonesia and Timor-Leste).
- Promote integrated coastal management (ICM) in eight municipalities, including developing sediment control measures for the ecosystems in Timor-Leste (Timor-Leste).
- Strengthen the coordination in watershed management between Indonesia and Timor-Leste (Indonesia and Timor-Leste).
- Support the management and availability of data, such as through a collaborative data centre (e.g. oceanic data centre of ITF system and sea sedimentation). The collaborative data centre is a platform that facilitates data sharing and integration among different data providers and related stakeholders (Indonesia and Timor-Leste).

Conserve endangered, threatened and protected (ETP) species and other key marine species

- Develop and implement the national plan of action (NPOA) for ETP and key marine species in both countries (Indonesia and Timor-Leste).
- Create and implement a crocodile management plan in the north coast of Timor-Leste. This would provide guidelines and measures for the monitoring, education, awareness raising, conflict resolution, and habitat protection of crocodiles (Timor-Leste).
- Strengthen the monitoring mechanism for the critical habitats of ETP and migratory marine species in the ISLME region. Monitor critical habitats to assess their status and trends, identify and mitigate the threats and impacts,

and evaluate the effectiveness and efficiency of the conservation and management interventions (Indonesia and Timor-Leste).

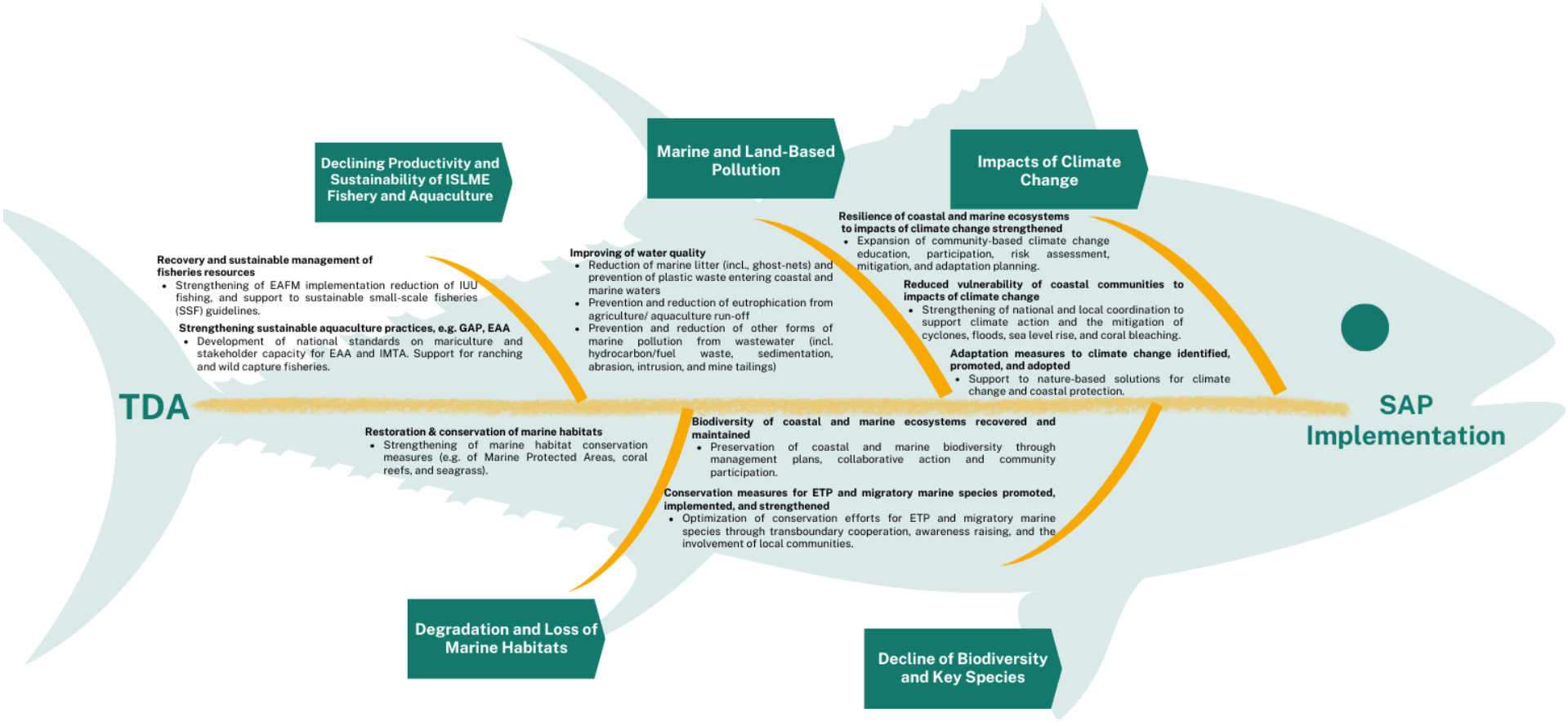
- Establish a collaborative data centre for the critical habitats of ETP and migratory marine species in the ISLME region. Data management would include a process that collects, stores, analyses, and disseminates information to improve scientific knowledge and understanding, decision-making and planning, monitoring and evaluation, and communication and awareness raising (Indonesia and Timor-Leste).

Respond to impacts of climate change

- Enhance the resilience and diversification of livelihoods, disaster risk reduction and preparedness, and the participation and empowerment of vulnerable groups, such as women and youth, in coastal communities and stakeholders (Indonesia and Timor-Leste).
- Support nature-based climate change solutions and alternative incentives (e.g. blue carbon incentives) in the ISLME (Indonesia and Timor-Leste).
- Strengthen coordination and collaboration between the Government of Indonesia and the Government of Timor-Leste and the related national and regional stakeholders (Indonesia and Timor-Leste).
- Develop collaborative research and innovation on climate change issues and solutions in the ISLME. Coordination and collaboration can help harmonize and align the policies, strategies, and actions for the climate change response and assist in sharing the experiences, lessons, and best practices among related stakeholders (Indonesia and Timor-Leste).
- Establish a collaborative data centre to discuss climate change issues and solutions in the ISLME (Indonesia and Timor-Leste).

There are essential priority actions that must be taken in the ISLME region (Annex 2) These include: implementing sustainable fishing practices that ensure the long-term viability of fish stocks; protecting marine habitats to ensure the long-term health of its ecosystems; reducing the number of pollutants entering the region's marine waters; conserving key marine species such as ETP and migratory marine species; and taking steps to adapt to the impacts of climate change on the region's coastal and marine ecosystems (Figure 9).

Figure 9. National action plans based on five primary environmental concerns



4 Strategic action programme implementation considerations and arrangements

4.1 Governance cooperation and coordination

Effective management of marine resources relies heavily on the interconnections both within and among governance approaches and structures. To facilitate the effective implementation of the SAP and national action plans (NAP), a structured governance approach is undertaken, and this involves:

- coordinating and managing the actions, while also planning the specific activities and projects, including their associated costs;
- developing a communication strategy and tools to disseminate information, share lessons learned, and mobilize support for the SAP's implementation;
- monitoring and evaluating the progress of the SAP's implementation, reviewing advancements, and adapting strategies and plans as needed;
- coordinating the mobilization and execution of implementation support and activities, ensuring proper coordination among stakeholders; and
- establishing a functional data and information management system, enabling efficient monitoring and evaluation of SAP implementation outcomes.

Within the framework of governance, Indonesia and Timor-Leste jointly formulated an NAP integral to the overarching SAP. Each NAP delineates a spectrum of strategies, providing detailed insights into national undertakings designed for ecosystem-based management and the sustainable exploitation of natural resources. For instance, in Indonesia the implementation of a quota-based fishing policy within the framework of the blue economy presents both opportunities and challenges. Despite its potential benefits, this policy is faced with several obstacles, such as the prevalence of IUU fishing activities, an inefficient industry and business chain, as well as inadequate fishing practices and fish handling techniques. To address these issues effectively, strategic interventions have been introduced. The quota-based fishing approach is meticulously divided into six distinct zones, establishing defined limits on fish catch quantities. This proactive measure aims to curtail excessive fishing by regulating the number of fishing vessels through administrative means, countering illegal fishery activities. Moreover, fishers are mandated to offload their catches exclusively at designated ports, simultaneously submitting accurate catch reports via e-logbooks. The efficacy of these efforts is bolstered through integrated satellite surveillance, providing comprehensive monitoring. The aim of this comprehensive strategy is threefold: to establish a legal, regulated, and transparent fishing industry

in Indonesia; to enhance the well-being of local communities; and to preserve fish stocks while simultaneously harnessing the maritime and fisheries sector's potential to significantly contribute to the nation's overall economic growth. These measures are strategically tailored to address significant transboundary issues and immediate environmental concerns at the respective national levels. Initiation of a regional cooperative mechanism is set to guarantee effective coordination and bolster capacity development, thereby advancing the cause of sustainable and integrated management within the ISLME region. The implementation of the SAP is facilitated through specific coordination efforts, encompassing national work plans that integrate the activities specified in the SAP document, collaborative initiatives conducted by regional partners, and a comprehensive regional work programme focused on:

- the development of effective collaboration among project partners, while concurrently supervising the state of the ISLME based on scientific observations-this collaboration is based on the principles of the ecosystem approach and promotes participation and co-management;
- the coordination and enhancement of cooperation between the two nations, while simultaneously reinforcing governance structures within each country-these collective collaboration initiatives aim to achieve the sustainable management of the ISLME, effectively carried out through the implementation of the SAP; and
- multilateral and bilateral collaboration with other partners (e.g. UN agencies and programmes, cooperation agencies of other countries, and also universities, the private sector, and NGOs) with funding working toward achieving the objectives of SAP implementation.

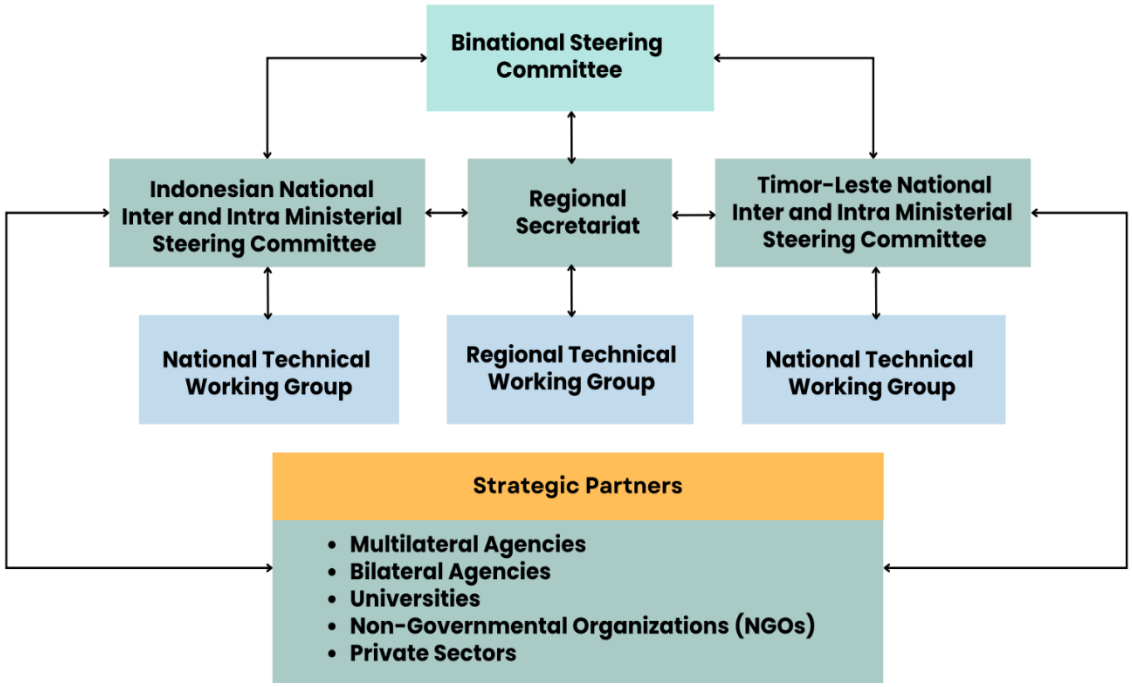
A flexible mechanism for cooperative governance between Indonesia and Timor-Leste participating in the ISLME Project is proposed, with the purpose of implementing and updating the SAP. This mechanism takes into account the proposed organizational structure. The proposed cooperation mechanism places the Regional Secretariat at the centre of the management process. This collaboration is to ensure the effective implementation of the SAP and NAPs.

A Binational Steering Committee (BSC) will be created to provide guidance and act as a coordinating body between national institutions and oversee the management of allocated funds. The committee is not limited to only the Ministry of Maritime Affairs and Fisheries (MMAF) and Ministry of Agriculture, Livestock, Fisheries, and Forestry (MALFF) but is also open to the involvement of other ministries and government bodies. A National interministerial and intraministerial Steering Committee (NSC)

will be established in both Indonesia and Timor-Leste that reports to the Binational Steering Committee (BSC) regarding national activities and funding. The National interministerial and intraministerial Steering Committees (NSCs) are also tasked with following up on and executing instructions from the Binational Steering Committee (BSC). Each National interministerial and intraministerial Steering Committee (NSC) has the authority to independently cooperate on a national level with strategic partners, which consist of multilateral and bilateral agencies, universities, NGOs, and private sectors.

National and regional technical working groups will guide the implementation of the SAP and consist of representatives of the involved ministries and experts in relevant fields. In addition, a Regional Secretariat will be established to facilitate the Binational Steering Committee (BSC), regional technical working group, and each country's National interministerial and intraministerial Steering Committees (NSC). The secretariat also handles communication with regional strategic partners as instructed by the Binational Steering Committee (BSC) (Figure 10).

Figure 10. Proposed organizational structure for strategic action programme implementation



Source: Authors' elaboration based on the results of regional workshops.

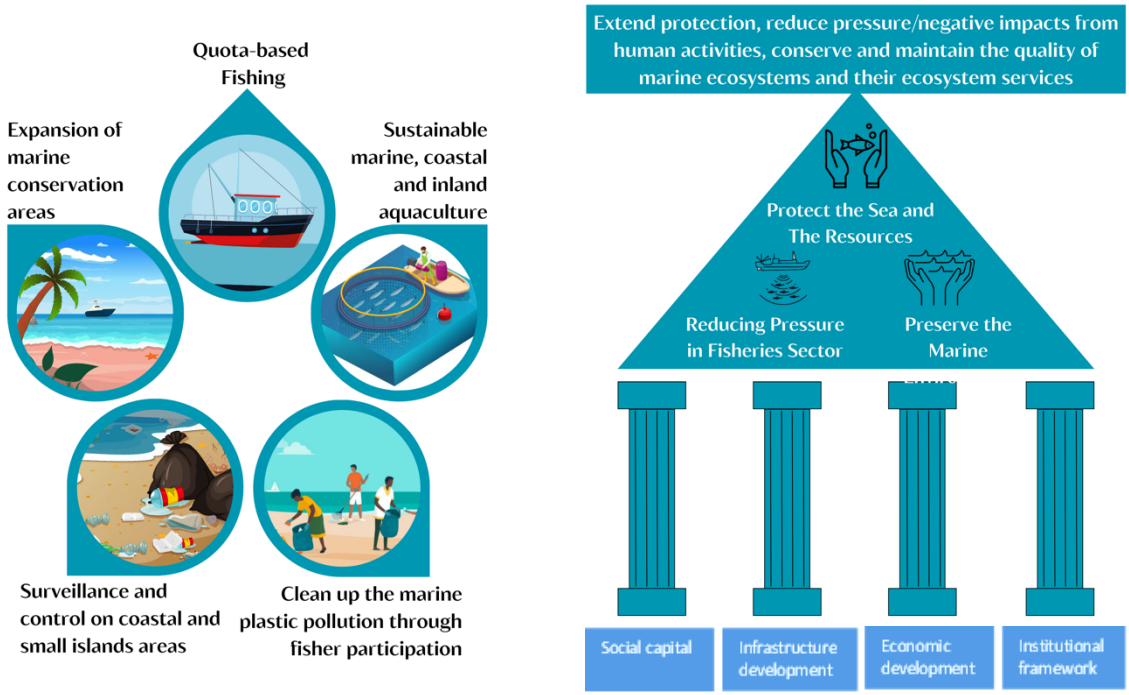
Interministerial and intraministerial collaboration between Indonesia and Timor-Leste is crucial to increasing the efficiency and effectiveness of public policies and services within the ISLME. This collaborative approach fosters synergy among ministries, improving policy consistency and addressing complex and cross-cutting issues. It also aligns with principles of good governance, reinforcing sustainable

ISLME management through the SAP implementation project. Key focuses include enhancing collaboration among partners, conducting scientific observations, and coordinating across borders and ministries. Governance frameworks, exemplified by the Binational Steering Committee (BSC) and National interministerial and intraministerial Steering Committees (NSCs) for both interministerial and intraministerial collaboration, actively facilitate this partnership, guaranteeing a comprehensive strategy that goes beyond geographical and ministerial boundaries. This dedication reflects the commitment of both countries to sustainable marine resource management and the prosperous future of the ISLME.

Best practices in resource management are at the forefront of the blue economy concept adopted by both countries as the Blue Economy Policy in Indonesia and the Blue Economic Pillars in Timor-Leste. The blue economy bears the potential to greatly contribute to ocean sustainability and the poverty reduction for both countries. As a small island developing state (SIDS), the economies and cultures of Timor-Leste are intrinsically tied to the country's oceans and marine resources (UNDP, 2021). Indonesia, as the world's largest archipelagic nation, also has an abundance of marine resources that sustain a diverse array of economic sectors (BAPPENAS, 2023). The blue economy provides a blueprint for both countries to achieve low-carbon and resource-efficient economic growth and development. The blue economy focuses on several sectors and involves various industries, including fisheries, aquaculture, tourism, shipping, and transportation.

Furthermore, both countries possess abundant natural marine resources, encompassing both living and non-living components. The countries occupy a position in the heart of the Coral Triangle and stand out as global focal points for marine biodiversity exemplified by this marine region. The Blue Economy Policy functions as a strategic instrument for Indonesia and Timor-Leste to realize their vision of establishing a blue economy by placing emphasis on the prudent stewardship of marine resources, thereby fostering sustainable economic returns and quota-based fishing within the marine and fisheries sector. SAP Implementation is strongly guided by existing and emerging best practices on resources management. Among these are the blue economy concept and agenda as well as ecosystem-based management (Figure 11).

Figure 11. Blue economy policy in Indonesia and Timor-Leste



Source: BAPPENAS. 2023. Indonesia blue economy roadmap. Ministry of National Development Planning/National Development Planning Agency. Jakarta; UNDP. 2021. Financing the blue economy in Timor-Leste: a preliminary roadmap. United Nations Development Programme.

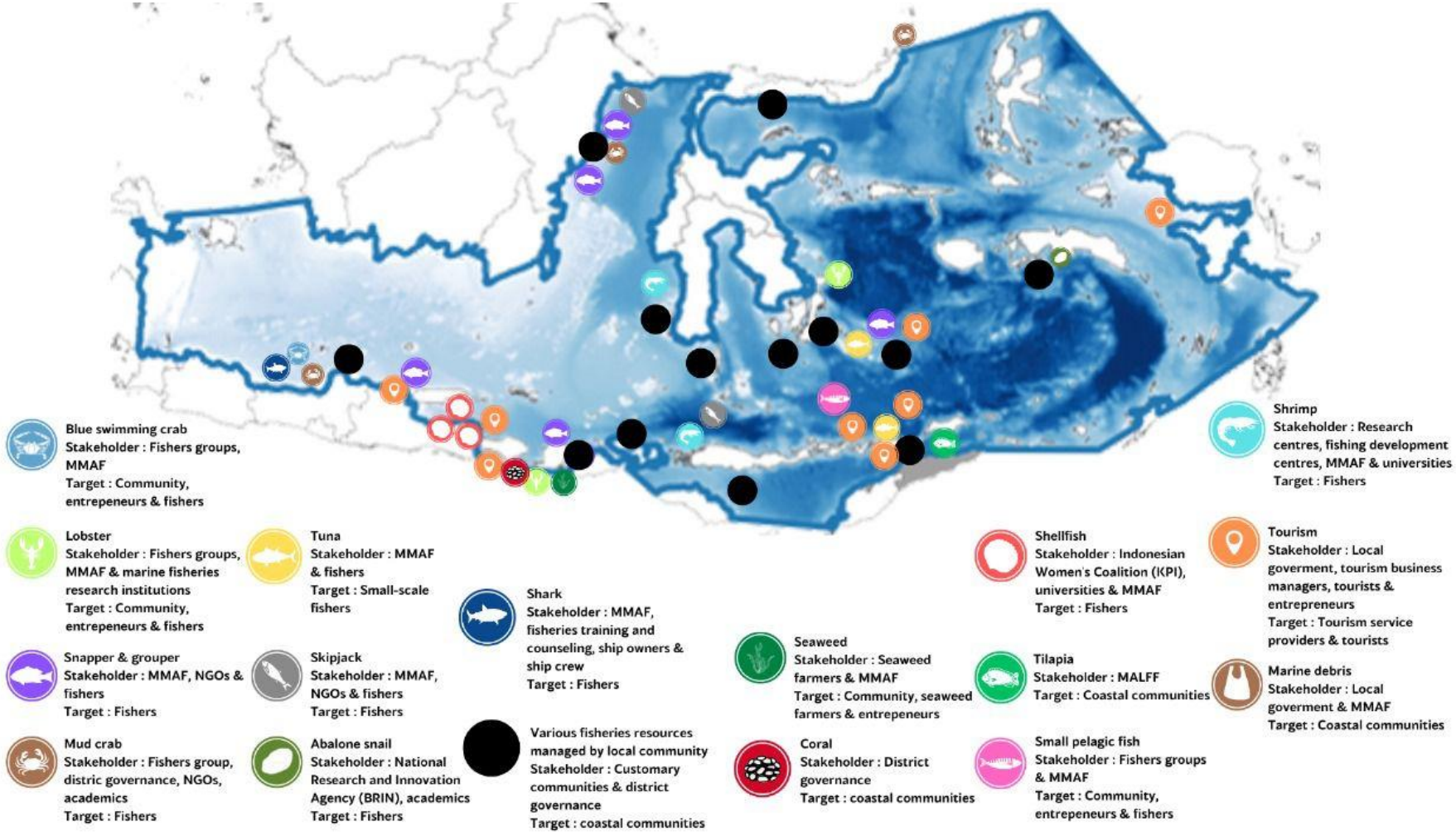
Ecosystem-based management or EAA and EAFM have been effectively implemented in several locations in the ISLME, including FMA 573, which includes the Savu Sea and the EAFM plans for lobsters (Central Lombok) and seaweed (Eastern Lombok). The EAFM and EAA planning and implementation tools have been strategically devised to assist fisheries and aquaculture managers and practitioners in formulating and executing sustainable and ethically responsible practices. The EAFM and EAA have key features that aim to achieve sustainable development, maintain ecosystem integrity, and improve human well-being and equity, while promoting good governance (EAFM Learn, 2023). Diverse paradigms exist in fisheries management, including EBM, EAFM, EAA, and species-specific management. However, area-specific management is most common. In Timor-Leste's north coast, there are ongoing efforts to establish a network of marine protected areas (MPAs), including locally managed marine areas (LMMA), that aim to protect marine and coastal biodiversity. The MPAs have become the foundation for the development of marine tourism, especially in the case of Ataúro Island where they have been providing alternative income sources for fishers. The MPAs and LMMAs' mode of governance is co-management, which hybridizes customary laws and statutory systems. These frameworks and approaches collectively provide an expanded contextual framework for the management of marine and coastal resources, aiming to attain sustainable

development while concurrently enhancing ecological and human well-being. The implementation of the SAP process for best practices in resource management includes:

- establishment of comprehensive stakeholder consultation and participation to ensure broad ownership;
- development of policies and practices based on lessons learned from past experiences promoting adaptive management;
- implementation of measures to prevent irreversible environmental harm, even in the absence of complete scientific knowledge;
- establishment of equitable benefit distribution as a guiding principle for SAP planning subject to ongoing evaluation; and
- development of integrated management strategies to maintain ecosystem equilibrium and human well-being considering cultural identity and diverse factors.

The past and present application of best practices for natural resources management within various locations in the ISLME region can be seen in Figure 12. Successful initiatives such as these will be further supported and scaled-up in other sites within the ISLME during SAP implementation. Each of these practices involve various stakeholders, such as local communities, government institutions, NGOs, and academic communities. Collaboration between these stakeholders to manage and safeguard marine ecosystems and resources is vital to address the needs of both the environment and the people dependent on it, leading to more impactful and sustainable outcomes (Annex 4). Through the integration of diverse expertise, perspectives, and contributions, this collaborative approach seeks to establish a comprehensive and efficient strategy for marine ecosystem and resources management and conservation, acknowledging the interconnectedness of ecological, social, and economic elements within marine ecosystems, thereby fostering a more sustainable future for both nature and human communities.

Figure 12. Best practices in resources management within the Indonesian Seas Large Marine Ecosystem



Note: Black dots represent local wisdom identified in various places in the ISLME (i.e. Sasi in Maluku Province, Tara Bandu in Timor-Leste, Awig-awig in Bali and Lombok, Petuanan Laut in Maluku). Source: Authors' elaboration (See Annex 4 for further details)

4.2 Economic, social and political analysis

An economic valuation of the ecosystem services provided by the ISLME was conducted by Antony and Mumby (2021). The ecosystems assessed included estuaries, mangroves, seagrass, coral reefs, and marine ecosystems. These ecosystems provide various services, of which the following were evaluated in the study: capture fisheries, aquaculture, salt production, timber and forest products, erosion control, CO_2 sequestration, biodiversity, fish nursery, and tourism. The study provided two metrics for the economic valuation of the ISLME, namely gross value of production (GVP) and ecosystem value (ESV). GVP estimates the monetary value of all ecosystem goods and services produced, whereas ESV seeks to provide an approximation of an ecosystem's true value, independent of the commercial value chains built on the ecosystem services and the human effort and purchased inputs. The study estimated that the GVP generated by the ISLME amounts to USD 20.8 billion at 2019 value, with the main source of this value being capture fisheries at USD 13.7 billion followed by aquaculture at USD 5 billion. Moreover, the total ESV of the ISLME was estimated at USD 4.6 billion, which amounted to 0.4 percent of Indonesia's GDP in 2019 (Antony and Mumby, 2021).

Marine and coastal ecosystem services in Indonesia are estimated to be worth over USD 338 billion a year (World Bank, 2019). In the ISLME, direct income generated in the fisheries and aquaculture and tourism sectors account for nearly USD 33 billion and USD 28 billion of this total, respectively. The remaining value of nearly USD 277 billion includes offshore oil and gas, manufacturing, marine construction, and other industries (Antony and Mumby, 2021).

4.2.1 Value of ecosystem services

The implementation of the ISLME SAP has the potential to elevate the economic stability of coastal communities through the prospect of higher GVA. Special attention is directed toward conserving fish resources and fostering sustainable growth in the fisheries sector at the local, national, and subregional levels, in alignment with the FAO Voluntary Guidelines for Securing Small-Scale Fisheries in the Context of Food Security and Poverty Eradication. The application of the principle of equitable benefit distribution from marine ecosystems as an integral aspect of the ecosystem approach is a guiding factor.

The abundance of ecosystem services present in the ISLME can support the economic advancement of Indonesia and Timor-Leste, particularly in remote and economically

disadvantaged areas. Furthermore, global blue carbon emissions, which result from mangrove ecosystems, are equivalent to 3 percent to 19 percent of all greenhouse gas emissions associated with worldwide deforestation. This leads to economic damages estimated at USD 4 billion to USD 6 billion each year, considering a price of USD 41 per ton of CO_2 (Pendleton *et al*., 2012). Earlier research suggests that the economically viable cost of abating these emissions is less than USD 10 per ton of CO_2 (Siikamäki, Sanchiriko and Jardine, 2012). The economic evaluation of preserving mangroves to maintain their carbon storage encompasses a range of considerations. This includes potential emissions resulting from mangrove loss, estimated at USD 4 to USD 10 per ton of CO_2, and the social cost or marginal value of an additional ton of CO_2 in the atmosphere caused by mangrove conversion, which stands at USD 41 (Pendleton *et al*., 2012; Siikamäki, Sanchiriko and Jardine, 2012). The value of ecosystem services provided by mangroves, specifically their natural carbon storage in conservation areas, could be at least USD 4 000 per hectare. This estimate does not include the value of their capacity to sequester carbon, which was estimated at an additional USD 30.50 per hectare per year (Barbier *et al*., 2011).

In Indonesia, coral reefs hold significant use values (UVs), contributing substantially to the economic benefits of the fisheries sector, tourism industry, and coastal protection, amounting to USD 2.2 billion, USD 258 million, and USD 782 million per km^2 a year, respectively (Burke, Spalding and Perry, 2012). These economic assessments, however, do not encompass the values associated with biodiversity, the inheritance of coral reefs, or the importance of their continued existence. Based on the calculation, economic losses fluctuated from 1994 to 1995 and from 2013 to 2014. For the 1994-1995 period, the economic loss because of coral reef damage was USD 54.1 million, which then increased rapidly to USD 90.4 million in 1995-1996. In the period of 1996-1997, the financial loss rose significantly to a peak of USD 109.5 million. It then gradually decreased to USD 16.4 million from 1996 to 1997 and from 2013 to 2014. The total value of the economic loss as a result of coral reef damage from 1994 to 2014 was USD 1 billion or USD 50 million per year (Haya and Fujii, 2019).

Seagrass ecosystems, aside from their ecological significance, hold substantial economic worth. Adopting the United States of America standard for carbon pricing at USD 10 per ton in 2016 (Hamrick and Gallant, 2017), the estimated value of Indonesia's seagrass meadows concerning carbon stock services (Alongi *et al*., 2016) amounts to roughly USD 3.68 billion (Nadiarti *et al*., 2012). In Timor-Leste, the main resources of the coastal economy are derived from oil and gas exploitation, fisheries, mining, and the tourism sector. In addition, marine and coastal ecosystems also contribute significantly to coastal communities in terms of food security, incomes,

and job opportunities. This reliance on ocean and coastal resources and ecosystems is exemplified by the ocean economy of Timor-Leste, amounting to 87 percent of the country's GDP in 2015 (USD 1.96 billion). Offshore oil and gas comprise a value amounting to 80 percent of the country's GDP or nearly USD 1.5 billion. The second largest contributor is government activities (USD 377 million), followed by ports and shipping (USD 66.7 million), tourism (USD 19.6 million), and fisheries and aquaculture (USD 7 million). In addition, coastal and marine ecosystems in Timor-Leste (mangroves, seagrass, coral reefs, and tidal swamps) are estimated to be worth approximately USD 5.25 billion, with much of this value coming from coral reefs (USD 4 billion) (PEMSEA, 2019b). Communities on the northern coast of Timor-Leste are heavily reliant on resources and services provided by coastal ecosystems, including water, food, and shelter, as well as intrinsic services such as recreation and tourism.

4.2.2 Cost of strategic action programme implementation

To implement the strategic action programme (SAP), cost estimates were created for each action plan in Table 12. When totalled, the estimated cost for implementing this SAP is approximately USD 49 million in total for a five-year period. Approximately USD 44 million is allocated for the action plans of Indonesia, whereas Timor-Leste's action plans are estimated to cost about USD 5 million. The highest expenses are mainly associated with Priority Environmental Concern (PEC) 1, which focuses on the declining productivity and sustainability of ISLME fishery and aquaculture, approximately USD 32 million (Table 11).

Table 11. Cost estimation of strategic action programme implementation

ACTION PLANS	Estimated Cost (000 USD)
Declining productivity and sustainability of ISLME fishery and aquaculture	
Recovery and sustainable management of fisheries resources: Strengthening the implementation of EAFM (for specific fisheries and fisheries management areas), reduction of IUU fishing and increasing compliance with fisheries regulations, support to the implementation of the sustainable small-scale fisheries (SSF) guideline as per NPOA and regional strategy of SSF	28 880
Strengthening of sustainable aquaculture (mariculture) practices, including ecosystem approach to aquaculture (EAA), good aquaculture practices (GAP): develop national standard on mariculture and aquaculture, EAA and IMTA; support for ranching and wild capture fisheries, milkfish culture, seaweed aquaculture, social acceptance of the implementation of risk-based business licensing	3 210

Degradation and loss of marine habitat	
Restoration and conservation of marine habitats (mangroves, seagrass, and coral reefs ecosystems): strengthening of marine habitat conservation measures (e.g. of marine protected areas), coastal marine ecosystem restoration, monitoring and management MPA; establishment of MSP (marine spatial planning)	5 238
Marine and land-based pollution	
Improving water quality: reduction of marine litter (including ghost-nets) and prevention of plastic waste entering coastal and marine waters, prevention and reduction of eutrophication from agriculture/aquaculture runoff, and prevention and reduction of other forms of marine pollution from waste water (including hydrocarbon/fuel waste, sedimentation, abrasion, intrusion, and mine tailings)	5 220
Decline of biodiversity and key species	
Biodiversity of coastal and marine ecosystems recovered and maintained: conservation measures for ETP and migratory marine species promoted, implemented, and strengthened	4 700
Impacts of climate change	
Resilience of coastal and marine ecosystems to impacts of climate change strengthened: reduced vulnerability of coastal communities to impacts of climate change and adaptation measures to climate change identified, promoted, and adopted	1 729

There is a total of 185 action plans to be implemented over five years and carried out in the ISLME region. The action plans intended to be implemented comprise 63 action plans in Indonesia and 25 action plans in Timor-Leste. Furthermore, a total of 97 action plans will be implemented jointly in both countries. The action plans can be seen in more detail in Annex 2.

4.2.3 Gender mainstreaming and customary communities

Gender mainstreaming, the process of assessing the implications for women and men of any planned action, including legislation, policies, or programmes in all areas and at all levels, is another crucial social aspect in the management of the ISLME. Over six million people are involved in fisheries and aquaculture in Indonesia, predominantly led by small-scale fishers constituting about 95 percent of the total fishery production (FAO, 2016). Research indicates that women constitute approximately 42 percent or more of those engaged in fisheries in Indonesia (Ariadno and Amelina, 2016). Meanwhile in Timor-Leste, with as many as 80 percent of households in coastal areas involved in fishing, and at least 50 percent of women fishing (House, Martins and Gough, 2021; Tilley *et al.*, 2021). Enhancing gender integration needs the adoption of systematic approaches, including gender awareness capacity building for programme staff, communities, and beneficiaries. Some of the

activities already implemented in the fisheries and marine sector in the ISLME region involving women are shown in the Table 12.

Table 12. Some of the activities already implemented in the fisheries and marine sector in the Indonesian Seas Large Marine Ecosystem region involving women

Activities	Location	Organization
Workshop on women's role in small-scale fisheries	Takalar District, South Sulawesi; Bima District, West Nusa Tenggara; Buleleng District, Bali; and Padang City, West Sumatra.	Nusantara Nature Conservation Foundation
Implementation of small-scale fisheries guidelines for gender equitable and climate change resilient food and livelihood systems (talk show, drawing competition, fish cooking demo, and mini exhibition)	Banyuwangi Regency, East Java Province	FAO and MMAF
Economic empowerment and alternative economic activities to encourage the independence of fisherwomen	Three villages: Margolinduk, Purworejo, and Morodemak	Puspita Bahari Fisherwomen Community
Energy and economic independence training for the Bali coastal women's community, with the theme "diversification of mangrove non-timber forest products (NTFP) business"	Beaches in Bali	Ministry of Women Empowerment and Child Protection; Udayana University, and utilities company PT. PLN Indonesia Power Bali Power Generation Unit (PGU)
Empowerment of fishermen's wives through blue blood digital marketing strategy (DMS) *Darah Biru*	Mayangan Village, Probolinggo City	University of Muhammadiyah Malang
Creative economy development for coastal women's communities after the COVID-19 pandemic	Supatuo Community Galeso Village, Wonomulyo District, Polewali Mandar Regency, West Sulawesi Province	University of West Sulawesi
Women fishers forum, focus group discussion or pre-consultation for the National Fisheries Strategy	Ilik-namu on Atauro Island, Timor-Leste	MAP and Worldfish
Women's empowerment and participatory monitoring of small-scale fisheries	Ilik-namu, Fatumeta, Ma'abat, Beto Tasi, Lian-lidu	Grupu Monitorizasaun Peskas (GMP)/Fisheries Monitoring Group
Training on seafood processing for women	Manufahi Municipality	ATSEA-2 Programme, MALFF Timor-Leste

Source: Authors' elaboration

Therefore, incorporating gender perspectives into sustainable development planning is essential for creating inclusive, equitable, and effective policies and initiatives that truly benefit societies and promote long-term well-being for all (Stacey *et al.*, 2019).

Gender equality is a fundamental human right (UN-DESA, 2023). In addition, gender equality is closely linked to economic growth. Gender-sensitive policies promote access to quality healthcare, which is essential for overall human development. Women often have deep connections to natural resources and play key roles in sustainable resource management. Integrating gender perspectives in environmental policies can enhance conservation efforts. The SAP commits to assessing gender issues in every programme, project, and activity. In addition, SAP implementation takes the following steps to foster and ensure gender mainstreaming (Brugere, 2015):

- review and understand gender issues;
- consider gender at every stage of the SAP drafting process;
- allocate sufficient budget for gender mainstreaming;
- train and develop capacity for gender awareness;
- involve highly motivated members of the community and local government to champion gender equality; and
- ensure gender consideration in the monitoring process, such as for data collection.

Another crucial social aspect that the SAP commits toward is that of the rights and involvement of customary communities or people. Involving customary communities ensures that projects are contextually relevant and respectful of local values and needs. Their participation increases the likelihood of project success and sustainability and can help shape policies that prioritize sustainability and environmental protection. In summary, involving customary communities or people in sustainable projects not only contributes to environmental preservation but also respects their rights, knowledge, and cultural heritage. Several steps taken toward the consideration of customary people are early engagement and consultation, respect for traditional knowledge, free, prior, and informed consent (FPIC), cultural sensitivity, inclusive decision making, customary land rights, capacity development, benefit sharing, cultural heritage protection, environmental impact assessment (EIA), conflict resolution mechanisms, long-term engagement, collaborative partnerships, communication, and monitoring and evaluation (GEF, 2014; IFAD, 2019). The SAP implementation will ensure that customary people are valued partners in sustainable development initiatives and that their rights and contributions are respected and upheld.

4.2.4 Social and political considerations for strategic action programme implementation

The social and political perspective forms the framework for the development of livelihoods in Indonesia's fisheries sector. The sustainable management of marine resources aims to support local communities by enhancing sustainable livelihoods. Enhanced social sustainability resulting from the implementation of SAP activities is crucial for fostering political stability within the ISLME region. The implementation of SAP engages with various factors that exert influence on the political dynamics in this area and this requires:

- integrating SAP priorities into national policies, legal frameworks, development plans, and budgets to ensure a harmonized approach.
- coordinating legal respect. This means developing an approach that respects the legal systems of both countries, including their commitments to binding or voluntary international legal agreements and conventions.
- ensuring a strong commitment to implement the identified actions within the SAP, aimed at resolving transboundary and shared challenges.
- monitoring and evaluating political developments to prevent deviations from regional collaboration and a tendency to engage in unilateral actions.
- monitoring political dynamics to proactively influence any shifts away from collaborative regional action (this makes use of effective communication and aims to generate high-level political support); and
- ensuring compliance with international agreements to which each country is party to such as the Indian Ocean Tuna Commission (IOTC) and Western and Central Pacific Fisheries Commission (WCPFC) (Surowidjojo *et al*., 2019).

4.3 Capacity development, knowledge management, and communication

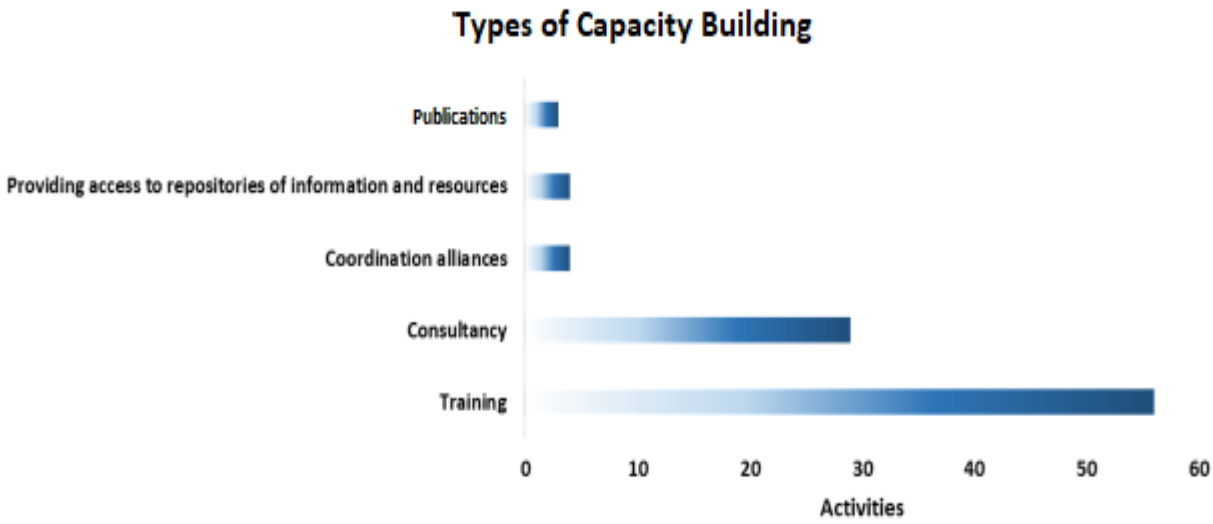
Capacity development, knowledge management, and communication are integral components of the ISLME initiative and together form a synergistic framework that drives the success and sustainability of the ISLME initiative, and several agreed SAP actions directly pertain to these areas of intervention.

4.3.1 Capacity development

The strategic capacity development initiative encompasses a range of essential elements in human resources to ensure effective implementation and collaboration for the advancement of sustainable and integrated management in the ISLME region.

This will include the enhanced capabilities of human resources involved in various activities related to fisheries and marine resource management in the ISLME (Figure 13).

Figure 13. Types of capacity development which will be applied in strategic action programme implementation of the Indonesian Seas Large Marine Ecosystem



The capacity development activities in the national action plans that have been discussed during the consultative meetings between Indonesia and Timor-Leste consist of five types with training being the most prominent capacity development activity. Training generally plays a role in enhancing the abilities of development partners across all PECs. It is conducted for various development target participants with the aim of supporting the achievement of general and specific objectives.

The recipients or targets of capacity development in the national action plan (NAP) are parties that play a direct or indirect role in enhancing the effectiveness of ISLME management. Training activities aimed at developing or enhancing skills will be designed based on the recipients' needs. Recipients include community members and resource users (fishers, farmers, women, youth), government staff (e.g. inspectors, harbour masters, extension workers), and also staff of development partners' institutions (NGOs).

Knowledge transfer will be delivered by facilitators or trainers, including from scientific communities, NGOs, and government entities. Both countries' lead ministries, MMAF and MALFF, have capacity development branches which will play a key role in these initiatives. Knowledge transfer is not restricted to just one party, as it is also open to the participation of various stakeholders, including those engaged in knowledge transfer, facilitating, and coaching. NGOs are able to participate in

numerous activities because of their capability in enhancing capacity, both within the government framework and among coastal communities. Knowledge transfer can be delivered in the form of workshops, training, coaching, tutorials, lectures, tailored to specific needs. Details can be seen in Annex 2.

Capacity development in ISLME can be implemented in certain actions to achieve the expected capabilities of target groups. To build a good and established network among stakeholders is crucial to enhance the human capacity of the subjects of programme implementation. Coordination in certain actions, such as establishing and using collaborative platforms for knowledge exchange among stakeholders, will only be effective in fostering innovative solutions and active engagement if supported by capable human resources. This also applies to coordination of funding sources through national consultations and specific plans for effective SAP actions and policies. Capacity development is also needed for developing the stakeholder partnership forum to mobilize, research, and enhance coastal livelihoods in coordination with a regional network of institutions. In addition, the establishment of mechanisms to evaluate progress by documenting and sharing successful practices requires facilitators for learning and emulating the success story by conducting the capacity development in specific technical regional meetings and training activities, including outcomes evaluation. Furthermore, in some priority areas of both countries, capacity development of stakeholders involving ecosystem-based management needs to be enhanced in relation to the collaboration with UN bodies and related organizations through training initiatives and workshops.

In the case of priority sites and their suitability for the implementation of key fisheries species management, the involvement of local governments in the EAFM programme and provincial sites, as well as their capacity to adopt EAFM and EAA approaches for the benefit of communities and fishers, is critical. In addition, support from partners such as NGOs and international agencies in the pilot sites is also instrumental (FAO, 2021).

4.3.2 Communication and knowledge management

The knowledge management of the SAP implementation involves a range of activities with the aim to successfully carry out the project by raising the awareness of various stakeholders. These activities include regional actions specified in the SAP, establishing additional initiatives that align with its goals and objectives, and developing partnerships among stakeholders. The main focus is on documenting and sharing best practices, establishing a repository of successful approaches, and facilitating the sharing of knowledge among stakeholders. Dialogue and consultation

among stakeholders as engagement efforts provide knowledge to be shared to transform data and information into evidence-based decision making, and also to build consensus and a collective contribution in achieving the SAP's objectives. Communication objectives, messages, and media are based on the targeted groups or recipients of information (i.e. national, provincial and local governments, the public and private sectors (including resource users), donors, and the scientific community) and on their growth context (FAO, 2020).

A well-structured communication strategy is essential for effectively conveying information to various groups of stakeholders. Developing proper strategies to meet the specific needs and growth contexts of various groups is crucial in order to maintain coherence and relevance. In the SAP, the strategy is designed to support better communication among various groups of stakeholders, with emphasis on governments, scientific communities, coastal communities, the targeted public (e.g. fishers, women, youth), private sectors related to fishing and marine tourism, media, and donors. Each group of stakeholders has distinct requirements for information regarding their function and involvement in communication strategies. For example, the government, as the authority figure and decision maker, contributes to developing cooperation and implementing sustainable fisheries policies based on the availability of measurable data. The members of the scientific communities (researchers and academic institutions) seek, gather, and analyse research data and transform it into scientific information which is accessible to policymakers and the public. The data and information is then socialized and published to reach the public through media, either in scientific events, common dissemination, or via social media. Addressing policymakers and higher-level government staff, the most common form of information transfer is through policy briefs produced on the basis of research information. In this part, the role of NGOs as the government’s independent counterparts in public communication will be significant. Press releases and NGOs can also provide information for the government and general public regarding specific issues.

The strategy highlights the need for providing communication methods, content, and paths for diverse targeted groups, thus ensuring the information disseminated meets the specific needs and interests of each group. Within the ISLME initiative, communication tools and products have been deliberated on with a view to their establishment in collaboration with various governmental bodies such as the Directorate General of Capture Fisheries, MMAF Indonesia, Ministry of Agriculture and Fisheries, now the Ministry of Agriculture, Livestock, Fisheries and Forestry (MALFF), and the Ministry of Environment in Timor-Leste. Supported by key

international organizations such as the FAO and GEF, these tools will include a comprehensive website, social media channels, media relations, newsletters, and policy briefs, also during the ISLME SAP implementation phase.

The rising influence of social networks is both unavoidable and crucial for enhancing website visibility. The proposed website aims to establish a concurrent platform and strategy dedicated to leveraging social networking and web marketing for the project. This approach will integrate pre-existing social media networks to sustain and elevate public awareness regarding scientific aspects and accomplishments of the project. The project's website stands as the primary communication hub, seamlessly connecting project countries, stakeholders, and global partners. It integrates various media formats, offers an open-access data repository, and facilitates a crucial feedback loop.

Media relations constitute a significant part of the strategy, involving press releases, field visits, workshops, and promotional publications. The purpose is to effectively disseminate project-related information across diverse media platforms, ensuring maximum visibility and impact. Additionally, a newsletter is set to showcase project progress and upcoming activities, distributed to partners, stakeholders, and interested individuals within and beyond the region, drawing upon input and content provided by project partners and stakeholders. The policy brief works as a significant tool, offering a concise yet comprehensive overview of critical issues, policy options, evidence, and actionable recommendations. This targeted document is tailored for policymakers and influencers, underscoring the importance of evidence-based policy formulation. The current ISLME Policy Brief Series specifically identifies key issues, proposed actions, supportive evidence, and impactful recommendations for effective policy implementation.

The ISLME communication strategy and knowledge management has progressed by initially identifying specific target audiences and setting communication objectives. This was followed by formulating key messages tailored for these audiences, and subsequently choosing suitable communication products to effectively deliver these messages. In accordance with the protocols and bureaucratic procedures of the respective government agencies in Indonesia and Timor-Leste, the process was structured to align with coordination and administrative stages, ensuring compliance with governmental guidelines in both countries.

4.4 Monitoring and evaluation

Monitoring and evaluation (M&E) activities are conducted within the framework of the NAPs and the SAP. These efforts are aimed at facilitating the achievement of key objectives, which include the recovery of unsustainable fishing and aquaculture practices, the restoration of degraded marine habitats, the revitalization of biodiversity and critical marine species, and the enhancement of adaptive measures to address the impacts of climate change.

4.4.1 Indicators for monitoring and evaluation

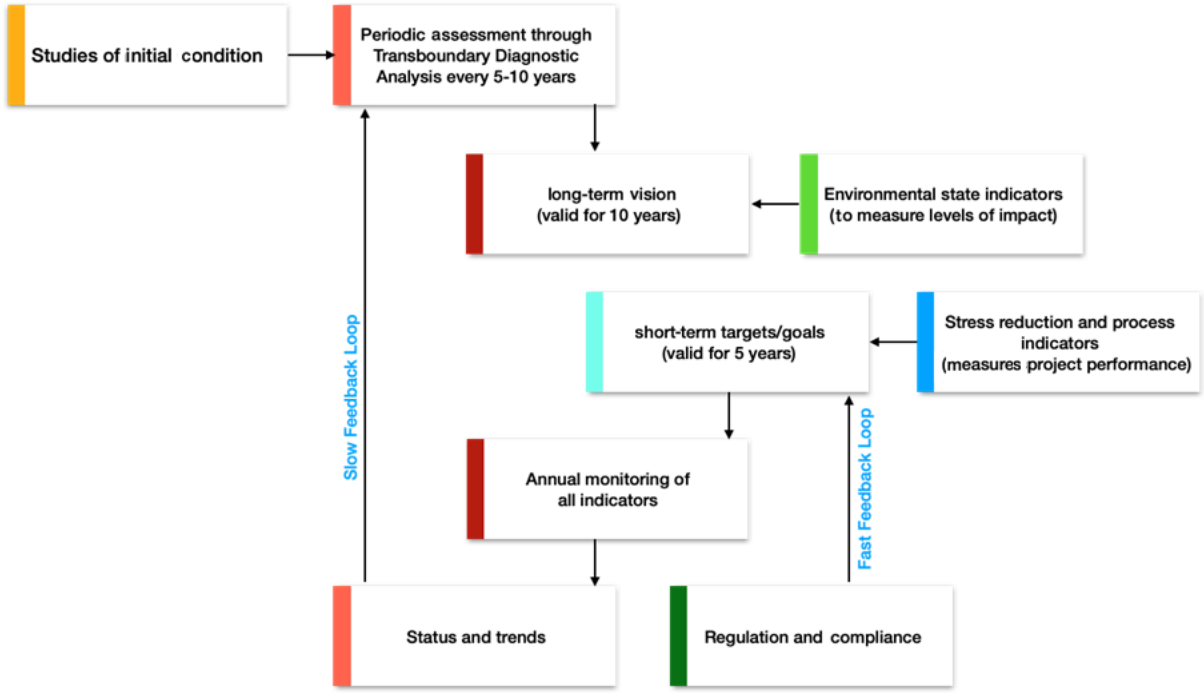
The SAP functions as a dynamic and ever-evolving document. Within this framework, effective M&E emerges as a fundamental role of the SAP Coordination Unit. Effective M&E are essential components of the SAP implementation process. In general, M&E is implemented under the NAPs and the SAP to support and assess the achievement of the established objectives. The Regional Mechanism Unit is the overall responsible body for carrying out the monitoring and evaluation of the implementation of the SAP. Initially, mostly process indicators are used to measure progress in these areas.

- ISLME SAP implementation adapts in response to shifts in the region's political and economic dynamics, environmental factors, and the advancement of scientific knowledge.
- The purpose of the SAP includes the continual enhancement, refinement, and streamlining of the mechanisms and procedures integral to the proposed actions.
- It reduces uncertainties stemming from the intricate natural environment, as well as those arising from the complexities of the social systems and technological advancements.
- Interventions and initiatives encompassing institutional arrangements, legal and policy reforms, knowledge reinforcement, awareness campaigns, and the development of human capacities are expected to yield tangible results and contribute significantly to the achievement of objectives.
- The successful application of management measures with a direct impact on the ecosystem are assessed through the utilization of ecosystem indicators.

M&E is essential to ensure sustainable positive outcomes from the implementation of the SAP. Figure 14 outlines that the M&E process begins with studies into the initial condition (baselines) of the region resulting in periodic assessment through the TDA every five to ten years. A long-term vision as well as short-term objectives and targets are subsequently established. The M&E of the ISLME project forms two

feedback loops, involving regular yearly monitoring of established M&E indicators. The first is a rapid feedback loop between the short-term targets and the observed changes in regulation and compliance. The second is a slow feedback loop that leads from the observable long-term status and trends into periodic assessment.

Figure 14. Monitoring and evaluation flowchart



Source: Authors' elaboration based on the results of regional workshops

Project M&E will be conducted in collaboration with the respective ministry branches and Regional Secretariat, to ensure that all stakeholders responsible for supervision are actively involved in the process. To ensure effective and rigorous M&E, several indicators have been established to assess the output of SAP implementation. The indicators for M&E are outlined for each goal within the relevant components of SAP, as presented in Section 3.2, Figure 6 and in Annex 3.

4.4.2 The mechanism for monitoring and evaluation

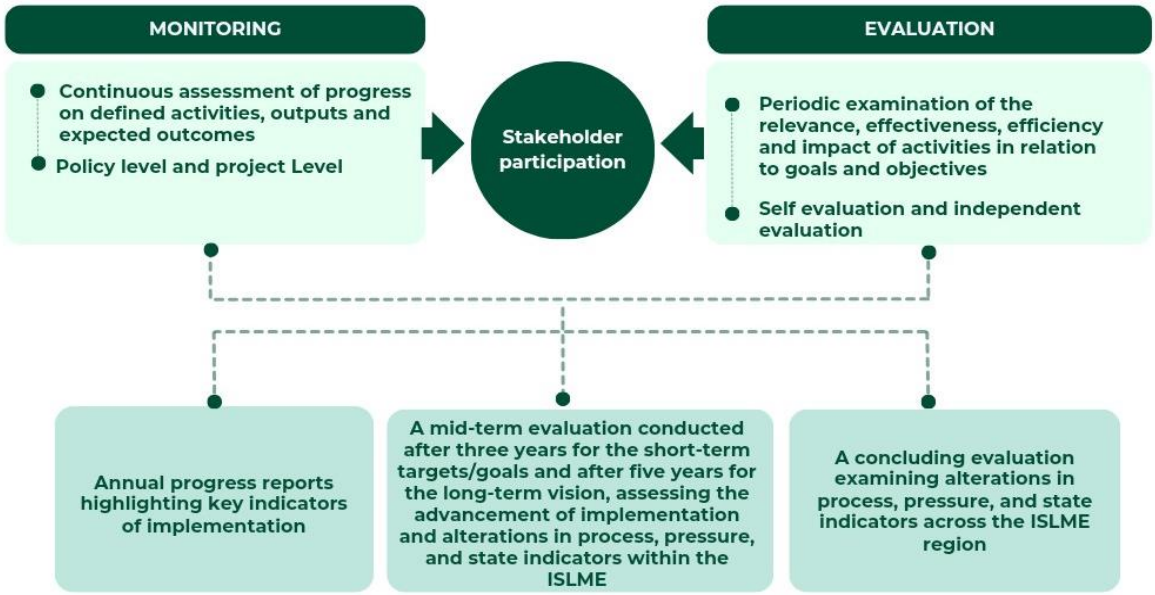
The principal role of monitoring and evaluating the implementation of the SAP lies with the ISLME Regional Mechanism (Figure 15). The following reporting mechanisms are established:

- Annual progress reports highlighting key indicators of implementation.
- A mid-term evaluation conducted after three years for the short-term targets/objectives and after five years for the goals and long-term vision,

assessing the advancement of implementation and alterations in process, pressure, and state indicators within the ISLME.

- A concluding evaluation examining alterations in process, pressure (stress reduction), and state (environmental status) indicators across the ISLME region.

Figure 15. Monitoring and evaluation mechanism for the Indonesian Seas Large Marine Ecosystem



Source: Authors' elaboration based on the results of regional workshops

The Binational (Regional) Steering Committee is responsible for supervising the monitoring and evaluation of the implementation of the SAP. Furthermore, the monitoring and evaluation of the SAP implementation typically involves a collaborative effort among multiple stakeholders, including national and binational steering committees.

4.4.3 Risk management and sustainability

During the development of the SAP, several risks were identified that could negatively affect the implementation of the project, leading to unsustainable results down the line. The main potential risks and mitigation strategies identified in the ISLME region are shown in Table 13.

Table 13. Risks and mitigation strategies

Risk	Mitigation
Inadequate financial support: e.g. limited financial resources at the district and provincial levels.	Seek additional financial support from strategic partners (i.e. multilateral and bilateral partners and private sector partners).
Ineffective government regulations: e.g. overlapping of government frameworks and the gaps, limited compliance, monitoring, and enforcement in regards to them.	Coordination and cooperation, as well as lobbying for clear government regulations (no gaps and overlaps); and by generating better awareness of and compliance with regulations.
Political will and ineffective governance: allocation of responsibility and accountability is not always well-defined. The presence of overlapping or clashing legislation also causes further ambiguity.	Clear coordination and communication between government institutions, and more effective participation of resource users or their representatives in management advice and decisions.
Weak coordination between related stakeholders: the absence of a suitable platform for multinational discussion, planning, monitoring, and reporting on sustainable development progress is an institutional barrier.	Annual capacity building for government institutions.
Inadequate cooperation and coordination between multiple stakeholder levels (i.e. regional, national, and sub-national) and coastal communities: e.g. insufficient community-based planning and management leads to unsustainable outcomes.	Comprehensive and inclusive regular coordination meetings on all governmental levels, with prominent evaluation on each outcome.
Unpredictable events (force majeure): e.g. natural disasters, economic recessions, and military conflicts	SAP implementation adapts to these unpredictable circumstances as they arise.
Donor priorities and timeline: e.g. a lack of adherence to donor requirements and priorities. The extended timeline of SAP implementation in the ISLME project may result in outdated or less relevant information within the established TDA because of possible gaps between project phases.	Optimizing the timeline and scales of the project activities, so they are implemented on time and on target.

Source: Authors' elaboration

The SAP has taken these risks into consideration, with measures put in place to assess and mitigate them. Actions to garner financial and political support and foster adequate stakeholder coordination have also been formulated for the action plans and targets. Furthermore, financial support from strategic partners (multilateral and bilateral partners and private partnerships) for implementing the ISLME SAP has also been arranged, as well as donor agreements and financial mechanisms. For instance, Indonesia envisions itself as a global hub for carbon sequestration, playing a pivotal role in maintaining the sustainability of our planet and addressing the fluctuations in global climate. This comprehensive approach also includes the preservation of marine and coastal ecosystems, not only as sources of nourishment and economic prosperity, but also as crucial base and components of a sustainable future.

The indicators analysed and presented in the M&E section serve to monitor the progress of each initiative's efforts to generate positive outcomes from various strategies. Within the SAP, there are three types of indicators: (i) process indicators, which track the advancement in implementing activities involving stakeholders; (ii) stress reduction indicators, which indicate the results of management measures; and (iii) impact indicators, which demonstrate improvements in the environment, resources, and the human community as a result of implementing these management measures. The framework employed for implementing the ISLME SAP is primarily focused on adaptive and effective management. This SAP offers guidance to resource managers in terms of their actions and is refined based on the outcomes of management activities reported by resource managers to policymakers.

5 Conclusions

The ISLME is unique in how it connects two independent countries—Indonesia and Timor-Leste—and both states rely on its ocean resources. However, there are several issues and challenges to achieving a sustainable ISLME. The management of the ISLME by both countries requires improved administrative skills in each country and joint management in various fisheries and marine sectors. The two countries require proper collaboration and coordination of their joint efforts to maintain these resources in a sustainable manner.

The ISLME SAP document develops a strategy for securing long-term sustainability by focusing on five critical environmental priorities that require immediate attention: (i) maintaining sustainable fisheries; (ii) restoring marine habitat biodiversity; (iii) reducing marine pollution; (iv) protecting and conserving endangered, threatened and protected (ETP) and key marine species; and (v) responding adequately to climate change challenges and impacts.

The implementation of this SAP document is in line with FAO's vision and is closely related to the global goals set out in the UN SDGs. As members of the global community, Indonesia and Timor-Leste are obliged to participate in the implementation of the SDGs. Most notably, the SAP is intended to make a significant contribution to achieving SDG 14, which emphasizes the conservation and sustainable use of the ocean and to other related SDGs. This SAP also works toward achieving SDG 3, SDG 5, SDG 10, SDG 13, and SDG 17. The implementation of this SAP is also in line with the vision of the two countries, namely the Indonesian Vision 2045 and the Timor-Leste Strategic Development Plan 2011–2030. These efforts will significantly improve the fisheries sector, conserving marine biodiversity and critical marine habitats in the ISLME region, which will contribute to achieving the national goals of both countries.

Sustainable fisheries

Sustainable fisheries are a crucial pillar to achieving the ISLME vision. However, numerous challenges confront its realization, including unsustainable fishing practices, the declining health of ecosystems, the impacts of climate change on small-scale fisheries, high fish farm feed costs, limited aquaculture practices, excess fishing capacity, and substantial bycatch and discards. To address these issues, the action plans emphasize two primary strategies: (i) the recovery and sustainable management

of fisheries resources; and (ii) the enhancement of sustainable aquaculture, particularly mariculture. These endeavours encompass a range of priorities such as:

- the implementation of the ecosystem approach to fisheries management (EAFM);
- reduction of illegal, unreported, and unregulated (IUU) fishing;
- the bolstering of compliance with fisheries regulations; and
- support for sustainable small-scale fisheries.

Improving sustainable aquaculture practices is a key priority, and it can be achieved by ensuring that stakeholders are fully familiarized and compliant with fisheries laws, as well as by building the capacity to implement EAA and GAP at both managerial and technical levels. These initiatives are underscored by quota-based fisheries management designed to mitigate overfishing and regulate the number of fishing vessels.

Human well-being

The strategic actions outlined in this SAP document not only address the ecological and environmental aspects of the ISLME but also emphasize the importance of enhancing human welfare. Gender mainstreaming, a critical component of the SAP, plays a pivotal role in realizing the ISLME vision concerning human well-being. Gender equality is intricately linked to economic growth and fosters essential access for overall human development. Another crucial aspect is the engagement of local customary communities and individuals. Their involvement can provide significant insight to develop policies that prioritize sustainability and environmental protection that is aligned with their cultural values. Customary communities are valuable partners in sustainable development initiatives, and their rights and contributions are respected and upheld. By nurturing economic opportunities, food security, and community resilience, the objective is to elevate the quality of life for all people in the ISLME region, thereby advancing human welfare and promoting equitable development.

Ecosystem well-being

Coordinated transboundary waters management between Indonesia and Timor-Leste addresses unsustainable fishery practice and their ecological impact. In addressing the challenge of ecosystem well-being in the ISLME, the SAP emphasizes key strategies, which comprise the establishment of new marine protected areas to enhance the vitality of critical marine habitats, such as seagrass, mangroves, and coral reefs. Efforts are also directed toward rehabilitating the ecosystems to sustain

ecological health and resilience. Behavioural change initiatives are an urgent measure needed to reduce plastic consumption not only in marine tourism areas and coastal communities but also in other related communities. This will require integrated coordination in water management, in some cases, such as excess sedimentation, also watershed management. The implementation of the SAP will contribute to sustainable management of the environment, ensuring that the ISLME remains a provider of valuable ecosystem services for the ISLME communities.

Good governance

The SAP implementation holds the promise of strengthening relations between Indonesia and Timor-Leste, thus fostering effective coordination between the two governments. This endeavour places a strong focus on specific aspects, such as enhancing collaboration among project partners, conducting regular scientific observations to monitor the state of the ISLME, enhancing governance cooperation of both countries, and simultaneously reinforcing participatory governance approaches and structures. These collaborative initiatives are aimed toward achieving sustainable ISLME management through the SAP, and they require the Binational Steering Committee (BSC) and National Interministerial and Intraministerial Steering Committees (NSCs) to facilitate cooperation among national institutions and strategic partners, including resource users and donors, as well as to ensure a holistic approach to governance that transcends borders and ministries.

The ISLME SAP envisions the establishment of sustainable fisheries and healthy oceans that provide an ecosystem beneficial for long-term prosperity. Implementing the SAP could assist the future efforts of MMAF Indonesia and MALFF Timor-Leste in achieving a balance between the use of ocean natural resources and the quality of life for the communities in this region, while ensuring the sustainability of the ocean ecosystem. Overall, the ISLME SAP document serves as a set of fundamental best practices for preserving the ocean ecosystem and offers guidance to ocean stakeholders and practitioners worldwide in their efforts to protect the Earth's vital ecosystems for future generations.

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Annexes

Annex 1 Causal chain analysis for priority environmental challenges (PECs)

PEC 1: Declining productivity and sustainability of ISLME fishery and aquaculture

SECTORS – artisanal and small-scale fisheries, industrial fisheries, aquaculture at all scales.

CATEGORIES – coral reef fisheries, reef gleaning, offshore fisheries, IUU fishing, seaweed farms, offshore caged culture, coastal pond culture.

IMPACTS

ENVIRONMENT

- Decline in pelagic, invertebrate, reef fish, and other local fish stocks, also non-target species.
- Decline in reef biodiversity, ecosystem health and water quality.
- Reduced fisheries production and smaller-sized fish.
- Change in fish population structure.
- Degradation and loss of marine habitats, particularly benthic habitats from impacts of fishing gears and fishing activities.
- Loss of coastal habitat and nutrient pollution from coastal land and water-based aquaculture
- Shading effects on seagrasses from poorly managed seaweed culture.
- Spread of diseases, introduced feral species and threats to local species from introduced cultured species.

SOCIOECONOMIC

- Lower catches, and declining profitability of fishing, and high operational costs to fish further offshore.
- IUU-associated organized criminal activities.
- Reduced production, increased losses, and higher operating costs for aquaculture.
- Pristine coastal scenery and its economic values are negatively affected.
- Negative impacts on coastal subsistence communities, traditional harvesting, reef gleaning, and culture/customary practices.
- Reduction in livelihoods/family income, decline in national and seafood revenue.
- Increased household poverty, food insecurity, malnutrition.
- Diverging perspectives and potential conflicts among local fishers, reef users, and other coastal-marine users.
- Emigration from rural and coastal communities.

IMMEDIATE CAUSES

- Inefficient management of domestic fisheries.
- Overcapacity and overfishing; high fishing pressure in most fishing grounds including commercial and SSF.
- IUU fishing and destructive fishing practices, capture of juvenile and immature fishes.
- High level of fisheries bycatch and discards.
- High demand for marine fish as feeds and fishmeal for aquaculture.
- Poor on-farm aquaculture practices.
- Insufficient regulation of aquaculture and inadequate attention to environment, ecology and other conflicts.

UNDERLYING CAUSES

GOVERNANCE

- Insufficient regulatory capacity for aquaculture and capture fisheries at all levels.
- Limited effectiveness of improvement in compliance, enforcement, monitoring, surveillance, and reporting.
- Future aquaculture production growth targets not aligned with sustainable development principles.
- IUU fishing by domestic commercial and SSF vessels.
- IUU activity of foreign vessels and vessels operating under foreign beneficial ownership.
- The prevalence and fragmentation of rights and the decentralized governance systems, leads to gaps or overlaps in the regulatory and management regimes for coastal and marine resources, especially fisheries.

SOCIOECONOMIC

- Limited development of fisheries value chains, financial and human resources.
- Harmful incentives and poorly targeted fuel subsidies.
- Inadequate incorporation of fishery management plans.
- Significant numbers and widespread distribution of artisanal, subsistence, and small-scale fishers.
- Aquaculture that conflicts with other users of water / land areas and local versus external investor conflicts.

- The approach to management of the fisheries and aquaculture subsectors is inadequately framed in environmental, governance and socioeconomic terms.

ROOT CAUSES

GOVERNANCE

- Archipelagic geography challenges of huge coastline and fragmentation of systems.
- Overlapping legal and institutional frameworks at all levels.
- Unclear property rights, land and marine tenure.
- Inadequate decentralized and intersectoral planning at all levels.
- Insufficient political will for stronger regulation of the sector.
- Low priority of sustainable fisheries in national and marine policy making, including blue economy.
- Cultural and traditional practices in support of sustainable fisheries and aquaculture management not well analysed and recognized.

SOCIOECONOMIC

- Population growth, pressure for food, employment and housing.
- High proportion of the population living in the coastal zone dependent on coastal resources for livelihoods.
- National food security, high levels of domestic seafood demand (Indonesia) for national food security.
- Limited availability of alternative coastal and rural livelihoods options.
- High levels of poverty, low levels of education/literacy.
- Limited environmental awareness and environmental responsibility.
- Economic development and revenue maximization (seafood production) prioritized over sustainability.
- Foreign earnings – high demand for seafood export, access to global markets (Indonesia).

PEC 2: Degradation and Loss of Marine Habitats)

SECTORS – coastal development, agriculture, aquaculture, fisheries, industry, mining, marine tourism.

HABITATS – coral reefs, seagrasses, mangroves, soft sediments and beaches, seamounts, pelagic and demersal.

IMPACTS

ENVIRONMENT

- Coastal habitat degradation: loss of critical habitat.
- Decline of ecosystem health and reduction of ecosystem services, marine biodiversity decline.
- Decline of marine living resources and key species including ETP species dependent on these habitats.

SOCIOECONOMIC

- Reduced fulfilment of food and livelihoods needs.
- Loss of coastal resources (including coastal protection offered by healthy habitats).
- Emigration because of negative effects on livelihoods dependent on marine resources.
- Reduced tourist attraction (loss of potential marine wildlife tourism).

IMMEDIATE CAUSES

- Progressive development within coastal area (housing, tourism, fuel wood, building materials, urban, industry) disregarding ecosystem sustainability.
- Unregulated coastal habitat and resource use activities such as destructive fishing practices and overfishing predominantly by small-scale fishers.
- Changing land use (aquaculture, palm oil, agriculture, grazing livestock, salt production, mining).
- Increasing shipping and maritime transport (ports, shipping lanes, building materials, road construction).
- Destructive fishing practices.

UNDERLYING CAUSES

GOVERNANCE

- Predominantly production-based approach ignoring ecosystem-based management (including MPA, mangrove management).
- Weak regulatory and enforcement capacity.
- Insufficient capacity to use and implement coastal spatial management.
- Limited regulatory capacity at local level to conserve or protect critical habitats.

SOCIOECONOMIC

- Insufficient financial support for coastal management effort by local communities.
- Insufficient education effort in in raising the public awareness of the environment.
- Inadequate capacity development effort for conservation skills of coastal community.

- Policy focuses on restoration rather than conservation.
- Insufficient environmental impact assessment capacity and implementation for larger scale development.
- Limited local government capacity in marine habitat management.

ROOT CAUSES

GOVERNANCE

- Short-term development policy does not require incorporation of long-term considerations for environmental sustainability and maintenance of integrity of ecosystem services.
- Policy and responsibility overlap between institutions.
- Divergence in planning and executing of adaptive management at all levels (*e.g.*, conservation zoning and fisheries zoning not synchronized).
- Legal uncertainty over resource use, development, and protection.
- Insufficient government understanding of ecosystem services.

SOCIOECONOMIC

- Short-term demand for livelihoods and services of natural resource exploitation.
- High dependency on coastal resources for national food security and livelihoods.
- Large coastal population and anthropogenic stressors.

PEC 3: Marine and Land-Based Pollution

SECTORS – industries, maritime transport, agriculture and forestry, mining, tourism, and recreation, offshore energy, fisheries and aquaculture, urbanization.

CATEGORIES – marine debris and plastics, sediments, sewage, and nutrients, heavy metals and contaminants, oil spills, invasive marine species.

IMPACTS

ENVIRONMENT

- Decline in water quality.
- Decline in environmental quality driven by land-based nutrient sources (*e.g.*, harmful algal blooms (HAB), high coastal turbidity).
- Increased marine contaminant impacts on marine life: acute (toxicity) and chronic (*e.g.*, growth, reproductive health).
- Increased bioaccumulation in the food chain (toxicants, plastics).
- Increased marine debris from multiple sources (land based and marine-based activity) endanger marine life: *e.g.*, ingestion, entanglements in discarded fishing gear.

SOCIOECONOMIC

- Contaminated seafood, threats to human health.
- Cost of treating illnesses.
- Aesthetic impacts reduced visual amenities, and economic value of coastal areas.
- Reduced marine tourism potential for coastal communities (diving, sport and game fishing, marine wildlife tourism).
- Loss of foreign exchange earnings.
- Cost of environmental 'clean-up', wildlife rescue.
- Increased monitoring, surveillance, and enforcement costs.

IMMEDIATE CAUSES

- Point and non-point land-based sources of nutrients and pollutants (industrial, mining, and urban waste).
- Increased flooding (freshwater, pollutants, etc.) and domestic waste, debris, plastics entering the ocean (riverine inputs), sediment loads from soil erosion.
- Atmospheric deposition (*e.g.* greenhouse gases, sulphur dioxide or acid rain, lead, organic chemicals).
- Use of antibiotics and chemicals in fishing and aquaculture practices, chemical fertilizers, and pesticides (agricultural runoff).
- Marine debris - solid waste from shipping and fishing industries including discarded fishing gears.
- Marine fouling, unauthorized discharges, and accidental spillages (marine pests, ballast water, fuel/oil, sewage).

UNDERLYING CAUSES

GOVERNANCE

- Inadequate waste and wastewater treatment, control, disposal, and management of coastal urban developments.
- Inadequate monitoring, regulation, and management of small-scale polluting activities (*e.g.* artisanal mining, aquaculture, recreation).
- Inadequate marine pollution monitoring.
- Deficiency in environmental impact assessments.
- Insufficient ICM, poor planning and coordination in coastal development.
- Criteria for development approvals not well defined including that of licensing potentially polluting activities.
- Lack of watershed management.

SOCIOECONOMIC

- Insufficient investment, policies, programs to implement 'best practices' for reducing excess nutrients (from all sources).
- Growing and intensive seafood demand (fisheries, aquaculture), maritime transport sectors and growing oil/gas sector.
- Insufficient biosecurity and quarantine facilities at ports, and waste disposal facilities (solid waste, including fishing debris).
- Limited financial and human resources (particularly at local district, province level).
- Improper land use, poor catchment, and agricultural practices.

ROOT CAUSES

GOVERNANCE

- Inadequate decentralized and intersectoral planning at all levels.
- Ineffective translation of political will into implementation.
- Less priority given to environment and habitat conservation.
- Insufficient appreciation and valuation of ecosystem services (in decision-making).
- Low environmental awareness and responsibility; poor application of precautionary principle, unsustainable development models.

SOCIOECONOMIC

- High proportion of population living in the coastal zone, making it vulnerable to anthropogenic impacts.
- Major dependence on maritime shipping, infrastructure and transport, and coastal industries.
- National energy security - rapidly growing energy sector, particularly coal, offshore oil/gas.
- Generation of export income from production of industrial products that have poorly controlled pollution impacts.
- Suboptimal nature of habitual behaviour in waste reduction and disposal.

PEC 4: Decline of Biodiversity and Key Species

SECTORS – fisheries, marine tourism, maritime transport.

CATEGORIES – coral reefs, sharks and rays, sea turtles, whales and dolphins, dugongs, crocodiles.

IMPACTS

ENVIRONMENT

- Decline in marine biodiversity and species diversity, including high-value fish, invertebrates, sharks and rays, pelagic fish, coral species, marine mammals, and marine reptiles.
- Decline and loss of critical habitat of key marine species.
- Human and vessel disturbance to marine wildlife, affecting behaviour, feeding, nursing, and reproduction.
- Negative impacts on the health and function of marine ecosystems because of the loss of higher-order predators and the spread of introduced marine species (displacing native species).
- Introduction and spread of marine pests, diseases [shipping ballast water, aquaculture introductions and escapes].
- Contamination of seafood by various industrial, agriculture, and aquaculture pollutants.

SOCIOECONOMIC

- Negative impacts on local coastal communities including increased poverty, food insecurity, displacement of fishermen, loss of livelihoods and employment, and decline in economic status.
- Loss of cultural totems and traditions (turtles in Bali, crocodiles in Timor-Leste), including traditional harvesting and hunting, and the decline and loss of existing and potential marine ecotourism assets and value.
- Illegal activities, including transboundary fishing and illegal wildlife trade (shark fin, turtles shell, manta ray gills, dugong tusks).
- Impacts on human health (eating contaminated seafood).
- Human-crocodile conflicts in certain areas (Timor-Leste).

IMMEDIATE CAUSES

- Unsustainable and destructive fisheries practices (overfishing, bycatch, and IUU fishing).
- Removal of keystone ecosystems species, leading to proliferation of other species.
- Legal and illegal trade of live reef fish, marine aquarium species, and traditional medicines.
- Declining water quality and increasing marine pollution, affecting especially coral ecosystem health.
- Inadequate management of critical habitats and key marine species.

UNDERLYING CAUSES

GOVERNANCE

- Weak regulatory capacity and law enforcement of marine species protection and conservation.
- Limited site-based conservation, critical habitat protection, and waste management.
- Insufficient information about critical habitats.
- Insufficient standardized monitoring, information generation and sharing (*e.g.* on ITF).
- Difficulties in regulating trade in CITES listed ETP species.

SOCIOECONOMIC

- Inadequate support for community-based conservation efforts (*e.g.* LMMA).
- Limited resources and inadequate public awareness of impact of demand and trade in ETP species products.
- High local cultural demand of ETP species resources (*e.g.* shark fins and turtle eggs).

ROOT CAUSES

GOVERNANCE

- High vulnerability and risk to the coastal zone and marine environment.
- Ineffective governance and legal frameworks and weak political will to address biodiversity issues.
- Inadequate environmental awareness and unsustainable development.
- Archipelagic geography and large population in coastal areas.
- Insufficient understanding of the relation between Indonesian Throughflow (ITF) and marine biodiversity.

SOCIOECONOMIC

- High dependency on coastal resources, prevalence of coastal subsistence communities.
- Lack of alternative coastal and rural livelihoods.
- Pressure for food, employment, and housing in the coastal zone.
- High levels of poverty and low levels of education/literacy.

PEC 5: Climate Change Impacts

SECTORS – Energy, agriculture, mining, industry, maritime transport, aquaculture, fisheries, marine tourism.

CATEGORIES – sea level rise, ocean warming, ocean acidification, oceanographic change, seasonal variability, storms, and storm surges.

IMPACTS

ENVIRONMENT

- Coastal degradation and islands sinking: loss of habitats, wetlands, beaches, and coral reefs, leading to impacts on biodiversity, fisheries, and critical habitats.
- Increased riverine flooding and landslides because of deforestation and poor catchment practices).
- Reduced freshwater resources: increased saltwater intrusion, salinization, and flooding leading to loss of freshwater resources.
- Climate-driven temperature changes: altered marine fauna and flora distribution, temperature-dependent sex determination (altered sex ratio fish and reptile), and reduced ocean productivity (algal blooms).

SOCIOECONOMIC

- Economic impacts: loss of foreign exchange and domestic earnings from seafood and tourism due to effect on fish resources and key marine habitats.
- Increased operational costs for fishing in increasingly distant fishing grounds.
- Impacts on local coastal communitiesncreased poverty, food insecurity, malnutrition, loss of livelihoods, employment, emigration, and cash income.
- Negative impacts on traditional practices and culture.
- Inundation and flooding leading to damage and loss of infrastructure and access: affecting coastal settlements, roads, agricultural land, and transportation infrastructure.

- Ocean warming related shifts in distribution of fish populations and on growth and productivity of fish; also, acute events of coral bleaching.
- Impacts on shellfish populations: decline and loss because of ocean acidification.
- Impacts on coastal agricultural and aquaculture production.
- Increased risks and dangers for fishermen: Decreased fishing time, unpredictable weather, and sea safety concerns leading to increased maritime accidents.
- Increased water and food insecurity: loss of freshwater resources and increased reliance on fishing during drought, as well as increased costs for accessing food and water on remote, small islands.

IMMEDIATE CAUSES

- Insufficient implementation of climate-smart, low-carbon, and climate-resilient approaches as well as EAFM.
- Climate variability (increased temperature and temperature variability, greater heat stress, prolonged droughts).
- Changes in precipitation patterns (more intense rainfall events, riverine flooding, and droughts).
- Extreme weather events (increased frequency and intensity of extreme weather events; strong winds, storms, storm surges, and cyclones).
- Changes in ocean conditions (ocean warming; increase SST, hypoxia, change in oceanographic processes).
- Ocean acidification and sea level rise (increasing coastal inundation, saltwater intrusion, reduced calcification.

UNDERLYING CAUSES

GOVERNANCE

- Inadequate protection and governance of marine habitats.
- Inadequate climate risk monitoring, predictive modelling, and adaptation planning.
- Insufficient integration of climate change in fisheries and habitat management planning.
- Loss of seagrass, mangroves and other forests leading to decline in natural carbon storage.
- Inadequate research and dissemination of information on GHG and other climate related issues.

SOCIOECONOMIC

- High coastal population density, with high vulnerability and limited adaptive capacity to cope with climate change impacts.
- Reduced climate change resilience of coastal ecosystems.
- Harmful incentives and poorly targeted subsidies encourage development that is vulnerable to climate variability.
- Insufficient support for nature-based climate solutions and incentives (*e.g.* mangrove/seagrass conservation and restoration).
- Limited investment, market instruments, and incentives for renewable energy.
- Limited financial and human resources available

ROOT CAUSES

GOVERNANCE

- Archipelagic geography challenges (*e.g.* insufficient mangrove conservation and general habitat management).
- Ineffective governance and legal frameworks.
- Insufficient implementation of coordinated inter-sectoral planning (*e.g.* One Stop Services).
- Modest environmental awareness, appreciation, and responsibility.
- Global threat of increased carbon emission which is not controlled.

SOCIOECONOMIC

- High dependency on coastal resources.
- Economic development and revenue maximization prioritized over sustainability.
- Population growth and pressure for resources.
- Limited infrastructure and economic diversification.
- Global and national phenomena (*e.g.* increase of GHG emissions and deforestation).

Annex 2 National action plans based on national and regional strategic action programme meetings

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
PEC 1 (Declining productivity and sustainability of ISLME fishery and aquaculture)				
General Objective: Recovery and sustainable management of fisheries resources Specific Objective 1: Strengthening the implementation of EAFM (for specific fisheries and fisheries management areas)				
ID	Sustainable support for optimization in fisheries management institutions (MMAF).	● Capacity building (human resources) (**Y1-Y5**; FMA: 573, 712,713,714, 715)	800	4 trainings x 5 FMAs = 20 trainings, 25 people per training; est. IDR 600 million/training
		● FGD: Evaluation of the implementation of fisheries policies and learning centre for EAFM managerial training. (**Y1-Y5**; FMA 573, 712,713,714, 715)	1 500	1 FGD x 5 FMAs x 5 years = 25 FGDs, 100 people per FGD, est. IDR 900 million/FGD
		● Training and capacity building (EAFM managerial sectors) and regional coordination for MCS (**Y1-Y5**; FMA 573, 712,713,714, 715)	800	4 trainings x 5 FMAs = 20 trainings 25 people per training; est. IDR 600 million/training, the training: EAFM Planner, EAFM Implementor, EAFM Evaluator, EAFM Lead
		● Workshop and capacity building socioeconomics related to EAFM (**Y1-Y5**; FMA 573, 712,713,714, 715)	200	1 workshop x 5 FMAs = 5 workshops 30 people per training est. IDR 600 million/workshop
		● Implementing the harvest strategy in all FMA, identify the data on economic reef fish or pelagic fish that are already being overfished to make quota-based fisheries, and control the input variable (**Y1-Y5**; FMA 573, 712,713,714, 715)	80	Data collection (3rd parties): IDR 400 million/HS HS: HS Snapper 573, HS Grouper 573, HS BSC 713
ID	Sustainable additional support review and implementation of fisheries management plans (FMP)	● Workshop on review and implementation of FMP FMA 573, 712,713,714, 715 (**Y1-Y5**; FMA 573, 712,713,714, 715)	2 000	5 workshops x 5 FMPs = 25 workshops 50 people per workshop
ID	Support development, review, and implementation of fisheries commodities management	● Workshop on development and evaluation of best management practice (BMP) on fish priority commodities (FMP): lobster, lemuru, mud crab, flying	7 000	3 workshops x 7 species x 5 FMAs = 105 workshops 50 people per workshop est. IDR 1.000 million/workshop

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
	plans (FMP) (lobster, lemuru, mud crab, flying fish, blue swimming crab, snappers and groupers)	fish, blue swimming crab, snappers and groupers (**Y1-Y5**; FMA 573, 712,713,714, 715)		
ID	Support development and implementation of harvest strategy (HS) including harvest control for priority species (snappers, groupers and blue swimming crabs)	● Workshop on development and implementation of harvest strategy (HS) including harvest control for priority species: snappers, groupers and blue swimming crabs (**Y1-Y5**; FMA 573, 712,713,714, 715)	1 800	3 workshops x 3 species x 5 FMAs = 45 workshops 30 people per training est. IDR 600 million/workshop
TL	Support development and implementation of fisheries management plans	● EAFM plans for potential commercial fishery resources and areas (Timor-Leste) ● Revision of Fisheries Law (general regulation and ministerial diploma) (**Y1-Y5**; north coast of Timor-Leste)	80	5 workshops x 20 people (USD 16 000 per workshop)
TL	Support the implementation and harmonization of traditional and formal law related to fisheries management in the ISLME	● All fishery resources ● Revising the fisheries law and Tara bandu rules ● Harmonizing the law between three maritime border areas such as Australia, Indonesia and Timor-Leste ● Enhance the knowledge of fishers to apply voluntary compliance (70 percent) ● Collaborating with local authorities to help control the fishers because of limited human resources. (**Y3-Y5**; north coast of Timor-Leste)	150	3 trainings x 30 people = USD 9 000; 3 workshops/meeting x 20 people = USD 6000
Specific Objective 2: Reduction of IUU fishing and increasing compliance with fisheries regulations				
ID+TL	Support capacity development of fisheries stakeholders (fisheries inspector (*pengawas perikanan*), harbour masters (*syahbandar*), assistant harbour masters (*asisten syahbandar*), fishers, regional	● Recruiting and capacity building for: fisheries inspector (*pengawas perikanan*), harbour master (*syahbandar*), assistant harbour master (*asisten syahbandar*) Note: Fisheries inspector (Directorate PSDP) (**Y1-Y5**; All ISLME region (FMA 573, 712, 713, 714, 715) and TL north coast)	500	3 trainings x 5 FMAs = 15 trainings est. IDR 500 million/training est. 25 participants/training

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
	coordination, *pokmaswas*) to increase the reporting and MCS of fishing activities (before, during and after fishing)			
		● Training and capacity building (fishers, fisheries inspector, and law enforcements) Note: Fisheries Resources Management (PSDP) (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	660	2 trainings (fisheries inspectors & fisheries investigators) x 5 FMAs x 2 times in 5 years = 20 trainings; est. IDR 500 million/training, est. 25 participants/training
		● Training and capacity building (fisheries inspector), regional coordination for MCS, strengthening of vessels for MCS. (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	500	1 training/ technical guidance/ workshop x 5 FMAs x 3 times in 5 years = 15 trainings/ technical guidance/ workshop est. IDR 500 million/training est. 25 participants/training
		● Training and capacity building, facilitating financial support for MCS. Note: PSDP (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	500	1 training/ technical guidance/ workshop x 5 FMAs x 3 times in 5 years = 15 trainings/ technical guidance/ workshop est. IDR 500 million/training est. 25 participants/training
		● Social acceptance and financial support for VMS transmitters (**Y1-Y2**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	1 600	1 unit of VMS transmitter = IDR 18 million, support for fishing vessels size 10-20 GT about 200 FVs x 5 FMAs = 1,000 FVs, total = 1,000 x 18 million = IDR 18 billion - 1 socialization x 5 FMAs x 2 years = 10 socializations (est. IDR 700 million / socialization, est. 100 participants/ socialization total = 10 x IDR 700 million = IDR 7 billion
		● Awareness raising activity and capacity building by socialization of fishers and regencies stakeholders level. (**Y1-Y5**; All ISLME region)	1 000	1 training + 1 dissemination = 2 meetings 1 meeting x 5 FMAs x 5 years = 25 meetings (est. 30 participants est. IDR 600 million / meeting)

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
		● Capacity building for *pokmaswas* (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	840	1 Technical Guidance (Bimtek) x 5 FMAs x 5 years = 25 Bimtek est. 50 participants est. 500 million/bimtek
		● Capacity building & training of reporting traceability for fishers, fisheries inspectors and harbour masters, law enforcement (*administrative sanction/ fine*) (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	500	1 training/ technical guidance/ workshop x 5 FMAs x 3 times in 5 years = 15 trainings/ technical guidance/ workshop est. IDR 500 million/training est. 25 participants/training
		● Dissemination of human rights policy for fishermen working in fishing vessels. (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	340	1 training/ technical guidance/ workshop x 5 FMAs x 2 times in 5 years = 10 trainings/ technical guidance/ workshop
		● Training on strengthening the stipulation of NPSK (norms, standards, procedures, and criteria), organizations, and human resources and operational monitoring infrastructure in the provincial and regency region. (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	500	1 training/ technical guidance/ workshop x 5 FMAs x 2 times in 5 years = 10 trainings/ technical guidance/workshop
		● Implement or install the infrastructure to strengthen surveillance such as Ocean Monitoring System that is integrated with high design technology (AUV Autonomous Underwater Vehicle), underwater drone, drone, real-time data satellite, IoT based system in vessels or local fisherman boat and arrange events such as a technical coordination meeting between MPA managers to share knowledge about fisheries regulations (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	1 000	Pelaksana Dit KKHL dan/atau Pusdatin (Command Centre)
ID+TL	Support for the strengthening of the coordination of Indonesia–Timor-Leste fisheries rules and arrangements in border regions (i.e. Atauro Island,	● Social acceptance of the regulations, joint research, FGD, MoU on MPA, IUU and transboundary fishers, strengthening existing programmes (government officials) (**Y1-Y5**; the boundary waters)	400	1 socialization in border region 1 socialization x 5 years = 5 socializations = IDR 500 million x 5 = IDR 2.5 billion (est. 50 participants) 2. FGD; 3 FGDs x 2 times in 5 years = 6

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
	Batugade, Oecusse, Covalima)			FGDs = IDR 500 million x 4 = IDR 3 billion (est. 30 participants/FGD)
ID+TL	[Before fishing] Improve and expand catch-effort reporting/monitoring (recruiting and building capacity for: fisheries inspector (*pengawas perikanan*), harbour master (*syahbandar*), assistant harbour master (*asisten syahbandar*). In Timor-Leste, strengthening of PesKAAS and capacity development of inspectors and national maritime authorities	● Recruiting and building capacity for: fisheries inspector (*pengawas perikanan*), harbour master (*syahbandar*), assistant harbour master (*asisten syahbandar*). (**Y1-Y5**; All ISLME region (FMA 573, 712, 713, 714, 715) and Timor-Leste north coast)	500	3 trainings x 5 years = 15 trainings est. IDR 500 million/training est. 25 participants/training
ID+TL	[Before fishing] Social programme and dissemination of regulations and fisheries laws to fishers (e.g. online registration procedure, online outlet) and strengthening pre-departure inspection	● Training and capacity building (fishers, fisheries inspector) ● Information campaign (socialization and dissemination) (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	1 000	1 socialization x 5 FMAs x 5 years = 25 socializations est. IDR 600 million per activity est. 100 fishers as participants
ID+TL	[During fishing] Increasing effectiveness of monitoring, controlling, surveillance (MCS)	● Training and capacity building (fisheries inspector), regional coordination for MCS, strengthening of vessels for MCS. (**Y1-Y5**; All ISLME region (FMA 573, 712, 713, 714, 715) and Timor-Leste north coast)	360	1 training x 5 years = 5 trainings est. IDR 600 million / training; est. 30 participants; 1 coordination meeting x 5 years = 5 meetings; est. IDR 500 million / meeting; est. 30 participants

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID+TL	[During fishing] Supervising MCS provincial institution (*bidang pengawasan* DKP); strengthening MCS institutions in Timor-Leste and potentially decentralized	● Training and capacity building, facilitating financial support for MCS. (**Y1-Y5**; All ISLME region (FMAs 573, 712, 713, 714, 715) and Timor-Leste north coast)	400	2 technical guidances/workshop x 5 years = 10 technical guidances/workshops IDR 600 million / workshop
ID+TL	[During fishing] Increasing number and quality of log-book record keeping, Strengthening current Kobo Toolbox-peskAAS tools in tablets in Timor-Leste	● Awareness raising activity and capacity building by socialization of fishers (**Y1-Y5**; All ISLME region)	1 000	1 socialization x 5 FMAs x 5 years = 25 socializations est. IDR 600 million per activity est. 100 fishers as participants
ID+TL	Harmonize & coordinate Indonesia-Timor-Leste fisheries rules, arrangements in border regions (i.e. Atauro Island, Batugade, Oecusse, Covalima) Ombai strait and Wetar strait	● Social acceptance of the regulation, joint research, FGD, MoU on MPA, IUU and transboundary fishers, strengthening existing programmes (government officials) (**Y1-Y5**; The boundary waters)	400	2 meetings x 5 years = 10 meetings est. 30 participants est. IDR 600 million/meeting
Specific Objective 3: Support to the implementation of the Sustainable Small-scale Fisheries (SSF) Guidelines as per NPOA and regional strategy of SSF				
ID	Support the review and implementation of NPOA SSF	● Dissemination of NPOA SSF document ● Regional workshop on evaluation of NPOA SSF, current version 2021–2025 effectiveness. (**Y1-Y3**; The ISLME region)	200	1 dissemination = est. IDR 600 million 2 regional workshops = est. IDR 1.2 billion/workshop

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID	Support the facilitation and acceleration of small fishing vessel registration through the provision of booths in fishing ports	● Booths in fishing ports for the registration of fishing vessels <5GT ● Support fishing gear for SSF, provide fishing zone for SSF <5GT especially in MPA that are already being gazetted, banned or restricted fishing activity for industry fisheries, capacity building or training for local communities or empowering women to create some variant food from fish, seaweed, etc. and connecting the local communities to the market that are be able to access the financial programme (**Y1-Y5**; The ISLME region)	1 000	2 events x 5 FMAs x 5 years = 50 events event = boat registration booths/fishing vessel ID book est. IDR 300 million/event
ID	Strengthening coordination at national and local levels to support co-management of SSF (promoting co-management (through *pokmaswas*)	● *Sasi* (FMA 715), *Awig-awig* (FMAs 713, 573) (**Y1-Y5**; Timor-Leste, FMA 573, 713, 715)	450	3 locations x 3 field visits x 5 years = 45 field visits est. IDR 150 million/field visit
ID+TL	Promote livelihoods enhancements and diversification along the fisheries value chain market, as well as alternative livelihoods outside the fisheries value chain for fishers (with emphasis on women to reduce pressure on fishing), particularly in fishing communities and adjacent to “no-take” protected areas (CoastFish-TL)	● Capacity building, training for livelihood diversification ● Capacity building in fisheries and aquaculture in all chains and tourism sectors (UMKM for Indonesia and livestock in Timor-Leste) ● Sustainable management gleaning fishery for women & children in coastal community ● Provide options for livelihoods, educate communities on gleaning activity without damaging the marine environment ● Gleaning: strengthen management (the gleaning size not indicated in the fisheries law. During current research shows that the impacts of gleaning activity still at the tolerance level ● The Fisheries law specifies the minimum size of species but does not specify for gleaning therefore target species for the gleaning must be identified (**Y1-Y5**; All FMA (ID), Batugade and Beacou (TL)	500	5 training events in the field x 5 FMAs = 25 training events est. IDR 300 million / training est. 25 participants

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID+TL	Strengthening coordination at national & local levels to support co-management of SSF	Socialization and training and MPA network, one island one management, focuses on the fishing areas (as some of the rules cover wide range of sectors including forestry). ● *Tara bandu* (local), MPA regulation (national) ● *Sasi* (FMA 715), *Awig-awig* (FMAs 713, 573) (**Y1-Y5**; Timor-Leste, FMA 573, 713, 715)	120	6 coordination meetings (5 local areas & 1 national) est. 25 participants est. IDR 300 million / meeting
		● Financial facilitation for business capital (–1 - Y5; All FMAs (ID), Batugade and Beacou (TL))	100	1 training in field x 5 FMAs = 5 trainings est. 25 participant, est. IDR 300 million
		● Environmental education for children in coastal community (Y1-Y5; All FMAs (ID), Batugade and Beacou (TL))	100	1 dissemination in field x 5 FMAs = 5 disseminations, est. IDR 300 million est. 25 participants
General Objective: Strengthening of sustainable aquaculture (mariculture) practices, including Ecosystem Approach to Aquaculture (EAA), Good Aquaculture Practices (GAP)				
ID	Develop national standards on mariculture and brackish aquaculture primary commodities as a Good Aquaculture Practice	● Develop Indonesia National Standards (SNI) on mariculture and brackish aquaculture primary commodities ● Training on ecolabel of aquatic products for ocean sustainability ● Training and dissemination of policy regulation of captured fish for each fisheries management area. ● Training on Implementation of good fish cultivation practices (CBIB) to groups of farmers (**Y4-Y5**; Jakarta)	400	4 workshops on developing standards 25 people per workshops est. IDR 600 million/workshop 6 training events 50 people per training est. IDR 600 million/workshop
ID	Develop stakeholder capacity regarding EAA and IMTA implementation	● Training and dissemination of EAA to marine fish farmers and related stakeholders ● Workshop on IMTA demonstration plots in University of Mataram (**Y3-Y4**; Provinces consist of islands i.e. NTT, NTB, North Maluku, Maluku)	200	2 trainings x 2 locations = 4 trainings 25 people per training est. IDR 600 million/training 1 workshop 50 people per training est. IDR 600 million/workshop

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID	Support acceptance of the Implementation of Risk-Based Business Licensing (PP No 5/2021) and Business and Product of Standard on the Implementation Risk-Based Business Licensing in the Maritime and Fisheries Sector (MAF Regulation No. 10/2021)	● Dissemination of Government Regulation of Republic of Indonesia No. 5/2021 regarding the Implementation of Risk-Based Business Licensing and Ministry of MAF Regulation No. 10/2021 regarding Business and Product Standard on the Implementation of Risk-Based Business Licensing in the Maritime and Fisheries Sector (**Y4-Y5**; Provinces consist of islands) i.e. NTT, NTB, North Maluku, Maluku	260	2 workshops x 2 locations = 4 workshops est. IDR 1 billion/workshop 100 people per workshop
ID+TL	Support for ranching and wild capture fisheries especially for lobster, blue swimming crabs, mud crabs in terms of differing objectives and management (i.e. operational, regulatory, administrative), including recognizing juvenile capture as a wild capture fisheries	● Capacity building, training for related stakeholders ● Workshop on implementation of capture fishery related to good aquatic practice and government related licensing (PKKPRL and PKKPRD) (**Y1-Y5**; Provinces consist of islands)	1 000	5 workshops on developing standards 50 people per workshops est. USD 50 000 /workshop 5 training sessions 50 people per training session est. USD 50 000/workshop
ID	Capacity building for ranching and wild capture fisheries especially for lobster, blue swimming crabs, mud crabs in terms of differing objectives & management (i.e. operational, regulatory & administrative), including recognizing juvenile capture as a wild capture fishery	● Capacity building, training for related stakeholder (**Y1-Y5**; Provinces consist of islands) i.e. (lobster) NTT, NTB, (mud crabs) East Kalimantan, North Kalimantan (Tarakan), blue swimming crab (Demak, FMAs 712	1 000	5 training sessions x 5 locations = 25 training sessions est. IDR 600 million/training

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
TL	Support milkfish culture by promotion of hatchery raised fry	● Infrastructure and capacity development (**Y2-Y4**; TL north coast)	200	12 Capacity buildings (4 activities per year) x 25 people = USD 10 000 2 upscaled operations = USD 10 000
TL	Seaweed aquaculture	● Capacity building and training for all aspects including technical, marketing and distribution (**Y1-Y5**; Atauro, Beacou, Metinaro)	100	3 locations x 5 years = 15 activities
TL	Increasing of broodstock of Nila hatchery	● Capacity development of Broodstock Nila (Red tilapia), increase production Tilapia monosex program (**Y1-Y5**; North coast of TL (Batugade, Beacou, Metinaro))	50	Capacity development in 3 locations for 5 years= 15 activities
PEC 2 (Degradation and Loss of Marine Habitats)				
General Objective: Restoration and conservation of marine habitats (coral reefs, mangroves, and seagrass beds)				
Specific Objective: Strengthening of marine habitat conservation measures (e.g. of marine protected areas)				
ID+TL	Support coastal ecosystem restoration measures	● Capacity building on the importance of marine conservation and implementing citizen science in local communities ● Coral transplantation, mangrove and seagrass restoration for its carbon sequestration role, and planula seedling ● Training on strengthening the stipulation of NPSK (norms, standards, procedures, and criteria), Organizations, and human resources and operational monitoring infrastructure in the provincial and regency region. (**Y1-Y5**; MPA rehabilitation of all zones and Timor-Leste north coast)	25	Raise awareness and capacity building for 5 years (USD 5 000 per year)
ID	Support for the evaluation of potential new MPAs	● Workshop on guidelines or policy briefs on the process of establishing new MPAs (**Y1-Y5**; Marine Protected Area (FMA 712, FMA 713 FMA 714, FMA 715))	1 000	5 FMAs x 5 years = 25 activities (USD 40 000 per activity)

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID	Developing capacity of local communities to be involved in the monitoring and management of MPA ecosystems	● Capacity building and training for local communities to protect their MPAs ● Dissemination to "customary communities" (Masyarakat Adat Hukum) in the monitoring MPA ecosystem ● Recruiting and capacity building for: marine and fisheries resources inspector (*pengawas sumberdaya laut dan perikanan*) ● Forum group discussion with private sectors and NGOs and conducted bilateral cooperation for strengthening marine habitat conservation (**Y3-Y4**; MPA's area (FMA 712, FMA 713 FMA 714, FMA 715))	128	10 capacity building events x 50 people = USD 100 000; 5 disseminations x 30 people = USD 28 000
ID	Revitalizing MPA management on potential spawning aggregations and nursery grounds	● Training on monitoring and evaluation of spawning aggregations and nursery grounds ● Workshop on exploring potential entrance fees for MPAs to help support MPAs management (**Y3-Y4**; FMA 714)	145	2 training sessions x 2 years = 8 activities = USD 90 000; 5 workshops x 2 years = 10 activities = USD 5 500
ID	Support the management and evaluation of existing MPAs	● Workshop on the evaluation of the core zone area for new MPAs (stakeholders) ● Workshop on MPA management effectiveness by upscaling application of EVIKA ● Workshop on EVIKA application and bilateral cooperation with private sectors and NGOs (**Y3-Y5**; FMA 714)	100	6 workshops x 3 yearss x 50 people = 18 meetings = USD 100 000
ID+TL	Establish integration between FMA (fisheries management plan) and conservation zone and develop fishing rules based on co-management	● Bilateral workshop on Habitat Conservation Measures and Fisheries Management Plan (–3 - Y5; FMA 714 and North coast of Timor-Leste)	100	6 workshops x 3 years x 50 people = USD 100 000

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID	Develop institutional frameworks on sustainable fisheries practices	● FGD for related stakeholders (fishers, traders, local communities, universities, and governance at different levels) on handling trawling impacts on benthic ecosystems and marine biota ● Training on eco-friendly fishing gear for resource users ● Workshop on importance of fish fry distribution to enhance the sustainable fisheries. (**Y1-Y5**; 5 FMAs in the ISLME)	1 000	5 years x 2 FGDs x 5 FMA x 50 people = 50 activities = USD 30 000; 5 years x 5 FMAs x 2 trainings = 50 activities USD 300 000; 5 years x 5 workshops x 5 FMA = 125 activities = 40000 USD
TL	Raise awareness about marine habitat conservation for local communities	● Training for community members for mangrove and coral reefs plantation and restoration (**–1 - Y2**; coastal community, local government, conservation communities)	100	3 trainings x 2 years x 50 people x 3 locations = 18 activities
TL	Increase the size of MPA's area	Identification new potential MPA and existing MPA (**Y1-Y5**; North coast of TL)	1 000	3 areas x 3 activities x 5 years = 45 activities
TL	Assessment of the effectiveness of the existing MPA and monitoring and evaluation for existing MPA	● Developing fishery strategy plan in MPA ● Natural fish parks for the north coast (fish breeding grounds are transboundary) (**Y1**; north coast of TL)	40	3 workshops x 50 people
TL	Strengthening of the ecosystem health monitoring	● Coral and seagrass ecosystem monitoring data (**–1 - Y5**; MPA's area in North Coast of Timor-Leste)	100	1 2 workshops x 5 years = 10 activities 2 3 monitoring x 5 years = 15 activities
TL	Establishment of MSP (Marine Spatial Planning)	● Capacity building for MSP ● Inter-ministerial level coordination. (**Y1-Y5**; North coast of Timor-Leste)	1 500	3 capacity buildings x 5 years = 15 activities (USD 100 000); 3 coordination meetings x 5 years = 15 meetings (USD 500 000)
PEC 3 (Marine and Land-Based Pollution)				
General Objective: Improving of water quality				
Specific Objective 1: Reduction of marine litter (incl., ghostnets) and prevention of plastic waste entering coastal and marine waters				

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID+TL	Support the reduction of marine debris in coastal tourism areas	● Socialization and educational activities on marine debris threats ● Develop trash bank in the local communities ● Implementation of regulations on reducing single-use plastic ● Increasing the quantity of trash bins in tourism areas and fishing ports ● Beach cleanup action ● Dissemination of plastic production policy from plastic manufacturer ● Recruiting and capacity building for: marine and fisheries resources inspector (pengawas sumberdaya laut dan perikanan in regencies area. (**Y1-Y5**; Timor-Leste and FMA 712, FMA 573) Students, local communities, university, and government	1 000	• 1 socialization x 6 locations = 6 activities (USD 10 000); • 1 implementation x 6 locations = 6 activities (USD 10 000); • 1 beach cleanup action 6 locations x 5 years = 30 activities (USD 30 000); • 1 dissemination x 6 locations = 6 activities (USD 10 000) • 1 recruiting and capacity building x 6 locations x 50 people = 6 activities (USD 40 000)
ID+TL	Promote incentive-based approaches for discharged fishing nets and other port-based litter based on economic circularity and developed Standard Operation Procedure (SOP) for pilot fishing ports	● Workshop for the development of incentive-based approach for discharged fishing nets and other port-based litter SOP ● Socialization of incentive-based approach for discharged fishing nets and other port-based litter SOP ● Implementation of incentive-based approach for discharged fishing nets and other port-based litter SOP in pilot fishing ports ● Dissemination of regulations on fishing port cleanliness and waste disposal ● Select fishing ports for ISLME interventions – (**Y1-Y5**; 5 fishing ports in the ISLME) e.g. PPN in North Java-Cirebon and Eastern Indonesia-PPN Ternate and 2 harbours in Timor-Leste	1 000	1 workshop x 7 locations x 30 people = 7 activities (USD 20 000)

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID+TL	Promote waste disposal facilities at fishing ports	● Increasing the quantity of trash bins ● Improve data recording on the departure and return of ships to and from ports to determine ship discharge waste ● Workshop on fishing related waste – oil, gears, boxes that processing waste is under HACCP. ● Conversion of ghost nets into useful products – e.g. trash containers ● Workshop on integration of fishing port cleanliness promotion with ecotourism (**Y1-Y5**; The ISLME (5))	1 000	· 3 workshops x 6 locations x 5 years = 90 activities (USD 90 000) · 1 dissemination x 6 locations = 6 activities (USD 10 000)
ID+TL	Raise awareness on marine debris threat to ecosystem	● Socialization and educational activities (**Y1-Y2**; Timor-Leste and FMA 712)	200	3 socialization and educational activities x 2 years x 4 locations = 24 activities
Specific Objective 2: Prevention and Reduction of eutrophication from agriculture/ aquaculture run-off				
ID	Support effective IMTA (polyculture) and silvo-fisheries application (aquaculture management)	● Workshop on incentive-based approach to brackish water pond technology ● Training and importance of physical structure improvement of run-off drainage across the aquaculture system ● Focus Group Discussion on agriculture run-off with various related stakeholders (e.g. MOA and MOEF) ● Workshop on biopore for waste water management (Instalasi Pengeloaan Limbah-IPAL) ● Government Focus Group Discussion (FGD) activities with communities in the agricultural sector to prevent and reduce eutrophication and discuss agricultural problem issues in the area. (**Y1-Y5**; FMA 712)	1 200	5 workshops/trainings/meeting activities Activity locations: Banjarmasin, Lampung, Cirebon, Surabaya, Jakarta Number of participants 40 people Activity days: 2 days
Specific Objective 3: Prevention and reduction of other forms of marine pollution from wastewater (incl. fuel waste, sedimentation, abrasion, intrusion, and mine tailings)				

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID+TL	Coordination in watershed management (for sedimentation)	● Focus Group Discussion on Watershed Management ● Training on reduction of sediments and installation of physical structure of waste-waste management over 500 000 inhabitants in cities ● Workshop on modelling for prediction of ENSO and IOD – on productivity, sediment and debris transport. ● Recruiting and capacity building for marine and fisheries resources inspector (pengawas sumberdaya laut dan perikanan) in each regencies area ● Recruiting and capacity building for local communities as marine debris inspector in each regency area ● Coordination between organization or stakeholders especially for land use utilization and bioremediation (**Y1-Y2**; FMA 712, FMA 713, Manado, Ombai, Laut Sawu, Bali, East Makassar and north coast of TL)	100	1 FGD x 2 years x 8 locations = 16 activities (USD 5 000) 2 trainings x 2 years x 8 locations = 32 activities (USD 40 000) 3 workshops x 2 years x 8 locations = 48 activities (USD 55 000)
ID+TL	Sediment control measures for mangrove and seagrass ecosystems	● Training on mangrove and seagrass plantation for local communities ● Mangrove and seagrass plantations ● Monitoring of mangrove and seagrass rehabilitation ● Data maintenance of mangroves and seagrass (**Y1-Y5**; 8 municipalities FMA 712)	125	1 training x 9 locations x 5 years = 45 activities (USD 30 000) 2 monitoring data x 9 locations x 5 years = 90 activities (USD 60 000) 1 mangrove plantation x 9 locations x 2 years = 45 activities (USD 30 000) 1 data maintenance x 9 locations = 9 activities (USD 5 000)
ID+TL	Support management availability data of river-to-sea sedimentation	● Workshop on related institutions at different levels (**Y1-Y5**; FMA 712, FMA 713, and north coast of TL)	125	3 workshops x 5 years x 3 FMAs = 45 activities
ID	Innovative measures in mine tailing treatment	● Research on mine tailing treatment ● Applied bioremediation using microbes, mangrove, and seagrass to local communities in affected areas (**Y1-Y5**; FMA 714 and 715)	125	2 research x 2 FMAs x 5 years = 20 activities
ID+TL	Support bilateral coordination of oceanography data centre of the ITF system	● Joint Workshop on oceanic data centre of the ITF system ● Dissemination of results on ITF, and impact of upwelling on pelagic species (modelling and prediction:	125	1 workshop x 5 years x 3 locations = 15 activities 1 dissemination x 5 years x 3 locations = 15 activities

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
		lemuru); ocean-climate prediction (**Y1-Y5**; FMA 712, FMA 713, and north coast of TL)		
ID	Enhance the coordination among stakeholders (government, industries, and communities)	● Workshop on ocean policy revitalization and coordination in mine tailing between related institutions at different levels (**Y1-Y2**; FMA 713, FMA 714, FMA 715)	80	2 annual workshops, @40 participants x USD 9 000
TL	Dissemination of integrated coastal management	● Training on integrated coastal management (**Y1**; 8 municipalities)	100	3 trainings x 8 location x 1 year = 24 activities
TL	Mangrove and seagrass rehabilitation	● Monitoring of mangroves and seagrass rehabilitation (**Y1-Y5**)	40	2 activities x 5 years x 8 locations = 80 activities
PEC 4 (Decline of Biodiversity and Key Marine Species)				
General Objective: Biodiversity of coastal and marine ecosystems recovered and maintained				
ID	Support mangrove and seagrass restoration	● Training on mangrove and seagrass plantation as marine ecotourism and edutourism ● Monitoring on mangrove and seagrass habitats ● Training on risk management for marine ecotourism and ● Workshop on upscaling of bamboo sediment trap and mangrove rehabilitation ● Monitoring and training on acoustic tagging: migration, routes, identification of conservation zones, and protection. ● Involve the community and NGOs to care for the environment and actively participate in national or international organizations. (**Y1-Y5**; All ISLME region)	1 000	1. 4 trainings or workshops (mangrove & seagrass plantation as marine and edu/ ecotourism, risk management, upscaling of bamboo sediment trap, acoustic tagging) x 5 years = 20 trainings 2. 2 monitorings (mangrove and seagrass habitat, acoustic tagging) x 5 years = 10 monitoring activities

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID	Support coral reefs conservation	● Workshop to raise awareness of local communities about the importance of coral reef ecosystems ● Capacity building (training) about coral transplantation for local and global communities ● Coral transplantation action ● Workshop on upscaling of Coastal Resilience Village Programme ("building with nature"); PRA and tailored solutions ● Dissemination of strict polices damaging of coral reefs (**Y1-Y5**; MPA Area and Coral Stock Center base UPT-PRL recommended location)	750	1. 1x dissemination for each area 2. 3 workshops or trainings (increasing awareness in coral reef, coral transplantation, upscaling coastal resilience) x 5 years = 15 workshops
ID+TL	Collaboration on early detection of coral bleaching using IoT	● Monitoring of coral bleaching through IoT ● Training on monitoring of coral bleaching through IoT ● Workshop on monitoring of coral bleaching through IoT (**Y1-Y5**; The ISLME)	500	Identifying priority location needed 2 trainings x 5 years = 10 trainings regionally 1 monitoring x 5 years = 5 monitorings regionally
ID+TL	Reducing the marine debris in coastal tourism area	● Students, local communities, university, and government ● Develop trash bank in the local communities ● Implementation of regulation about reducing single use plastic ● Increasing the quantity of trash bin in tourism area (**Y1-Y5**; FMA 712, FMA713, and north coast of TL)	500	Allocate the cost evenly to: Gradually develop trash bank in local communities from the first year with annual evaluation on the performance of the trash bank Add more trash bins to contain trash produced in tourism area
TL	Development of crocodile management plan	● Crocodile (Y1 - Y5; Timor-Leste)	50	
TL	Identification of marine coastal habitats of marine aquatic animals/ Mapping of marine and coastal habitats and disseminate conservation plans for the identified habitats	● Marine aquatic animals (**Y1-Y5**; north coast TL)	200	1 annual project 1 project dissemination x 5 years = 5 disseminations

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
General Objective: Conservation measures for ETP and migratory marine species promoted, implemented, and strengthened				
ID+TL	Promote transboundary cooperation and potential ISLME area for ETP species between related institutions at different levels regarding turtles, dugongs, whales, and dolphins	● Coordination on transboundary cooperation for ETP species ● Joint workshop on transboundary cooperation for ETP species ● Improving the facilities and infrastructure of ETP for ecotourism purposes ● Involve public in the management and utilization of the sea together by conducting focus group discussion (FGD) or socialization. (**YI-Y5**; The ISLME)	500	1 coordination meeting x 5 years = 5 coordination meetings 1 workshop x 5 years = 5 workshops regionally 1 FGD x 5 years = 5 FGD regionally
ID+TL	Optimization of turtle conservation centres	● Capacity building for local communities ● Improving the facilities and infrastructure of turtle conservation areas (**YI-Y5**; FMA 712, FMA 713)	250	1 training x 2 areas x 5 years = 10 trainings regionally Maintenance and necessary upgrade of the turtle conservation areas annually
ID	Support optimization of dugong conservation centres	● Workshop on potential new conservation centres ● Elevates the number of conservation species (**Y1-Y5**; FMA 712, FMA 713)	250	1 workshop x 2 areas x 5 years = 10 workshops
ID	Empowering local communities on shark, ray, and whale conservation	● Workshop on sustainable marine wildlife ecotourism guidelines and community-based enterprise development ● Workshop on legal definition and strict rules of attitude transition of traditional harvesting and traditional hunting of sharks, rays, and whales ● Raise awareness of shark, ray, and whale catch ● Pursue and support full membership of CMS and IWC to access international support or assistance for ETP species ● Support and collaborate with NGOs that provide incentives for sharks/rays release (**Y1-Y5**; FMA 713, FMA 712, FMA 714)	250	Public awareness 2 workshops x 3 areas x 5 years = 30 workshops
ID+TL	Coordination of traditional hunting of ETP species (needs to be confirmed	● Workshop on legal definition and rules around traditional harvesting and traditional hunting of turtle and dugongs ● Recruiting and capacity building for: marine and	250	1 workshop x 5 years = 5 workshops regionally 1 training x 5 years = 5 trainings regionally

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
	which division will be the PIC)	fisheries resources inspector (pengawas sumberdaya laut dan perikanan) in each regency area. (**Y1-Y5**; All ISLME region)		
TL	Increase and improve nesting area for turtle and dugong habitats	● Develop sustainable marine wildlife ecotourism guidelines and community-based enterprise-development ● Raise awareness of turtle and dugongs ● Capacity building on local communities ● Improving the facilities and infrastructure on turtle conservation area (**Y1-Y5**; north coast of Timor-Leste)	100	Development of guideline for 1 year 1 workshop (raising awareness about turtle and dugongs) x 5 years = 5 workshops; 1 training for local communities x 5 years = 5 training Maintenance and necessary upgrade for the turtle conservation centre annually
TL	Conservation measures for marine ETP and migratory marine species (whales, dugongs, dolphins, sting/manta rays, and sharks)	● Whales, dugongs, dolphins, manta rays, and sharks (**Y1-Y5**; North Coast of Timor-Leste)	100	1 annual project for 5 years
PEC 5 (Impacts of Climate Change)				
General Objective: Resilience of coastal and marine ecosystems to impacts of climate change strengthened				
ID+TL	Develop climate change awareness for all stakeholders in coastal communities	● Workshop on climate change awareness and adaptation. ● Training for higher education students to increase knowledge of ocean atmosphere science (university level in ISLME) ● Community development and empowerment activities related to stock and sustainability (**Y1-Y5**; All ISLME region)	240	5 annual workshops (3 FMAs) each year 5 annual trainings each year, @40 participants
ID	Support the incorporation of flood risk mapping and SLR projections into coastal development planning and approvals	● Workshop on the updating of flood risk Sea Level Rise (SLR) mapping (**Y1-Y5**; ALL ISLME region)	125	2 workshops x 5 years = 10 workshops
ID+TL	Expand community-based climate change education & participatory, risk	● Assessment of coastal community for climate change impacts, public awareness, ● Education and public information campaign (PIC) on	515	1 assessment project 2 trainings, 2 enhanced alternative source project

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
	assessments, mitigation & adaptation planning	climate change impacts by using the existing data. ● Training and education on climate change risk assessment mitigation and adaptation for women in coastal areas ● Enhanced alternative source of livelihoods such as horticulture, sewing activity for women, incentives, and others (**Y1-Y5**; All ISLME region)		
General Objective: Reduced vulnerability of coastal communities to impacts of climate change				
ID	Strengthen coordination at national and local levels to support climate action, including coastal vulnerability assessment, including integration with marine spatial planning laws (RZWP3K, RTRW)	● Coordination meeting for national and local institutions on climate change (**Y1-Y5**; ALL ISLME region)	125	2 meetings x 5 years = 10 meetings 2 meetings x 5 years = 10 meetings 1 workshop x 5 years = 5 workshops regionally
		● Coordination meeting for regional countries on climate change (**Y1-Y5**; ALL ISLME region)	125	2 meetings x 5 years = 10 meetings 2 meetings x 5 years = 10 meetings 1 workshop x 5 years = 5 workshops regionally
ID+TL	Strengthen regional and local data coordination on mapping, protection, warning, monitoring, and predictive climate risk modeling of cyclones, floods, sea level rise, and coral bleaching in priority areas.	● Workshop on data coordination for coastal vulnerability (SLR, maximum tidal range, maximum significance wave high, beach slope, coastal substrate type) mapping ● Create alternative employment opportunities and anticipate the lean season with aquaculture and micro, small or medium enterprises (**Y1-Y5**; ALL ISLME region)	250	2 meetings x 5 years = 10 meetings 2 meetings x 5 years = 10 meetings 1 workshop x 5 years = 5 workshops regionally
General Objective: Adaptation measures to climate change identified, promoted, and adopted				

Country	Objectives	Action Plan (activity, year, location)	Estimated Cost (x 1 000 USD)	Notes
ID+TL	Support nature-based climate solutions and incentives for blue carbon conservation, reforestation, and ecosystem restoration by local communities - for e.g. low carbon development plans (LCDPs, LCDI)	● Capacity building for raising awareness to local communities about climate change in coastal ecosystem ● Workshop on mitigation and physical structure for cold storage, reduction of fossil fuels in processing, blue carbon (seaweeds), with monitoring reporting and verification. ● Training on reduction of threats to seagrass areas (some seaweed farming, some mangrove planting) ● Workshop on blue carbon and incentives to elevate the blue carbon production (**Y1-Y5**; The ISLME region)	205	1 capacity building project workshops, @40 participants 1 training, 2 times, @40 participants
ID+TL	Promote nature-based materials, nature-based climate solution and ecosystem-based approach to improve coastal protection, particularly nature-based solutions, e.g. dunes, intertidal wetlands, reefs (coral and shellfish) and nature-based mitigation of inland flooding (Timor-Leste)	● Workshop on nature-based and physical infrastructure for coastal protection ● Workshop on traditional principles of preserving local wisdom with the application of environmentally friendly technology ● Workshop on reduction principles of good aquaculture practices in relation to the ecosystem protection that damaging the ecosystem and boost the gas emission (**Y1-Y5**; The ISLME region)	144	3 workshops, 2 times @40 participants

Annex 3 Process, implementation, and success indicators

The indicators for monitoring and evaluation are outlined for each priority action and activity within the relevant components of the strategic action programme (Table A3.1 and Table A3.2).

Table A3.1 Indicators for monitoring and evaluation (M&E) from Indonesia

PEC 1 (DECLINING PRODUCTIVITY AND SUSTAINABILITY OF ISLME FISHERY AND AQUACULTURE)				
Recovery and sustainable management of fisheries resources **Target:** **1. EAFM concept adopted into government regulations** **2. MCS effectiveness increased** **3. NPOA of SSF developed**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
a. Strengthening the implementation of EAFM (for specific fisheries and fisheries management areas)	Government develops existing regulations	Dissemination of developed EAFM-based regulations	The developed EAFM-based regulations amended	Amended at least four fisheries management plans (FMP) based on EAFM, and development of competent human resources and mechanisms for the implementation of EAFM at all levels
b. Reduction of IUU fishing and increasing compliance with fisheries regulation	The stakeholders understand about combating IUU and destructive fishing and optimize all forms of coordination	IUU fishing and destructive fishing decreased by 40 percent and catch reporting increased by 20 percent	Improvements in the effectiveness of MCS	a. Increased MCS effectiveness, specifically for human resource capacity and optimal inter- and intra-agency coordination b. 40 percent decrease of IUU fishing and destructive fishing practices in FMAs c. 20 percent increase in catch reporting

c. Support to the implementation of the Sustainable Small-scale Fisheries (SSF) Guidelines as per NPOA and regional strategy of SSF	Stakeholders develop key actions based on SSF Guideline	Dissemination of developed key actions	Application of the produced guidelines	The Sustainable Small-scale Fisheries (SSF) Guidelines as per NPOA and regional strategy of SSF adopted and key actions implemented
Strengthening of sustainable aquaculture (mariculture) practices, including ecosystem approach to aquaculture (EAA), good aquaculture practices (GAP) **Target: EAA and GAP guidelines developed and disseminated.**				
	Development of EAA and GAP guidelines in four provinces	Dissemination of EAA and GAP guidelines in four provinces	Application of EAA and GAP in the four provinces	EAA and GAP guidelines developed and disseminated in four provinces.
PEC 2 (DEGRADATION AND LOSS OF MARINE HABITATS)				
Restoration and conservation of marine habitats (coral reefs, mangroves, and seagrass beds) **Target: Improvement in habitat status of mangroves, seagrass, and coral reefs based on national indicators**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
a. Strengthening of marine habitat conservation measures (e.g. of marine protected areas)	Stakeholders develop plans and regulations to increase MPAs and their effectiveness	Increase in area of MPAs so that they cover 30 percent of ISLME and increase their effectiveness by 5 percent	Increase in number of marine conservation areas	Significant increase of MPAs area towards Indonesia's target of 30 percent by 2045 and an increase of 5 percent in management effectiveness (EVIKA).
PEC 3 (MARINE AND LAND-BASED POLLUTION)				
Improving of water quality in the ISLME **Target: Reduction of marine debris and other key pollutants**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**

a. Reduction of marine litter (incl., ghostnets) and prevention of plastic waste entering coastal areas	Stakeholders develop plans to regulate the amount of debris in ten fishing ports, mariculture areas, and five MPAS in the ISLME	Application of the plans to reduce marine debris in ten fishing ports, mariculture areas, and five MPAS in the ISLME	Decreased marine debris in fishing ports, mariculture areas, and MPAs in the ISLME	Reduction of marine debris by 25 percent in up to ten fishing ports, mariculture areas, and five MPAs in the ISLME
b. Prevention and reduction of eutrophication from agriculture/aquaculture runoff	Stakeholders develop plans to regulate the number of possible causes of eutrophication	Application of plans to regulate the number of possible causes of eutrophication	Increased water quality	Reduction of eutrophication in selected mariculture areas
c. Prevention and reduction of other forms of marine pollution from wastewater (incl. fuel waste, sedimentation, abrasion, intrusion, and mine tailings)	Development of watershed management for sedimentation guidelines in three selected areas	Dissemination of watershed management for sedimentation guidelines in three selected areas	Application of watershed management for sedimentation guidelines in three selected areas	Watershed management for sedimentation guidelines produced and implementation supported in three selected areas
PEC 4 (DECLINE OF BIODIVERSITY AND KEY SPECIES)				
Biodiversity of coastal and marine ecosystems recovered and maintained **Target: Local community awareness and local government skills regarding biodiversity conservation raised, and collaboration mechanism (e.g. joint data centre) established**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
Conservation measures for ETP and migratory marine species promoted, implemented, and strengthened	Stakeholders create species conservation centres for the ETP species and its operational plans	Establishment of species conservation centres	Improved conservation status of key ETP species, effectively functioning species conservation centres	Five new ETP species conservation centres established, functioning effectively, and improved conservation status of key ETP species based on regular monitoring information

PEC 5 (IMPACTS OF CLIMATE CHANGE)				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
Resilience of coastal and marine ecosystems to impacts of climate change strengthened	Stakeholders assess vulnerability and awareness level of local community	Stakeholders create vulnerability map and educate local community about climate change	Local communities understand climate change and the vulnerability map made available	Awareness and knowledge of climate change increased and vulnerability map for all coastal areas updated
Reduced vulnerability of coastal communities to impacts of climate change	Stakeholders create committees to hold national and/or regional meetings on climate change	Stakeholders develop contents for the coordination meetings on climate change	Coordination meetings on climate change are held at national and/or regional level	Annual national and regional coordination meetings on climate change held leading to adaptive climate resilient fisheries management
Adaptation measures to climate change identified, promoted, and adopted	Stakeholders develop plans to raise awareness and create capacity-building activities related to climate change adaptation in four priority locations	Application of plans to increase awareness and implementation on capacity building activities related to climate change adaptation in four priority locations	Local communities in four priority locations have skills related to climate change adaptation and are more aware of it	Local community awareness and skills on climate change adaptation increased in four priority locations and benefiting from adopted measures such as resilient livelihoods

Table A3.2 Indicators for monitoring and evaluation (M&E) from Timor-Leste

PEC 1 (DECLINING PRODUCTIVITY AND SUSTAINABILITY OF ISLME FISHERY AND AQUACULTURE)				
Recovery and sustainable management of fisheries resources **Targets:** **1. Improved status of selected fish stocks** **2. Stable income from fishing**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
a. Strengthening the implementation of EAFM (for specific fisheries and fisheries management areas)	Existing EAFM to be implemented based on its implementation plan	Improved coastal ecosystem leads to an increase in coastal fisheries resources	Increased income leads to increased standard of living	Comprehensive EAFM plan for north coast of Timor-Leste developed and implemented
b. Reduction of IUU fishing and increasing compliance with fisheries regulations	Regional stakeholders improved understanding about combating unreported fishing practice	IUU fishing reduced by 15 to 20 percent	Improved status of commercial fish stocks	Functional enforcement, MCS, and conflict resolution lead to a significant reduction of IUU fishing in entire project area
c. Support to the implementation of the Sustainable Small-scale Fisheries (SSF) Guidelines as per NPOA and regional strategy of SSF	National SSF develop in line with existing regional framework	Each municipality in the north coast adopts the required action to support the implementation of the SSF guideline	Increase volume of SSF activities in the area	Municipalities' co-management plan for the north coast, developed and implemented
Strengthening of sustainable aquaculture (mariculture) practices, including ecosystem approach to aquaculture (EAA), good aquaculture practices (GAP) **Target: EAA and GAP guidelines developed and disseminated.**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
	Developing policies on sustainable aquaculture/ mariculture practices	Disseminate the policies to related stakeholders and well adopted by the aquaculture group	Increased aquaculture productions	Seaweed culture scaled up in accordance with National Aquaculture Policy (NAP) and EAA principles, including milkfish and tilapia

PEC 2 (DEGRADATION AND LOSS OF MARINE HABITATS)				
Restoration and conservation of marine habitats (coral reefs, mangroves, and seagrass beds) **Target:** **1. Mangrove areas increased by 20 percent** **2. Area of coral reefs and seagrass maintained and status measurably improved**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
Strengthening marine habitat conservation measures (e.g. of marine protected areas)	MPA frameworks are developed and implemented	Increased number of MPAs	Increase in marine resources including fish stock	Existing MPAs and future MPA network managed effectively including The Peace Park
PEC 3 (MARINE AND LAND-BASED POLLUTION)				
Improving water quality in the ISLME **Target:** **Solid waste contamination reduced in selected sites of north coast and reduction of wastewater effluent in pilot areas**				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
a. Reduction of marine litter (incl., ghostnets) and prevention of plastic waste entering coastal areas	Establishing policies, regulations and laws	Dissemination of policies, regulations and laws	Better understanding of the impact of marine litter to marine resources and living	Behavioural changes regarding plastic use of coastal communities lead to the significant reduction of plastics used and improves the solid waste disposal focused in three selected municipalities
b. Prevention and reduction of eutrophication from wastewater /sewage and agriculture runoff				Sustainable aquaculture/mariculture of selected commodities practiced and providing stable income
c. Prevention and reduction of other forms of marine pollution from wastewater (incl. fuel waste, sedimentation, abrasion, intrusion, and mine tailings)	National stakeholders have better understanding about forms of marine pollution from wastewater (incl. fuel waste, sedimentation, abrasion, intrusion, and mine tailings)	Reduction in marine pollution by certain percentage	Improved management of wastewater source to marine pollution.	Three ICM plans focused on pollution reduction, developed and implemented in three municipalities (Bobonaro, Liquica, and Manatuto)

PEC 4 (DECLINE OF BIODIVERSITY AND KEY SPECIES)				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
Biodiversity of coastal and marine ecosystems recovered and maintained	Existing biodiversity decree laws are well implemented	Communities are well aware of the law	Less biodiversity destruction	Biodiversity status of marine habitats assessed and improved
Conservation measures for ETP and migratory marine species promoted, implemented, and strengthened	Critical biodiversity habitat protected	Increase coverage area of marine protected / conservations areas	Population of marine mammals of high biodiversity value will be increased	Crocodile management plan developed and implemented, including management plans for turtle, dugong, and other marine mammals
PEC 5 (IMPACTS OF CLIMATE CHANGE)				
Specific Objective	**Process indicator**	**Implementation indicator**	**Success indicator**	**Targets**
Resilience of coastal and marine ecosystems to impacts of climate change strengthened	Resilience strategic plan in place	Plan well adopted and implemented by coastal municipalities	Recovery of coastal and marine ecosystem	Municipal development plans that include climate change resilience drafted and implemented
Vulnerability of coastal communities to impacts of climate change reduced	Climate change vulnerability reduction plans in place	Climate change vulnerability reduction plans well adopted	Climate change vulnerability reduction plans in place and well implemented	Eight north coast municipalities draft and implement climate change vulnerability reduction plans focused on climate change knowledge and livelihoods
Adaptation measures to climate change identified, promoted, and adopted	Adaptation measures framework introduced to and accepted by community and local government	Adaptation measures framework included in the local government action plan	Local government action plan well implemented.	North coast communities of Timor-Leste benefit from infrastructure, skills, and knowledge that improved and secured their livelihoods

Annex 4 Some best resources management practices within the Indonesian Seas Large Marine Ecosystem region

Information on projects considered to exemplify best practices in resource management implemented between 2011 and 2023 is presented in Table A4.

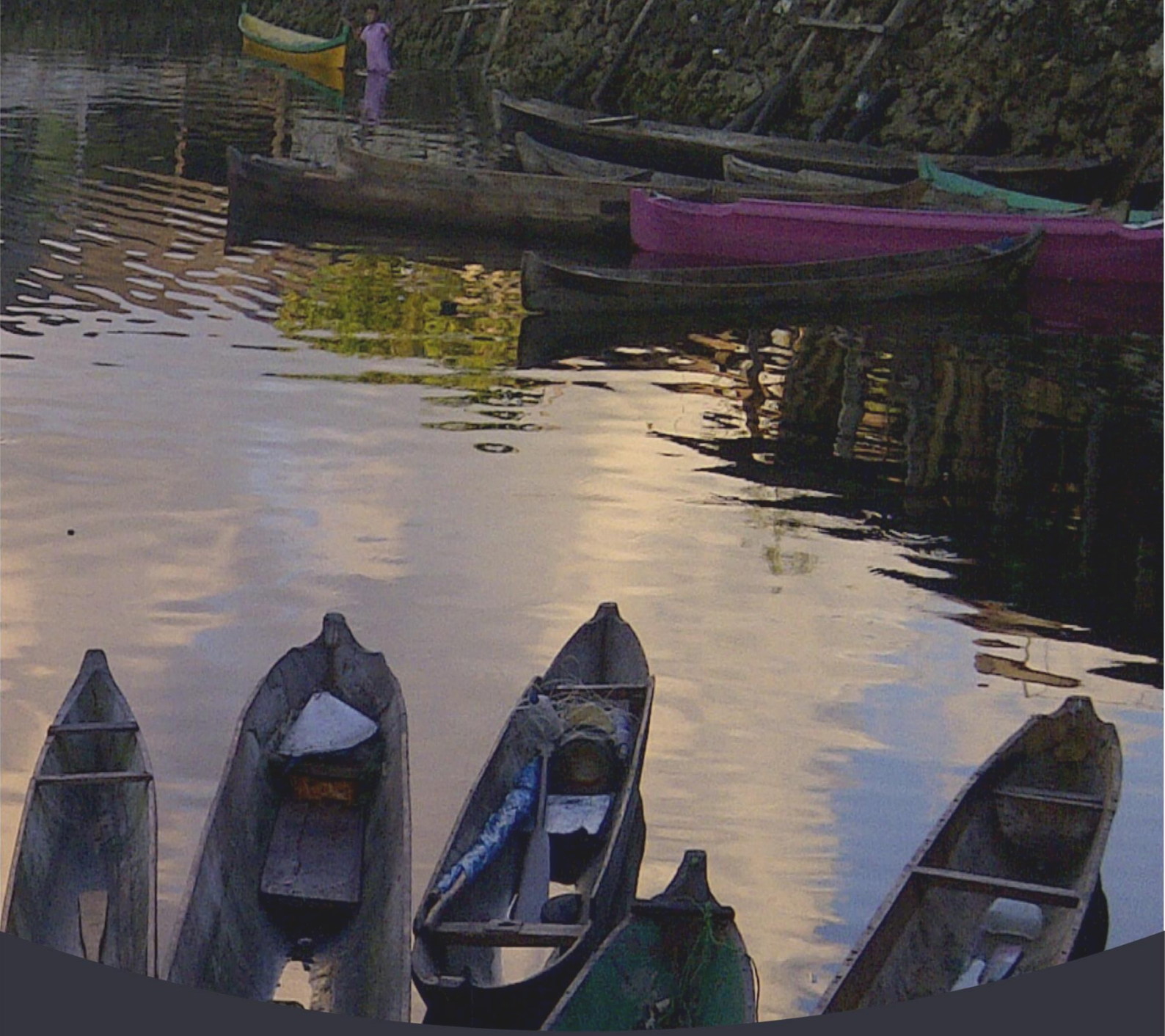
Table A4. Information on projects considered to exemplify best practices in resource management in the ISLME

Year	Project Name	Location	Stakeholder	Target group
2021	Guide to Marine Tourism Supporting Capacity BMP *[Online campaign, reduced plastic pollution]*	Komodo National Park, Wakatobi National Park, Bali Barat National Park, RMPA Koon, CSICA Serutbar, MMAF Alor	Local government, conservation area manager	Marine tourism practitioner
2021	Guidelines for Better Management of Community-Based Tourism BMP [Tourism education, local community interaction]	East Java, Bali, Wakatobi, Papua, Alor, East Flores	Local government, tourism business managers, tourists	Tourism managers, tourists, local communities
2021	Responsible Marine Tourism BMP [Sustainable Marine Tourism]	Cendrawasih Bay National Park, Atoll Bay (Baa Atoll, Maldives), Alor, Meru Betiri National Park, Perancak	District governance, tourism business actors, tourists	Tour operators and tourists
2015	Mud Crab BMP [Standard Compliance]	Pemalang, Manado	Fishers' group, district governance, academics, NGO (TAKA Foundation)	Mud crab fishers
2015	Abalone Snail BMP [capture/collection tools] Abalone snails and fishing locations management	Maluku	Indonesian Institute of Sciences (LIPI), academics	Abalone snail fishers
2015	Lobster BMP [catching and handling and packaging]	Gunung Kidul, Kendari	Fishers groups in Gunung Kidul and Kendari, district gov. (KKP, Lombok Marine Cultivation Center, DKP Gunung kidul, Marine Fisheries Research Institute)	Community, entrepreneurs, fishers

Year	Project Name	Location	Stakeholder	Target group
2015	Tuna Fisheries BMP [catching and handling and packaging]	Solor Alor, Wakatobi	Office of Maritime Affairs and Fisheries of East Nusa Tenggara Province, Kab. Alor, Lembata, East Flores, Wakatobi, Solor-Alor and Wakatobi Fishers Forum, Makassar	Small-scale tuna fishers
2022	Shark Bycatch Fishery BMP [De Hooker Utilization]	Tegalsari Beach Fishing Port, Tegal	Tegal Maritime Affairs and Fisheries Service, Tegal Sari Technical Implementation Unit, Tegal Fisheries Training and Counseling Center, ship owners, ship crews	Fishers
2015	Shellfish Fishery BMP [catching and handling and packaging]	Sidoarjo, Surabaya, Semarang, Banyuwangi	Indonesian Women's Coalition, FPIK UNAIR, FPIK Sam Ratulangi, DKP Sidoarjo	Fishers
2015	Environmentally Friendly Shrimp Catching BMP [trammel net utilization]	Labuan Bajo, Seraya Maranu Village, Manggarai Barat Regency	Research Center for Fisheries Management and Conservation of Fish Resources (P4KSI), Semarang Fishing Development Center (BBPPI), Faculty of Fisheries and Marine Sciences, Diponegoro University Semarang, Bogor Agricultural Institute, Aceh Brackish Water Seed Center, Aceh tiger prawn catcher group	Fishers group for fisheries business "Fajar Pagi"
2014 - 2017	Handling Sea Turtles Bycatch BMP [practice on longline and trawl fishing gear]	Paloh District, Sambas West Kalimantan	Pontianak Coastal and Marine Resources Management Center (BPSPL), Pontianak Marine and Fisheries Resources Supervision (PSDKP), Pontianak BPSPL, West Kalimantan Marine and Fisheries Service (DKP), Government of Sambas Regency	Monitoring community group (POKMASWAS) Kambau Borneo

Year	Project Name	Location	Stakeholder	Target group
2011-2022	Grouper and Snapper Fisheries BMP [catching and handling and packaging]	Wakatobi, Berau	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries, NGOs, Traditional Fishers	Traditional fishers
2015 - 2022	Skipjack Fishery BMP (huhate/pole and line)	East Flores, Bone Bay, Flores Sea	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries, NGOs, Traditional Fishers	Huhate traditional fishing gear (pole and line) fishers
present	SASI (Local Wisdom)	Maluku, Savu Sea, Binongko Island Wakatobi	Customary peoples, district governance	Coastal communities
2014-2019	Tilapia Production BMP [catching and handling and Ppackaging]	Timor-Leste	Timor-Leste Ministry of Agriculture and Fisheries	Coastal communities
2021	Blue Swimming Crab BMP [catching and handling and packaging]	Demak, Central Java	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Fishers, coastal communities, entrepreneurs
2021	Snapper and grouper BMP [catching and handling and packaging]	Lamongan, East Java	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Fishers
2020	Mud Crab BMP [catching and handling and packaging]	Kutai Kartanegara, East Kalimantan	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Fishers
Present	Snapper and grouper mariculture implementation [catching and handling and packaging]	Mataram	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Fishers, coastal communities, entrepreneurs
Present	Marine protected areas tourism practices [sustainable marine tourism]	Atauro	Timor-Leste Ministry of Agriculture and Fisheries	Coastal communities
2020	Snapper and grouper BMP [catching and handling and packaging]	Bontang and Balikpapan, East Kalimantan	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Fishers

Year	Project Name	Location	Stakeholder	Target group
2021	Small pelagic fish BMP [catching and handling and packaging]	East Flores	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Fishers, coastal communities, entrepreneurs
2021	Lobster BMP [catching and handling and packaging]	Central Lombok (Awang and Gerupuk Bay)	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Fishers, coastal communities, entrepreneurs
2021	Seaweed BMP [peg system, long line utilization]	East Lombok (Ekas and Serewe Bay)	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Coastal communities, seaweed farmers, entrepreneurs
Present	EAA-based Shrimp Cultivation	South Sulawesi	Department of Maritime Affairs and Fisheries, Ministry of Maritime Affairs and Fisheries	Coastal communities, shrimp farmers
Present	Petuanan Laut Local Wisdom	Southeastern Sulawesi	Customary people, district governance	Coastal communities
Present	Awig-Awig Local Wisdom	East Lombok	Customary people, District governance	Coastal communities



STRATEGIC ACTION PROGRAMME

Indonesian Seas Large Marine Ecosystem

ISLME

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