Report: Review of the Policy Gap Analyses of the Project Countries

Prepared for the benefit of The Mohamed bin Zayed Species Conservation Fund under the Dugong and Seagrass Conservation Project

Peter B. Fippinger and Dr. Simon Pearson

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Introduction

The Dugong and Seagrass Conservation Project (DSCP) was the first global initiative for the protection of the dugong and associated seagrass habitat. Its overall aim was to enhance the effectiveness of dugong conservation across the Indian and Pacific Ocean basins. Since conception in 2015, the effort invested in forty-two conservation initiatives across eight range states, and engaged nearly thirty local organizations.

The project comprised four main components, one of which was "*mainstreaming dugong and seagrass conservation priorities into national and regional policies and plans*." The purpose of this report is to provide an independent review of policy gap analyses conducted by the eight project countries related to this project component. In addition, this report seeks to provide an overview across the project countries to support future actions under the Conservation and Management Plan for the Memorandum of Understanding on the Conservation and Management of Dugongs (Dugong dugon) and their Habitats throughout their Range.

Background on Approach

Environmental challenges today are often complex and involve dynamics at the intersection of society, economy and environment. They often vary in scale or speed and severity of impact. In many countries and regions, scientific information about environmental status and trends remain limited, and conservation must often compete with pressures for growth and development. Leaders within government, businesses and communities are accountable to a diverse set of stakeholders, and the limits of their individual authorities often impact conservation efforts. Therefore, thinking holistically about relationships among society, economy and the environment is vital to fully understanding and strategically responding to environmental challenges.

At the third meeting of the Executive Project Steering Committee for DSCP in Trang Thailand 21-23 November 2017, the DSCP Project Coordination Team introduced the Driver, Pressure, State, Impact and Response (DPSIR) framework as an analytical tool for project countries to assess threats to dugong and seagrass conservation, and evaluate the presence and effectiveness of key policy responses – those policy responses that are aligned to the key pressures and/or drivers of dugong and seagrass habitat decline.

Driver, Pressure, State, Impact and Response (DPSIR)

The DPSIR framework is a conceptual model for environmental analysis, which can be used to improve understanding of cause and effect relationships among the D, P, S, I, R elements.

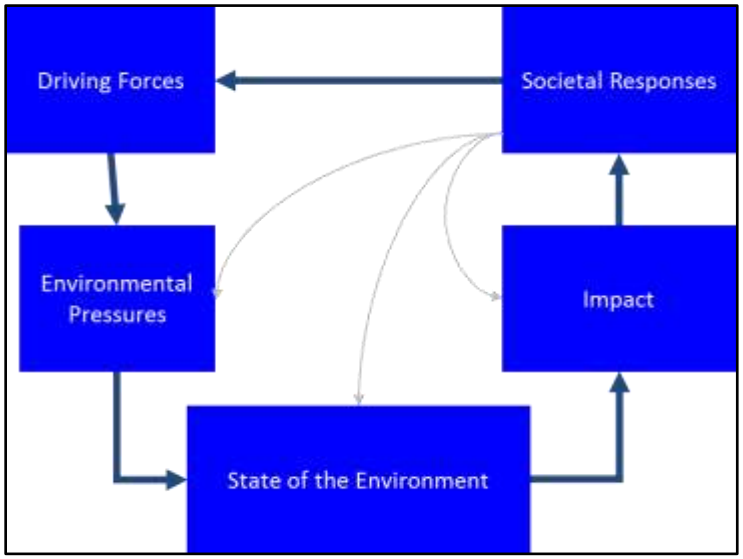
Drivers - Basic human needs, which may originate and act locally, regionally or globally (e.g. need for food)

Pressures - Human activities having a negative effect on environmental state, which cascade from causal drivers (e.g. land use change)

State –The existing physical, chemical or biological condition (and trends) of the components of an ecosystem, which result from the environmental pressures (e.g. extent of habitat)

Impacts – Changes to environmental, social or economic benefits that result from changes in environmental state (e.g. loss of ecosystem services)

Response – Actions taken by government or non-governmental actors to prevent, compensate, ameliorate or adapt to changes in the state of the environment (e.g. protected area establishment)



Strengths and Benefits of DPSIR

Applying DPSIR as an analytical tool can be particularly effective for:

- Identifying and prioritizing environmental challenges: DPSIR provides a logical framework that guides critical thinking about human-environment interactions.
- Analyzing and identifying key data and information gaps: DPSIR analysis reveals gaps in understanding that can be used to develop and prioritize a research agenda.
- Identifying key stakeholders: DPSIR outcomes often reveal key stakeholders and motivations by probing root causes.
- Identifying key performance measures: DPSIR analysis supports the identification of key measures related to each D, P, S, I, R, element, which reflect the dynamics of causal relationships.
- Analyzing existing responses: DPSIR prepares users to assess the presence and effectiveness of appropriate responses aligned to the key pressures, drivers or impacts identified during the analysis.

In addition to these strengths, there are additional benefits of using the DPSIR framework for environmental analysis. The method can be applied to any spatial or temporal scope – whatever is ecologically relevant or logistically possible. It can be completed and presented with data gaps and existing limits to understanding. Finally, DPSIR provides a standardized approach, which users can repeat as more data and information emerges.

Overview

Dugong and Seagrass Conservation Project

PROJECT COMPONENT 4. Mainstreaming of dugong and seagrass conservation priorities into national and regional policies and plans

Outcome 4: Conservation priorities and measures for dugongs and their seagrass ecosystems incorporated into relevant policy, planning and regulatory frameworks across the Indian and Pacific Ocean basins

Output 4.1 Policy, planning and regulatory gaps reviewed (conservation of dugongs and seagrass ecosystems) and recommendations developed

Project Country Inputs

The DSCP Project Coordination Team recommended that the project partners use the DPSIR framework as an analytical tool to understand the key challenges within the project area(s), and then assess the presence and effectiveness of policy responses. Project partners were provided a guideline, templates and case study as an example to support their efforts.

Indonesia, Madagascar, and Sri Lanka completed DPSIR analyses and policy gap analyses to a high degree using the templates provided by the DSPC Project Coordination Office.

Malaysia and Soloman Islands completed DPSIR analyses to a limited degree using the template provided, although the information included in both cases was general in nature, and appears to be based on pre-DSCP studies or anecdotal information.

Mozambique and Timor-Leste completed policy gap analyses to a high degree using another format.

Vanuatu did not submit a DPSIR analysis or policy gap analysis at this time, although other useful documents were provided to the DSCP Project Coordination Team.

Within the context of the DSCP, it is important to recognize that the eight project countries varied significantly with regard to geographic extent, scope of project activities, composition of project partners, and the baseline information available at the launch of DSCP. This review seeks to aggregate information from these diverse country experiences to communicate a few key observations from a DSCP (i.e. eight country) perspective. Contributors to the DPSIR analyses (as provided by the DSCP Project Coordination Team) are listed in the Appendix to this report.

Threats to Dugongs and Seagrass Habitat

The table of threats to dugongs and seagrass habitat, which first appeared as an appendix to the DSCP project proposal, has been updated (below) based on information in documents provided by the project partners. While in many cases, there are still gaps in knowledge about direct causes of dugong mortality (i.e. pressures) and relative impacts of existing pressures at the local level, the table provides an improved understanding of threats within the project areas. Those threats highlighted in red color were well supported as "key" drivers of mortality within project countries.

Threat	Indonesia	Madagascar	Malaysia	Mozambique	Solomon Islands	Sri Lanka	Timor-Leste	Vanuatu
Dugong								
Gillnets	✓	✓	✓	✓	✓	✓		✓
Tidal Traps	✓			✓		✓		
Trammel Nets			✓					
Drift Nets			✓					
Seine Nets				✓				
Artisanal Nets (unknown)			✓				✓	
Opportunistic Killing (nets or traps)	✓	✓			✓	✓		
Multi-hook Longlines			✓					
Intentional Hunting (spears or dynamite)	✓	✓			✓	✓		
Boat Strike or Disturbance			✓	✓				
Cyclone				✓				
Capture for Tourism	✓							
Seagrass								
Trawling	✓		✓	✓		✓		
Port and Channel Dredging	✓		✓	✓			✓	
Aquaculture Farms	✓						✓	
Sand Mining	✓							
Shell fishing				✓				
Direct Harvest							✓	
Boat Propellers				✓				
Sedimentation from Coastal Development	✓		✓	✓	✓		✓	
Outfall Pollution	✓			✓	✓		✓	
Non-point Pollution	✓			✓	✓		✓	

Key Findings

- Based on data reflecting "known" mortality (documented and quantified), entanglement and drowning in gillnet / driftnet is the top (known) cause of dugong mortality across project countries. Other fishing methods (e.g. seine, tidal traps) and direct hunting contribute to dugong mortality in some project countries on a local level but are less universal and less well documented.
- While all project countries provide legal protection to dugongs (with minor exemptions for traditional use), compliance appears to be a significant challenge and regulations for incidental catch (i.e. bycatch) are often poorly defined.
- Common drivers of fishing activity in these countries (whether legal or illegal) include food, economic need and cultural tradition, supported by a general absence or ineffectiveness of fisheries enforcement regimes.
- Key direct threats to seagrass habitat are less well defined, but appear to be trawling and seining methods of fishing, and dredging for navigation (ports and channels) or coastal development.
- Seagrasses and seagrass habitat are poorly protected under law across project countries, and poorly represented within protected areas in most project countries.
- While the loss of seagrass habitat is a real and significant concern in most project countries, the direct connection between the loss of seagrass extent and current dugong mortality rates is unclear. Other pressures appear to be a more immediate concern for dugong survivability, while longer-term sustainability is threatened by loss of seagrass habitat.

Barriers to Understanding Threats

Across DSCP project countries, there are a number of common (reoccurring) information gaps that inhibit understanding and therefore, inhibit developing effective policy for dugong or seagrass habitat conservation.

Common Barriers to Understanding Threats	Indonesia	Madagascar	Malaysia	Mozambique	Solomon Islands	Sri Lanka	Timor-Leste	Vanuatu
Limited observational data on the current abundance and distribution of dugong	✓	✓			✓	✓	✓	✓
Limited mapping or up-to-date mapping of seagrass extent, and		✓			✓			✓
Limited understanding of seagrass species present within seagrass beds		✓			✓			✓
Limited understanding of dugong movement or correlation of movements to available habitat	✓	✓	✓	✓	✓	✓	✓	✓
Limited understanding of the causes, or relative impact, of specific causes of dugong mortality at a local level	✓	✓	✓	✓	✓		✓	✓
Limited understanding of socio-economic drivers of key pressures/threats at a local level	✓	✓	✓		✓	✓		✓
Limited information about enforcement effort, compliance rates and judicial success of cases	✓	✓	✓	✓	✓	✓		✓
Limited information about extent of seagrass habitat represented within protected areas		✓		✓	✓		✓	✓
Limited information about level of protection afforded within protected areas' management plans	✓	✓		✓	✓	✓	✓	✓

Barriers to Effective Conservation

Across DSCP project countries, there are a number of common (reoccurring) barriers to effective policy, planning or regulatory responses for dugong or seagrass habitat conservation.

Common Barriers to Effective Conservation	Indonesia	Madagascar	Malaysia	Mozambique	Solomon Islands	Sri Lanka	Timor-Leste	Vanuatu
Strong dependence on fishing by impoverished communities (with few alternatives for food or revenue)	✓	✓	✓	✓	✓	✓	✓	✓
Incentives at the local level either not present or not aligned to conservation goals	✓	✓		✓	✓	✓		✓
Key causes of dugong mortality (i.e. fishing methods) are largely legal activities (despite the dugong protected status)	✓	✓		✓	✓	✓		✓
Regulations for incidental killing/bycatch poorly defined	✓	✓		✓	✓	✓	✓	✓
Limited capacity and competency for fisheries enforcement	✓	✓	✓	✓	✓	✓	✓	✓
Poor awareness of conservation regulations and a general acceptance of killing dugong by coastal communities	✓	✓	✓	✓	✓	✓		
Limited consideration of conserving seagrass habitat and dugong in coastal planning and development	✓		✓	✓	✓	✓	✓	✓
Existing protected areas provide little protection to seagrass habitat or dugong hotspots	✓		✓			✓		✓

Key Policy Recommendations

Across the eight project countries, there are a number of common areas where targeted action could improve mainstreaming dugong and seagrass habitat conservation.

- Government policy and management measures should seek to reduce or eliminate gillnet fisheries (and other driftnet methods) from areas of dugong distribution
- Government policy and management measures should seek to reduce or eliminate trawling and bottom seine gear from areas of seagrass habitat distribution
- Fisheries and conservation agencies should seek to reduce bycatch and other locally-implicated methods of fishing (e.g. tidal traps) through the adoption of incidental catch regulations and guidelines for dugong response and release
- Fisheries enforcement agencies (including community-level agents) should ensure adequate capacity and capabilities to provide fisheries enforcement within areas of dugong distribution
- Non-governmental organizations should focus awareness and capacity building for government and fishermen on preventing and responding to dugong bycatch
- Additionally, non-governmental organizations should focus awareness building efforts for government on reducing impacts of trawling and dredging on seagrass habitat, particularly in dugong hotspots
- Government policy and management measures should seek to physically separate fishing activities from areas of high dugong occurrence through zoning schemes and/or protected area establishment, with the explicit purpose of dugong and seagrass conservation
- Government policy should provide legal protection to seagrass habitat as critical for dugong survival in areas of dugong distribution
- Conservation agencies, supported by non-governmental organizations, should seek to ensure seagrass habitat is well represented within protected areas and protected area networks
- Conservation agencies, supported by non-governmental organizations, should seek to ensure that protected area management plans and enforcement regimes within protected areas provide adequate protections for dugong and seagrass
- In communities with significant dependence on fisheries for food or primary economy (where dugong mortality is occurring), government supported by non-governmental organizations should seek to create economic alternatives of livelihood in parallel with building awareness and increasing incentives for regulatory compliance
- Non-governmental organizations should build awareness of government decision-makers responsible for coastal planning, conservation management and fisheries management regarding threats and strategies for dugong and seagrass conservation
- Conservation agencies, supported by non-governmental organization should build awareness of stakeholders and stakeholder communities directly impacting dugong mortality at the local level (e.g. fishermen, development proponents, port operators, logging operations)

At the local, subnational or national levels, project partners could identify how best to implement these high-level recommendations within the local context and based on existing roles and responsibilities. More broadly at the regional or global levels, multilateral or non-governmental organizations could use these recommendations to more strategically target conservation planning, capacity building and advocacy efforts for achieving improved dugong and seagrass habitat conservation.

Conservation and Management Plan for the Dugong MOU

Based on experience of the eight project countries, the existing global Conservation and Management Plan for the Dugong MOU appears to still provide a comprehensive framework of objectives and actions related to improving understanding and conserving dugongs and seagrass habitat. However, signatory states and range states may wish to consider more focused domestic, bilateral, sub-regional or regional conservation management plans that prioritize and strategically target the key policy recommendations (above).

Project Country Reviews

Indonesia

Project partners report that remaining dugong populations in Indonesia are scattered in various waters of Sulawesi (Buton, Wakatobi, Bunaken and Takabonerate), East Nusa Tenggara (Sumba, Lembata, Flores Island, Kupang Bay and Komodo Islands), Maluku (Aru Islands, Lease Seram Islands, and Halmahera) Papua waters (Biak Island, Sorong and Fakfak), and a small portion in the waters of Sumatra (Riau, Bangka and Belitung), Java (Ujung Kulon, Cilacap, Cilegon, Labuhan and Segara Chicks) and Bali.

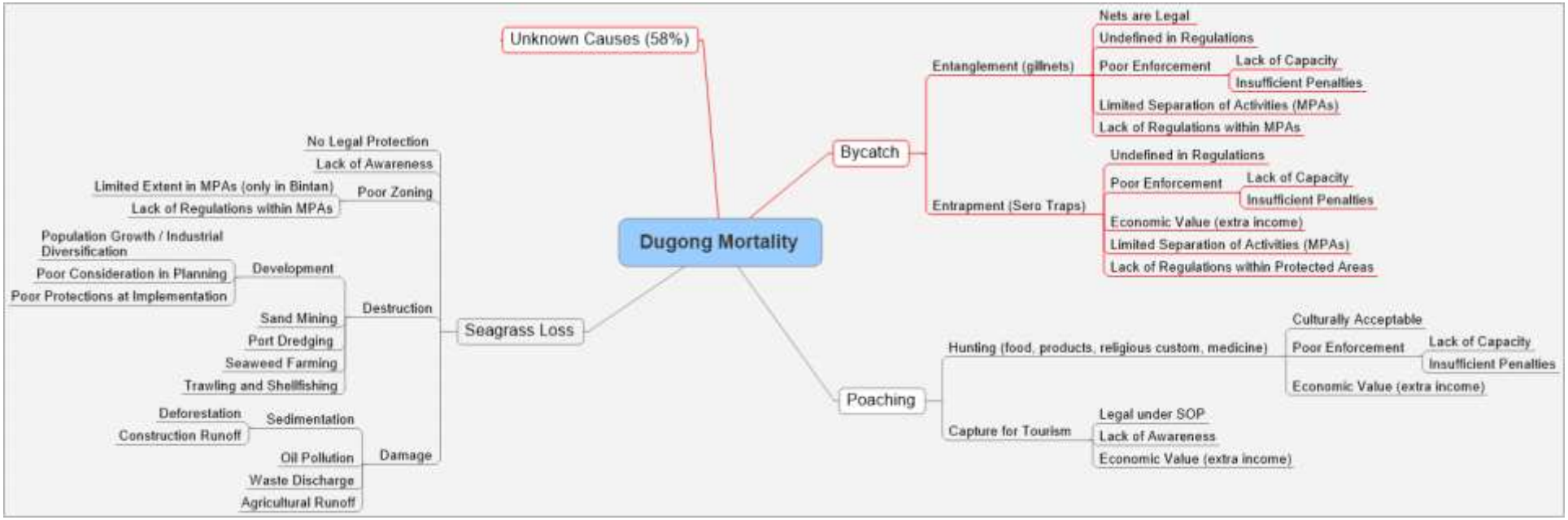
Remaining seagrass habitat can be found at 33 locations with estimated total area of 28,302 hectares, with the health of many remaining areas in decline.

Due to Indonesia's broad geographic expanse and scattered communities, threats to dugong are diverse and poorly recorded at present. Of recorded incidents since 2005, 58% are classified as "stranding" without any determination of cause. Entanglement in gillnets and unintentional entrapment in tidal traps, are both well documented. Hunting of dugong is rare, although still practiced for food, trade or cultural practices. Capture of dugongs for tourism activities appears to be on the rise.

Indonesia is not a signatory to the Dugong MOU. However, the country has prepared a National Plan of Action (NPOA) for Conservation of Dugong and Its Habitat (Seagrass) for the period of 2018 to 2022. The NPOA has been strengthened by a ministerial decree and the establishment of a National Dugong Conservation Committee for better coordination in policy and dugong conservation activities.

DPSIR Analysis - Project partners conducted both the DPSIR analysis and the policy gap analysis to a high degree, using the DSPC Project Coordination Team templates. Additional information was provided in other policy documents. Although recent abundance and distribution data is limited, project partners characterized the known and unknown pressures, drivers and policy gaps related to dugong and seagrass habitat conservation.

The figure below provides a visual representation of the key pressures and drivers represented in the documents provided by project partners. Those highlighted in red are considered to be of most strategic importance, based on the available evidence.



Key Findings - Based on available information, the primary pressure on dugong is unknown at this time. While it is clear that bycatch in gillnets and tidal traps are a key cause of the death for many dugongs, 58% of recorded incidents are recorded as "stranding", without determination of cause.

There have been 125 incidents of dugong stranding, entanglement, hunting or capture recorded since August 2005. The highest number of stranding incidents is recorded from Central Sulawesi and West Papua, while the highest number of entanglements is recorded from Riau Islands. Both stranding and entanglement incidents appear to be rising significantly, with increases of 23% and 90% in 2017, respectively. Hunting or live-capture of dugongs is less documented, with only 10 incidents recorded since 2005. West Papua is where 40% of live-capture or poaching of dugongs occurred. However, in November 2017, three events were recorded in three different provinces—Bangka Belitung, North Maluku, and West Sumatra.

The key policy challenge for known mortality is eliminating or significantly reducing the impact of gillnet and tidal traps on dugong. Drivers related to both challenges include the strong economic dependence on fishing and the lack of regulation, enforcement or penalties for incidental catch of dugong. Any direct use of dugong (except for tourist attractions) is illegal under law but there is little monitoring and few penalties for incidental catch.

Another key policy challenge is significantly reducing or mitigating impacts of human activities on seagrass habitat. Project partners report an estimated loss of 90% of seagrass habitat between 2014 and 2017, with the health of remaining seagrass meadows also in decline. Unfortunately, specific pressures on seagrass habitat are not well quantified, making it difficult to prioritize conservation approaches. However, seagrass habitat is not protected under law. Some specific activities (e.g. coastal development, dredging) require environmental impact assessments and permits under existing regulation, but implementation is not effective. Additionally, seagrass habitat is not well represented within marine protected areas (only within Bintan), and it is unclear that MPA management plans currently provide adequate protection.

Lesser (but important) challenges are related to a general acceptance of killing or capturing dugong when encountered (supporting poaching), and a significant mismatch between poaching penalties and the value of dugong meat, tusks and other products.

Barriers to Understanding Threats - While some progress has been made in understanding the key pressures and drivers of dugong mortality and seagrass loss in Indonesia, there remain a number of key information gaps that impede mainstreaming conservation policy and planning:

Abundance and Distribution Information

- Recent abundance and distribution data is limited for Indonesia. Project partners have aggregated data from public surveys and incident reports, which may not accurately reflect status and trends.
- Project partners have included several references to dugong migration and the importance of protecting migration corridors. However, little evidence of migration or specific habitat dependency is available at present.

Key Pressure/Driver Information

- To date, limited information is available about the direct cause of dugong mortality in Indonesia. 58% of incidents are only recorded as “stranding”, without cause. More study and investigation is required to understand the causes of stranding.
- Similarly, the key pressures and drivers for loss of seagrass habitat are not well quantified, limiting the ability to prioritize and target appropriate responses.

Socio Economic Information

- Further information is required about the demographics and economic value of gillnet and tidal trap fisheries in order to develop appropriate responses and/or incentives to reduce impacts and support communities.
- In addition to improving understanding of key pressures on seagrass habitat, the social and economic drivers of those activities are also required.

Existing Conservation Measures Information

- Little information is available regarding the current effort and impact of enforcement measures (e.g. extent of patrols, violations issued, successful prosecutions, penalties issued). It is difficult to assess or predict the effectiveness of new or amended regulations and enforcement measures without such data.
- Further information is required about existing protected areas – what seagrass extent is represented within the sites; what protections are provided to dugong and habitat; what enforcement regime exists to ensure compliance; how effective is the site performing?

Barriers to Effective Conservation - While some key conservation measures are already in place in Indonesia, such as outlawing the use of dugong, there remain a number of important barriers to mainstreaming dugong and seagrass conservation:

Regulations and Compliance

- The use of dugong is prohibited under Regulation 7/1999. However, dugong are regularly caught and killed in gillnet and tidal traps, as well as directly poached without prosecution.
- Regulation 71/2016 defines target fish species, gear types, and locations for fishing. However, gillnets and tidal traps – the two primary sources of bycatch - are not defined in the regulation. Further, regulations and penalties related to incidental catch are unclear.
- Seagrass habitat is not protected under law, other than the extent within existing protected areas.
- Specific activities that may damage seagrass (e.g. coastal development, dredging, sand mining) are regulated or otherwise considered as part of environmental impact assessment processes. However, awareness of the importance of habitat protection and the successful implementation of existing regulations appears limited.

Planning

- Spatial planning for the coastal zone and small islands is obligatory under law. However, there appears to be both a lack of awareness of the importance of seagrass habitat and poor implementation of permitting against plans.
- Seagrass habitat is underrepresented in marine protected areas. Project partners report that only areas in Bintan currently contain seagrass habitat of note.
- Management plans for some protected areas are still under development. Further, it is unclear from the project documents what protections are provided for dugong or seagrass habitat within existing or draft management plans.

Financial

- Penalties and fines for killing dugong seem insignificant in relation to economic value of dugong meat, products or other cultural uses. Current compliance levels support this notion.
- Project partners report that no penalties exist to deter activities damaging seagrass habitat.

Behavior Change

- A cultural acceptance of killing dugongs and the economic value of the meat contribute to both intentional and opportunistic poaching.
- Similarly, the growing interest in tourism appears to be an increasing threat, as dugongs are being captured and contained specifically for tourist operations.

Madagascar

Madagascar has an extensive coastline of over 4,880 km with seagrass habitat and dugongs present in the North West coastal zone. Project partners have mapped seagrass using satellite imagery and supported this with fieldwork to ground-truth data. Seagrass habitats were generally abundant and occurred throughout the entire study area. A total of 11 species of seagrass were observed and potential dugong hotspots were identified by an abundance of *Holophila* and *Halodule* seagrass meadows.

The presence of dugong was determined based on community surveys, passive acoustic monitoring in specific areas and the completion of 230 CMS Dugong MOU Catch and Bycatch Questionnaires. Community survey results showed that dugong sightings in the northwest of Madagascar were rare, with only a few sightings within the last two years from three different villages in the Southern study area (all sightings north of Mahajanga). In the Northern study area, there were no recent sightings of dugongs, and few within the last 10 years. In contrast, acoustic monitoring in two locations detected 18 possible dugong vocalizations, 10 in the Southern study area and 8 in the Northern study area.

The communities living along Madagascar's coastal zones are typically isolated and impoverished, and rely on artisanal, subsistence fisheries as their main source of food and income. Tourism and agriculture act as alternative sources of income for some communities.

Within the study area, fishing is the primary form of livelihood (80% of respondents), followed by agriculture (12-20% of respondents), diving (6% of respondents), and boat skipper/seamen (2% of respondents). The most common fishing gear is gillnets, primarily set at the surface during the day and left unattended (95-100% respondents). Few people reported that they (or someone in their village) actively hunted dugongs (1-2%), and only 3% reported that dugong hunting might be occurring in other villages.

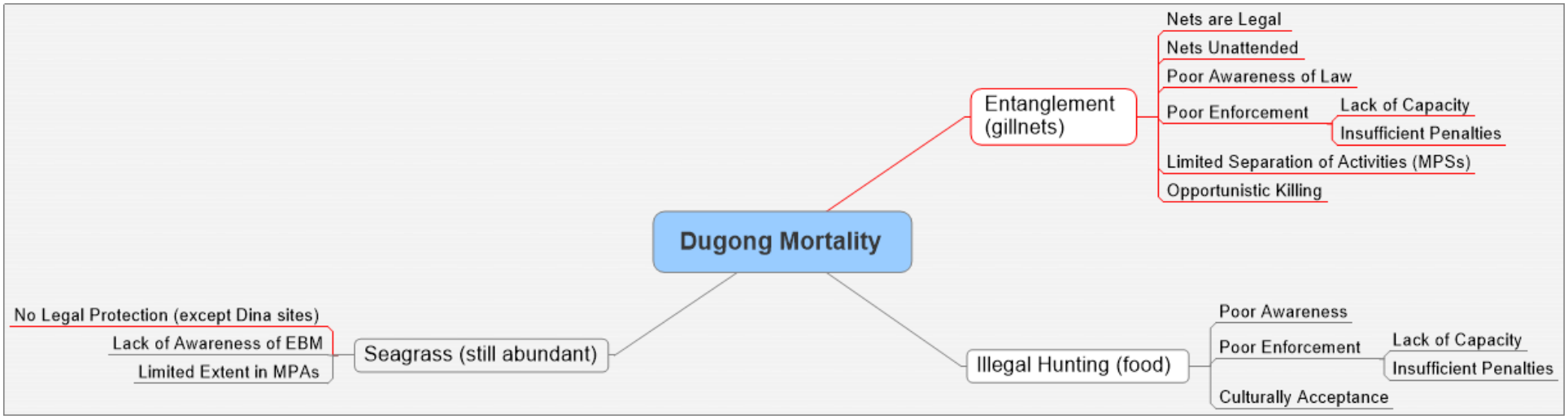
Dugong meat is considered a delicacy and most respondents in the Southern part of the research area said they would eat the meat if a dugong was hunted or found in a net rather than sell the meat. In the Northern part of the study area where there was a slightly higher understanding of the important of the dugong in the marine environment, respondents reported that dugongs caught in nets were more likely to be released.

Madagascar has a network of more than 80 Locally Managed Marine Area (LMMAs), known collectively as MIHARI, which have been established by NGOs with the support of local fishing communities that want to continue to sustainable harvest marine resources, a practice that is at risk from a rapid expansion in the number of commercial licenses being granted to domestic and international fishing companies. In 2017 three formal motions were adopted by the MIHARI Network to addressed exclusive access rights for small scale fishers, support using Dina to govern natural resource management, and to regulate fishing gear. In July 2018 the Minister of Fisheries pledged to support the drafting of two decrees, to implement exclusive fishing zone (EFZ), and to create a steering committee to drive the process forward, providing further validation for locally-led natural resource management via Dina.

Madagascar became a signatory to the Dugong MOU in 2007.

DPSIR analysis - Both the DPSIR analysis and the policy gap analysis have been completed to a high degree. However, the documents lack valuable data on the status and trends of dugong, and the different aspects of the DPSIR appear to have been completed independently rather than as a route cause analysis.

The figure below provides a visual representation of the key pressures and drivers represented in the documents provided by project partners. Those highlighted in red are deemed to be of most strategic importance, based on the available evidence.



Key Findings - Based on the available information, the primary pressure and cause of dugong mortality is entanglement in gillnets, most often left unattended. During community interviews respondents suggest there is a low level of direct hunting but that if a dugong becomes caught in a net then it will be killed for food (i.e. indirect hunting). Project partners allude to the fact that there would likely be more direct hunting if there were more dugongs present and they could be found.

The drivers for the high rates of bycatch and opportunistic killing appear to be a high reliance on marine resources for food and income and lack of compliance with regulations. This finding indicates a lack of enforcement and adequate penalties to act as a deterrent. There is some evidence that education and awareness about the importance of dugong to the marine environment results in a higher likelihood of dugongs being released if there are accidentally caught in fishing nets.

Seagrass habitat is described as abundant and healthy. Therefore, habitat loss is unlikely to be a cause of declining dugong observations. However, the relative abundance also provides a timely opportunity to protect seagrass habitat for dugong recovery.

Barriers to Understanding Threats - While some progress has been made in understanding the key pressures and drivers of dugong mortality and seagrass loss in Madagascar, there remain a number of key information gaps that impede mainstreaming conservation policy and planning:

Abundance and Distribution Information

- Recent abundance and distribution data is limited, with all evidence gathered coming from either community survey or passive acoustic monitoring. Survey results indicate that the numbers of dugong have declined over the past couple of decades to the point where they are rarely sighted.

Socio Economic Information

- There is currently a limited understanding of what alternative sources of income or food might be acceptable to communities, which would help to inform a plan to transition away from an over reliance on marine resources.

Regulations and Compliance Information

- More information is required to understand how often penalties have been used by the enforcement entity and the courts, and how the application of penalties is used as a deterrent to drive behavior change.

Existing Conservation Measures Information

- Protected areas have been established in the North West of Madagascar and dugongs are considered an integrated management target in the management of Sahamalaza National Park, with the creation of the Berafia Locally Managed Marine Area, a dugong hotspot, in the Sahamalaza Biosphere Reserve. During the project the presence of dugongs was confirmed with 11 sightings. However, enhanced data about the abundance and distribution of dugong is required to ensure protected areas are effectively providing protection.

Barriers to Effective Conservation - While some key conservation measures are already in place in Madagascar, there remain a number of important barriers to mainstreaming dugong and seagrass conservation:

Regulations and Compliance

- Even though legal protection for dugongs exists and local conventions prohibit the hunting of dugongs, 95% of respondents in the community interviews did not know whether hunting dugongs was illegal or not.
- The enforcement entities appear to have been identified and are trained and motivated. However, there is record or reporting of enforcement actions taken.
- Current law prohibits certain types of fishing gear, but the use of drift nets is not specifically covered. The most common practice is to set the drift net and then leave them unattended.

- There is no legal protection for seagrass or seagrass habitat.

Planning

- The marine spatial planning process for the area is in progress but not complete.

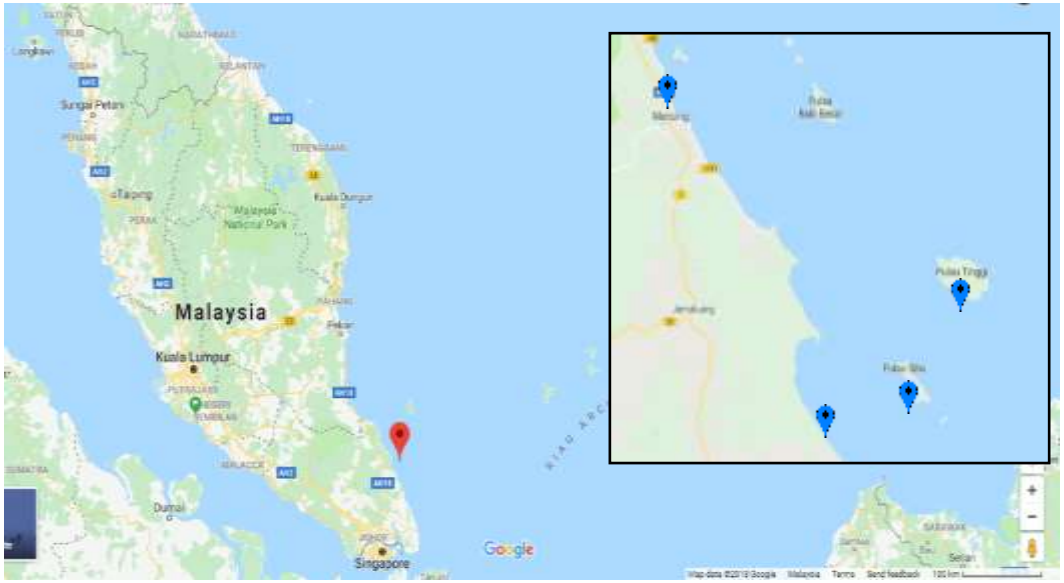
Behavior Change

- Conflicting information is presented about the level of awareness of fishers about dugong protection. The DPSIR analysis highlights that fishermen are aware of regulations but the MG6 technical report states that 95% of survey respondents in did not know whether hunting dugongs was illegal. Therefore, greater stakeholder awareness is required, supported by enforcement engagement/action to reinforce the message.

Malaysia

Published accounts of dugong occurrence include scattered populations in Peninsular Malaysia, Sarawak and Sabah, although recent abundance and distribution studies are lacking. Dugong is listed as marine endangered species in Malaysia under the Fisheries (Control of Endangered Species) Regulation of 1999 and is protected under the Fisheries Act of 1985. Seagrass habitat is not provided any legal protection under law, except for areas where it falls within the boundaries of existing marine protected areas.

The Mersing Archipelago in the state of Johor appears to be the only stronghold for the dugong in Peninsular Malaysia, owing to the presence of extensive seagrass habitat in shallow coastal areas. In particular, the areas southwest of the Sibu islands and between the islands and the adjacent mainland are where dugongs, including mother and calves, are primarily distributed.



In 2015, Johor State Government announced its commitment to establish a Johor Dugong Sanctuary in this region. However, recent changes in Government have delayed the gazetting process. As of September 2018, the site has additionally been accepted as the 'Mersing Archipelago Important Marine Mammal Area (IMMA)', an initiative under the joint IUCN-WCPA Marine Mammal Protected Areas Task Force.

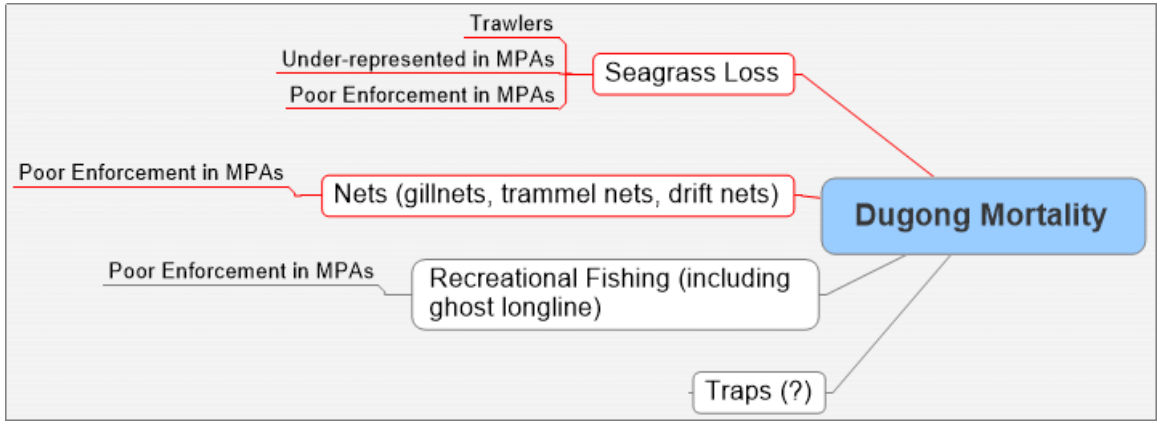
DSCP Project MY4 activities around Pulau Sibu and Pulau Tinggi in Johor comprised dugong aerial surveys, seagrass mapping, dugong feeding ecology surveys, social science interview surveys, Pulau Sibu womenfolk alternative livelihood development project, and dugong-centric marine education program for schools in Mersing and Tenggaroh.

Project partners did not present information about dugong occurrence and distribution in East Malaysia, other than the specific project site within Brunai Bay in Sarawak. DSCP Project MY5 was designed to collect the information necessary to establish a marine protected area for the conservation of dugong and seagrass habitat in the Malaysian Bay of Brunei at Lawas, and at the same time gain support from the local community. In April 2018, the Controller of National Parks and Nature Reserves office published the initial gazette notification of the Kuala Lawas National Park in the local newspaper, based on hotspots of dugong and seagrass habitat identified under the project.

Malaysia is not a signatory to the Dugong MOU. However, Malaysia has developed a Dugong National Plan of Action in 2011 (now out of date).

DPSIR Analysis - Project partners completed a DPSIR analysis to a limited degree using the template provided, although the information included appears general in nature and based mostly on anecdotal information. Project partners generally characterize pressures as fishing activities, coastal development and tourism. However, there is limited information both about documented causes of dugong mortality, as well as the drivers associated with those threats.

DSCP MY5 captured "encounter rates" of various activities, which may pose threats to dugongs or seagrass habitat. The figure below provides a visual representation of those activities.



Key Findings - The Sibu cluster of islands in the Mersing Archipelago in Johor represents the area with the highest occurrences of dugongs in Peninsular Malaysia. Seagrass mapping of the Pulau Sibu cluster of islands showed that the acreage of seagrass habitat covered ~12.1 km2 areas with >50% coverage on average. Dugong feeding trails were found congregated at the mid-southern part of the meadow across the inter-monsoon (June) and pre-monsoon season (October), suggesting that dugong-feeding hotspots are centralized around Pulau Sibu Tengah and Pulau Sibu Hujung.

Human activities recorded during the aerial surveys were found to overlap frequently with areas of dugong distribution and the analysis showed that dugongs around Pulau Sibu are at high risk of bycatch, especially within their core habitat and adjacent areas. Based on aerial surveys, potential encounters of dugongs in the core area at Pulau Sibu were highest with nets, followed by trawlers and traps. Encounters of dugongs with recreational fishing were widespread. Ghost longline incidents, in particular, have been attributed to dugong incidents in the recent past. While development levels remain low in the immediate vicinity of the main dugong areas, the islands of Sibu and Tinggi are islands with an active tourism industry, thus speedboat traffic is prevalent in the area. Weak regulatory enforcement has also led to illegal fishing activities within and outside of existing protected areas.

The waters surrounding the islands are currently gazetted as protected area (i.e. marine park), starting from the low water mark out to 2 nm from shore. However, there are at least 2–3 cases of dugong deaths recorded each year in Johor. Field surveys showed many incidences of

artisanal and commercial fishing activities within the no-take zones. In addition, project partners reported that a significant portion of dugong sightings, including the mother-calf pairs, occurred outside of existing protected areas.

Barriers to Understanding Threats - While project partners at the two project sites have identified some of the threats to dugongs and seagrass habitat in Malaysia, there remain a number of key information gaps that impede mainstreaming dugong and seagrass conservation:

Abundance and Distribution Information

- Project partners in Johor noted that improved information is required about occurrence and distribution of dugongs, particularly about the use of habitat by small groups or individual dugongs, as well as their range (southward) further away from the Islands.
- The presence of the large herds of dugongs around Sibu Tengah Island are also a driver for further research into how and where the groups disperse, particularly in the afternoons since they were encountered less in the afternoons.
- Project partners in Johor further noted that more in-depth and long-term studies are required on the dynamics of seagrass meadows.

Key Pressure/Driver Information

- In the project documents for both sites, there is a gap in available information about dugong mortality (i.e. status and trends) and the quantification of the key pressures (i.e. causes) of dugong mortality. This gap in information inhibits the prioritization of threats and development of targeted responses that might minimize regulatory impacts.
- Project partners in Johor noted that various legal restrictions and lack of coordination amongst the management authorities make it almost impossible for scientists and conservation practitioners to participate in necropsy of dead dugongs.
- Project partners in Johor additionally noted the absence of a coordinated stranding response protocol that would enable the proper examination and investigation into the cause of death of dugongs.

Socio Economic Information

- Further information is required specifically about the demographics and economic value of fisheries and tourism activities generally implicated in dugong mortality at both sites. This is particularly important since effective responses may impact fishermen and communities.

Barriers to Effective Conservation - While project partners at both project sites have highlighted some of the existing protections for dugong, such as endangered species status and fisheries regulations, there remain a number of important barriers to mainstreaming dugong and seagrass conservation:

Regulations and Compliance

- At a national level, seagrasses and seagrass habitat have no legal protection in Malaysia, except for areas where seagrass exists within the boundaries of existing protected areas.
- Overlapping responsibilities of federal and state agencies complicates both the development and effective implementation of policy and plans.
- Project partners in Johor noted that illegal fishing within existing protected areas is rampant and that core dugong areas are at high exposure to bycatch risk. They reported that existing levels of monitoring and patrolling of marine protected areas are inadequate.

Planning

- The Dugong National Plan of Action for Malaysia, first published in in 2011, has never been fully operationalized and is now overdue for review and update.
- Some of the critical seagrass habitat for dugongs in the area of Pulau Sibu Tengah and Pulau Sibu Hujung fall outside the existing boundaries of protected areas. It is unclear whether they would be protected by the new sanctuary or IMMA designations. These are core dugong feeding areas that are open to the threats of destructive fishing and ecosystem degradation (e.g., dredging, coastal development).
- Recent changes in Government have delayed and complicated the gazette process of the Johor Dugong Sanctuary.

Financial

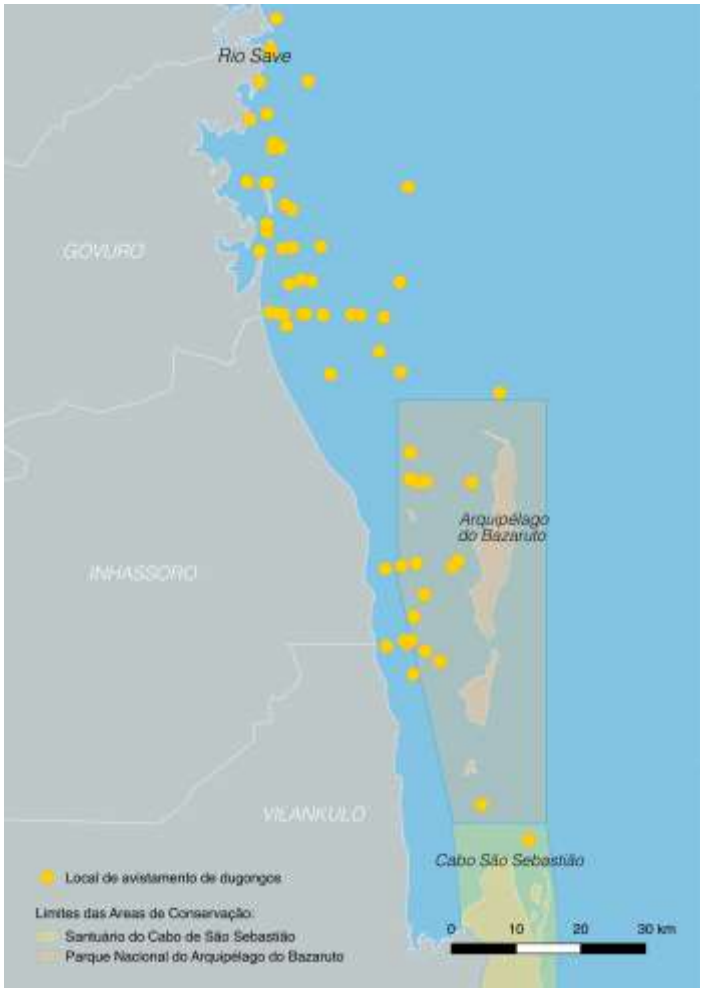
- Project partners in Johor noted the need for a budget allocation for the implementation of the Dugong National Plan of Action, as well as funding of scientists and conservation managers to carry out more applied work.
- Project partners also highlighted the need for adequate funding for fisheries enforcement and management of protected areas.

Behavior Change

- Project partners in Johor noted a lack of awareness among communities and operators in the region regarding the importance of dugongs and seagrass ecosystems.

Mozambique

Mozambique possibly represents the last refuge for dugongs in East Africa, with the main population being found in the Bazaruto Archipelago. Aerial surveys from 2008 indicate a population estimate of 359 in the Bazaruto region. New survey data from 2018 is still being analyzed to improve current understanding of abundance and distribution in Bazaruto. Additional dugongs have been observed elsewhere along the Mozambican coast via aerial survey, but in limited numbers. Overall seagrass habitat in Mozambique is limited in areas studied, with the exception of Bazaruto Bay.



Due to a high-level of extreme poverty and lack of alternative livelihoods, fishing remains a primary source of food and income for local communities. Fishing is often a family heritage and the numbers of fishers and nets have increased significantly in the past two decades. Reduced fish stock and few healthy coastal areas are the result. In addition, fishing seasons vary by region and some fishermen migrate to neighboring regions when there are periods of closure.

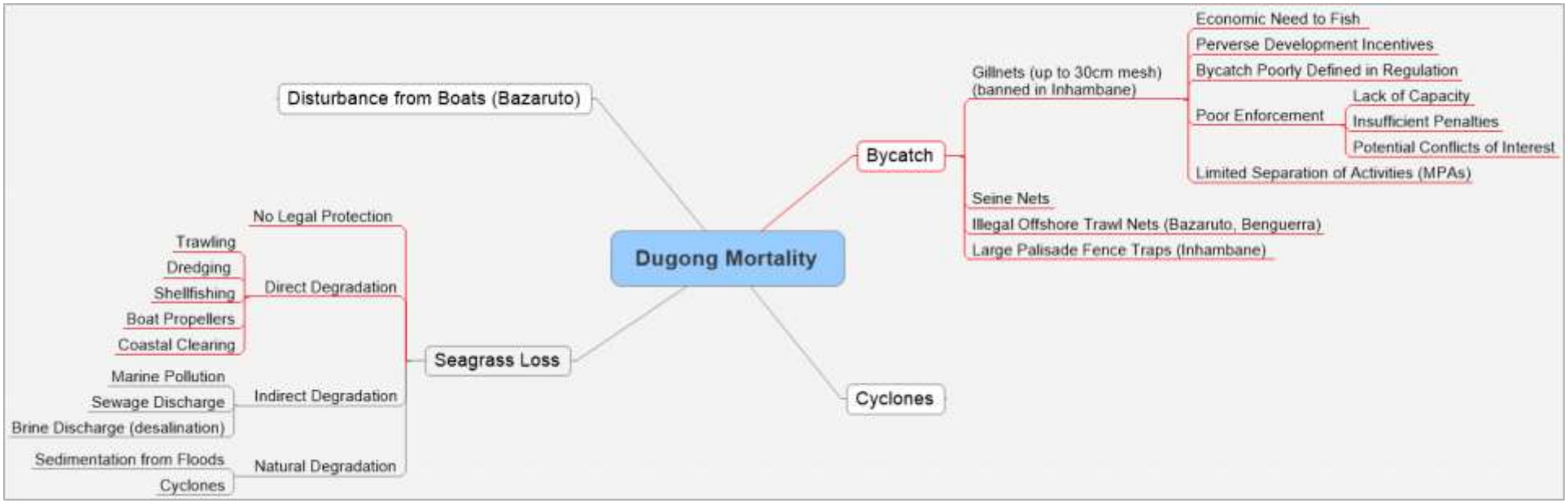
The Government of Mozambique has initiated a number of programs to try and alleviate poverty. In 2011 a new Poverty Reduction Action Plan aimed to reduce poverty from 55 percent to 42 percent by 2014 in part by increasing agricultural and fishery production. A Strategic Plan for the Artisanal Fisheries Sector (2006–2015) and a Fisheries Master Plan for 2010–2019 provides a vision for an increased transition from subsistence fishing to commercial artisanal fisheries, and provides an increased focus on aquaculture. A Local Initiatives Development Fund introduced by the Government has, according to fishermen, tripled the number of fishing nets in the Bazaruto Archipelago. All of these programs have the potential to increase pressure on natural resources and potential pose a threat to dugongs.

Multiple fishing techniques are practiced, which include large mesh (30cm) gillnets, seine nets, trawling gear and large palisade (fence) fish traps which are set in intertidal areas. There are also many anthropogenic activates and natural causes that result in damage to seagrass habitats. These include trawling and dredging, coastal clearing, damage from boat propellers, harvesting of shellfish such as oysters, as well as increased sedimentation from floods that transport sediment down rivers and cyclones. In addition, seagrasses are indirectly affected by sewage discharge, detergents, pollutants and the discharge of brine from desalination plants.

While hunting is not specifically identified by project partners as a key threat, since 2016 there have been 8 reported and confirmed cases of dead dugongs, and a witness reported 10 dugongs being killed in Bazaruto but the evidence was destroyed. Mozambique became a signatory to the Dugong MOU in 2011.

DPSIR analysis - Project partners completed a DPSIR analysis and a policy gap analysis, but not in the format provided by the DSCP Project Coordination Team, creating some difficulty analyzing the information in a consistent manner with other countries. Additional data, maps and detail to clarify the current understanding of dugong mortality was derived from other documents provided by project partners

The figure below provides a visual representation of the key pressures and drivers represented in the documents provided by project partners. Those highlighted in red are deemed to be of most strategic importance, based on the available evidence.



Key Findings - Based on available information, the primary pressure affecting dugong mortality in the Bazaruto region appears to be entanglement and drowning in shark gillnets and seine nets, typically during night fishing. Gillnets have been banned in the Bazaruto National Park region. However, illegal nets are still used quite extensively. This seems to be exacerbated by:

- A lack of a lack of enforcement of existing regulations around fishing leading to bycatch of dugong and degradation of seagrass habitats.
- A lack of alternative livelihoods for fishermen and the promoting of fishing as an economic activity by the Government to try and move the local populations out of poverty. This strategy is reported to have tripled the number of fishing nets in the Bazaruto Archipelago.

- A potential conflict of interest, as the some Government entity is responsible for promoting fishing and protecting natural resources.
- Barriers to shifting to alternative sources if food and income such as aquiculture due to a lack of locally produced fish food and effective markets to sell the fish produced.

Because seagrass habitat is neither extensive, nor well protected, significantly reducing or otherwise mitigating the human activities that are destroying seagrass is another key policy challenge. Project partners have provided a set of useful recommendations the final report of MZ5. However, these recommendations could be enhanced with monitoring and data collection especially related to dugong mortality.

Barriers to Understanding Threats - Participation in the DSCP has increased knowledge about dugongs and seagrass, but there remain significant gaps in knowledge:

Abundance and Distribution Information

- Current abundance and distribution information is based on aerial surveys conducted around 10 years ago. Further aerial surveys were conducted during 2018 but this data is not yet available.
- Project partners report that seagrass along the nearshore coast north of Bazaruto reflect low levels of coverage, but expansive seagrass meadows are found in Bazaruto Bay. This information would be much more useful if presented as maps indicating seagrass extent, health and species and overlaid with data such as the presence of dugong and activities such as harvesting of oysters known to degrade seagrass habitat.

Key Pressure Information

- It would be very helpful to better understand the relative impact from different gear types on dugong mortality (e.g. Do fence traps result in less mortality than gillnets). This would allow for informed development and policy decisions around fisheries regulation and alternative livelihoods.
- Data on dugong mortality is anecdotal but has been linked to bycatch in shark gillnets and drowning in seine nets.

Socio Economic Information

- The challenges facing the coastal communities of Mozambique include extreme poverty. The Government is implementing plans to alleviate this poverty, which include an increase in fishing effort and a shift from subsistence fishing to commercial artisanal fisheries and aquiculture. This has the potential to increase the pressure on the dugong and dugong habitat. No specific socio-economic data is provided for the project area.

Existing Conservation Measures Information

- The Bazaruto National Park was initially created in 1971 with an area of 600km2 and extended in 2001 to its current size of 1430 km2 to create the Bazaruto Archipelago National Park (BANP). The park was proclaimed to protect dugongs, sea turtles

and their habitats, as well as the vegetation of the islands, coral reefs, waterfowl and all the fauna of the park. An extensive management plan is mentioned but there are no details provided about the plan and how effectively it is being implemented and achieving the objectives.

Barriers to Effective Conservation - A number of regulatory and planning actions have already been taken but these could be strengthened to enhance the protection of dugongs and seagrass:

Regulations and Compliance

- It has been illegal to kill dugong since 2002 but the Policy Gap Analysis Final Report states that no convictions have been recorded.
- Community Fisheries Councils (CCP) which are nonprofit community organizations that play multiples roles including fisheries management, conflict resolution, promotion of best practice to support the recovery of natural resources and the protection of seagrass. There is a lack of information about how many CCP's exist and how effective they are. It is reported that fisheries management is primarily conducted in the (BANP) by the local CCP's. It is not clear if the protection of dugongs from fishing activity is a responsibility or a priority for the CCP's.
- The use of gillnets has been banned in Bazaruto National Park region (and by provisional government in every province) but anecdotally they are still used extensively.
- The Governments plans to alleviate poverty which include an increase in fishing effort and a shift from subsistence fishing to commercial artisanal fisheries and aquiculture have the potential to increase the pressure on the dugong and dugong habitat. These increased commercial activities in areas with dugong populations present must be accompanied with effective regulations and enforcement in order to provide protection for dugongs.
- It is reported that seagrass habitats are being degraded by many direct and indirect human activities. Seagrass habitats require legal protection supported by enforcement to limit future degradation, especially if fishing effort is increasing in response to government programs to alleviate poverty.
- Illegal fishing and night fishing are reported as being a significant cause of dugong mortality but there is no data to substantiate this. Both illegal fishing and night fishing should attract greater monitoring and enforcement effort.

Planning

- The role of fisheries management and protection of natural resources falls to the local CCP's. It is unclear how effectively this role is carried out.
- An extensive management plan for the BANP is mentioned but there are no details provided about the plan and how effectively it is being implemented and achieving the objectives.

Behavior Change

- A number of programmes have been implemented aimed at reducing the impact of fishing. The Pride Campaign implemented by the Ministry of Sea, Inland waters and Fisheries, the World Bank and Rare aims to improve the management of natural resources and have trained several local communities in fisheries management and good fisheries practices.
- The Artisanal Fisheries Program run by Ministry of Sea, Inland waters and Fisheries and Gapi and funded by the African Development Bank seeks to reduce catch of fish species still in development and reduce the use of mosquito nets and small mesh nets used for fishing.
- No information is provided as to whether these programs included techniques to protect dugong or seagrass habitat.

Solomon Islands

The Solomon Islands did complete a DPSIR analysis or policy gap analysis related to dugong or seagrass habitat at this time. There is not sufficient information in other reports provided to the DSCP Project Coordination Team to conduct a full analysis within this report.

Project partners report that there is very little information available on the abundance, distribution or ecology of dugongs in Solomon Islands. Dugongs are reported to be present in Choiseul, Isabel, Guadacanal, Malaita, Western Province, and Temotu, as well as in the Arnavon Community Marine Park and Tetepare Marine Protected Area, two well established and actively managed protected areas. Anecdotal evidence suggests that dugong population throughout the country is declining.

The pressures and drivers can be summarized at a generic level as:

- Dugong pressures include hunting (primarily for meat) and opportunistic harvesting of dugong caught as bycatch and the use of gillnets. This could be for cultural feasting or to be sold to supplement income. A growing coastal community is leading to more boats, which may be leading to increased boat strikes.
- Pressures impacting seagrass include sedimentation caused by unsustainable logging and agricultural practices, pollution in the form of sewage and marine litter, as the over harvesting of marine resources.

The Solomon Islands became a signatory to the Dugong MOU in 2010. In addition, the Solomon Islands banned possession of dugongs (pieces/ whole dugong; alive or not) in 2018.

Sri Lanka

Dugongs occur in the Gulf of Mannar and Palk Bay between Kalpitiya and Jaffna, stretching over the wide continental shelf that connects Sri Lanka and India. This area contains the most extensive remaining areas of seagrass habitat in Sri Lanka, with nine species of seagrasses recorded in various depths from 0.5m to 14m. The proximity and potential connectivity of habitat between Sri Lanka and India further complicate management, regulatory enforcement and conservation efforts for dugongs.

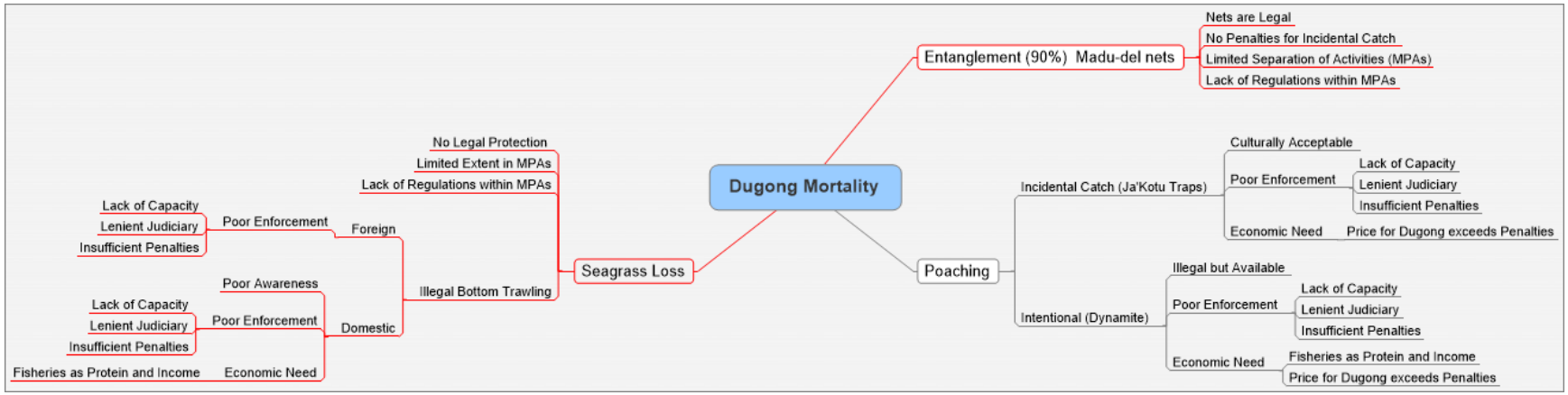
A 30-year war had made this zone previously un-accessible to all but the military activities, which limited fisheries activities and most conflict with dugong. The re-settling of the coastal communities who had sought refuge in the South during the war and the recent expansion of fishing activities have become major threats' to both the dugong and sustainability of seagrass habitat. Fishing occurs in the Gulf of Mannar between October and March, while fishing in Palk Bay (north of Mannar Island) occurs throughout the year due to its sheltered position from the waves of the Mansoon season.

The dugong is still considered a valuable commodity and its meat is highly priced in the black market, which leads to high likelihood of killing when encountered whether intentionally hunted or incidentally caught.

Sri Lanka became a signatory to the Dugong MOU in 2012.

DPSIR Analysis - Project partners conducted both the DPSIR analysis and the policy gap analysis to a high degree. Some additional information and details can be gleaned from other policy documents submitted to the DSCP Project Coordination Team. Although recent abundance and distribution data is limited to fishery interaction information, the project partners have characterized the key known pressures, drivers and policy gaps related to dugong and seagrass habitat conservation.

The figure below provides a visual representation of the key pressures and drivers represented in the documents provided by the project partners. Those highlighted in red are deemed to be of most strategic importance, based on the available evidence.



Key Findings - Based on available information, the primary pressure on dugong is entanglement and drowning in "legal" Madu-del nets (bottom set gillnet – mesh size 16" to 18"), accounting for 90% of known mortality. The net is mostly used as a secondary gear depending on the presence of the targeted skates, rays and guitarfish, and widely used within 12 to 15 nautical miles of shore for the full extent of the Mannar peninsular, except in Talaimannar main landing site up to Kalpitiya.

The key policy challenge is eliminating or significantly reducing the impact of Madu-del nets on dugong. Project partners estimate that on average, one dugong per month is being killed. Some key drivers related to the Madu-del fishery include the strong economic dependence on fishing, and the lack of regulation, enforcement and penalties for incidental catch of dugong. Killing of dugong is illegal under law but there is no monitoring or penalties for incidental catch.

Another key policy challenge is protecting seagrass habitat from both domestic and foreign fishing fleets using "illegal" bottom trawls in both Sri Lankan and Indian waters. Seagrass habitat is not protected under law in Sri Lanka but bottom trawling was outlawed in July 2017. In addition, seagrass habitat is under-represented in the existing marine protected areas and only within one site. The strong economic dependence on fisheries, regulatory enforcement challenges and trans boundary poaching of fish by Indian fishermen further complicate the protection of seagrass habitat.

Lesser (but important) challenges are related to a general acceptance of killing dugong within the communities when encountered (supporting poaching), and a significant mismatch between poaching penalties and the value of dugong meat in the black market.

Barriers to Understanding Threats - While significant progress has been made in understanding the key pressures and drivers of dugong mortality and their associated habitat, there remain a number of key information gaps that impede mainstreaming dugong and seagrass conservation:

Abundance and Distribution Information

- There is minimal information available about the dugong abundance and distribution in Sri Lanka. The present data on dugong distribution is based on kills or encounters between fishermen and dugongs and would indicate the areas of highest overlap of fishing activity with the range of the dugongs.
- Further research is needed to identify populations of dugong between India and Sri Lanka. It is unclear if there is a single population using trans boundary waters, and therefore, what importance collaboration may play in addressing fisheries impacts.
- There is minimal information available about seagrass habitat extent and distribution, particularly in Palk Bay and possibly Palk Straights. DSCP efforts focused primarily on Gulf of Mannar.

Socio Economic Information

- Further information is required specifically about the demographics and economic value of the Madu-del fishery, since effective responses may impact fishermen and communities.

- Similarly, an understanding of the demographics and economic value of domestic bottom trawlers is necessary to support increased compliance with the July 2017 ban.

Existing Conservation Measures Information

- Project partners identified the existing legal mandates and resource constraints for a number of "enforcement" bodies. However, little information was provided on the current effort and impact of enforcement measures (e.g. extent of patrols, violations issued, successful prosecutions, penalties issued). It is difficult to assess or predict the effectiveness of new or amended regulations and enforcement measures without such data.
- Further information is required about existing MPA management plans (particularly Vidattaltivu Nature Reserve) and what protections the implementing regulations provide for seagrass habitat and dugongs. For example, it is unclear from the materials presented whether destructive fishing practices are allowed at present and what level of environmental monitoring or enforcement is practiced within the sites. As a result, it is not clear if the protected designations have any practical conservation impact for dugong or seagrass at present.

Barriers to Effective Conservation - While some key conservation measures are already in place, such as outlawing dugong killing and banning bottom trawling, there remain a number of important barriers to mainstreaming dugong and seagrass conservation:

Regulations and Compliance

- Entanglement and drowning in Madu-del nets appears to be the most direct threat to dugong survival. However, Madu-del nets are still legal. Additionally, there are no penalties for accidental killing of dugong as bycatch.
- Seagrass habitat is not protected under law. Amendments to the Fisheries and Aquatic Resources Act No. 2 of 1996 (FARA) and banned mechanized bottom trawling in July 2017. However, bottom trawling is regularly carried out, including activities by Indian trawlers in Sri Lankan waters.
- The Fisheries and Aquatic Resources Act No. 2 of 1996 (FARA) and its amendments banned blast fishing. Blast fishing remains rampant in the Gulf of Mannar.
- Enforcement capacity is lacking and depends mainly on the Navy and the Coast Guard. The Department of Wildlife Conservation's (DWC) Marine Unit is under resourced, in terms of equipment, skilled personnel to implement and monitor illegal activities. The Department of Fisheries and Aquatic Resources (DFAR) is also under resourced. The Fisheries Inspectors do not possess boats; they are not skilled in working at sea and rarely go out to sea to apprehend illegal fishers. There is currently limited coordination among enforcement entities.

Planning

- Most present day records indicate that the dugongs' main range is found in the areas of the Cheval banks and along the Arippuvankale reef ridge. A high incidence of dugong sightings is also reported closer to shore at Iranathivu Island between Maldiva Bank and Vedithalathivu, and on the Nothern Coast of Battalangundu Island at the entrance to the Puttalam/

Kalpitiya Lagoon. However, existing protected areas are not located in areas thought to represent hotspots of dugong presence. Only one protected area declared in 2016 (Vidattaltivu Nature Reserve) contains a large seagrass area. Existing MPAs were neither established for, or provide, any significant level of protection for seagrass habitat or known areas important to dugong.

Financial

- Under the Fauna and Flora Protection Ordinance (FFPO) No 2 of 1937 and its amendments, the dugong is protected under Schedule II. Penalties are in place for the intentional killing of dugong, but these penalties are below the value of dugong meat sold into the black market.

Behavior Change

- A cultural acceptance of killing dugong and economic value of the meat on the black market contribute to both intentional and opportunistic poaching.

Timor-Leste

Timor-Leste comprises the eastern half of the island of Timor, the nearby islands of Atauroand, Jaco, and Oecusse. To date, precise information on dugong abundance and distribution is unknown, with few field or community surveys available.

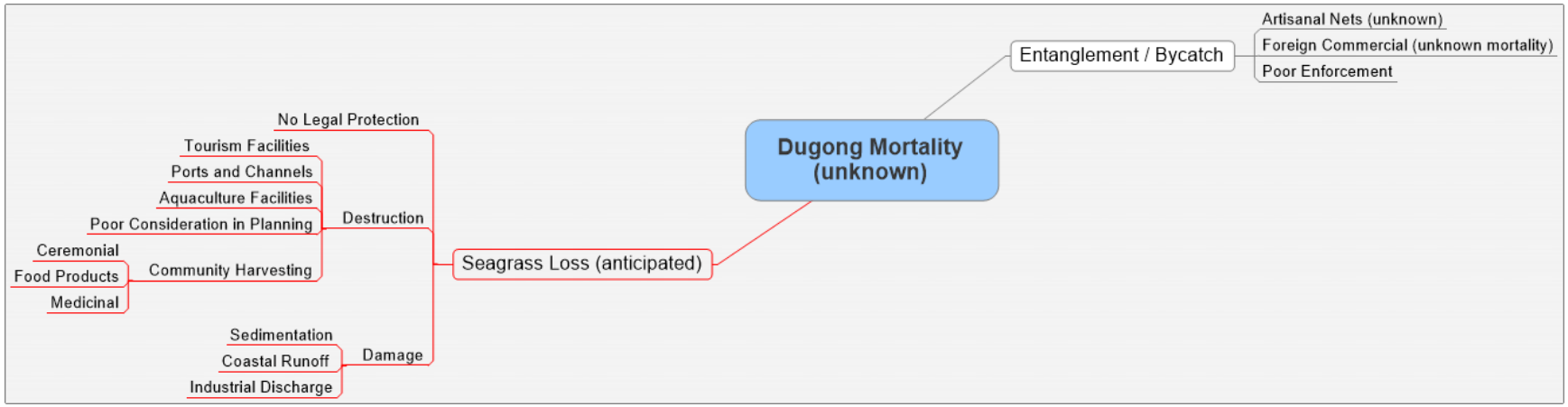
Due to its geological formation, Timor-Leste possesses a narrow band of shelf around the island, which holds corals, seagrass, and mangroves, with the shelf abruptly dropping away to the 400meter level. As a result, seagrass habitat areas are small and interspersed with areas of coral reefs, mangroves, mudflats, and sand. To feed, dugongs move frequently between seagrass areas and are thought to use deeper waters along the shelf to accomplish this.

The Northern Coast hosts most seagrass habitat, estimated at 2,200 hectares, alongside 1,266 hectares of mixed coral and seagrass and open reef flat. Nine species of seagrass have been identified within local waters, reaching peak density in shallow-water, back-reef environments (reef flats), and lagoons.

Achieving independence from Indonesia in 2002, the country is still in the process of building its administrative and governmental institutions, which possibly has delayed environmental protection and conservation planning.

Timor-Leste became a signatory to the Dugong MOU in 2018.

DPSIR Analysis - The figure below provides a visual representation of the key pressures and drivers represented in the documents provided by project partners. Those highlighted in red are deemed to be of most strategic importance, based on the available evidence.



Key Findings - Based on available information, project partners believe the loss of seagrass habitat is the greatest threat to dugong survival in Timor-Leste. However, habitat loss is characterized as a "threat", rather than a current pressure. As presented, it is unclear if seagrass extent or health is currently in decline. Further, project partners have not provided any evidence that the extent (or loss thereof) of habitat is currently impacting dugong survivability.

Project partners have identified several key pressures on seagrass habitat, including coastal development and dredging for tourism, port expansion and aquaculture facilities. In addition, they identified the potential of coastal debris, runoff and sedimentation to further impact seagrass viability by degrading coastal water quality.

In Timor-Leste, seagrass habitat is not protected under law. However, communities of Timor-Leste have created over 22 marine protected areas under traditional law (i.e. Tara Bandu), the majority of which include seagrass habitat. One community has created a distinct dugong marine protected area of 360 hectares, which includes approximately 60% seagrass. Biodiversity Decree Law of 2012 supports Tara Bandu designations and prevents any action that would contradict the assigned purpose of protection.

Project partners report occasional incidents of dugong being caught in the nets of the artisanal fisheries. However, dugong are usually caught in shallow water and reportedly released without injury. Timor-Leste has protected dugong under Fisheries Decree Law 5 of 2004 and Biodiversity Decree Law of 2012. Hunting is not a traditional cultural activity of local communities and appears not to be a threat.

There is a growing offshore commercial fishery or foreign-owned vessels licensed by Timor-Leste. However, the gear types and potential for dugong conflict are unknown. Boat strikes have not been recorded in Timor-Leste. However, there is no formal avenue by which anyone can make these reports.

Barriers to Understanding Threats - While progress has been made in considering the threats to dugong and seagrass habitat, there remain a number of key information gaps that impede mainstreaming dugong and seagrass conservation:

Abundance and Distribution Information

- To date, information on dugong abundance and distribution in Timor-Leste remains unknown.

Key Pressure/Driver Information

- There is little known about direct cause of dugong mortality and therefore, the key pressures of concern.
- One particular area of concern is developing and understanding of the size and nature of the growing commercial fishing industry (e.g. locations, gear types, bycatch records) and what potential conflicts exist with dugong and/or seagrass habitat.
- While discussed as threats by project partners, the human activities impacting seagrass habitat is not well characterized or quantified (i.e. activity level and trend, impact level and trend). This limits the ability to prioritize or target appropriate policy.

Existing Conservation Measures Information

- There is little information presented about the status of spatial planning or planning processes in Timor-Leste. As a result, it is unclear what consideration is presently placed on mainstreaming protection of seagrass habitat early in development.
- Similarly, it is unclear from the documents presented what regulatory processes (e.g. environmental impact assessment, permitting) exist to manage potential impacts of coastal development and dredging for tourism, port expansion and aquaculture facilities.
- Further information is also required about effectiveness of existing marine protected areas for protecting seagrass habitat and dugong (e.g. what is the extent of seagrass represented, are sites managed under monitoring and enforcement regime?).

Barriers to Effective Conservation - While some key conservation measures are already in place, such as providing the dugong protected species status, and establishing community-based protected areas, there remain a number of important barriers to mainstreaming dugong and seagrass conservation:

Regulations and Compliance

- Project partners have presented the loss of seagrass habitat as the most direct threat to dugong survival. However, seagrass habitat is not afforded protection under national law.
- Regulatory processes (e.g. environmental impact assessments, permitting, licensing, inspection regime) should consistently screen projects and/or operations for compatibility with conservation of dugong and seagrass habitat.
- Fisheries laws (including licensing of foreign operators) need clarity over habitat protection and protected species. Potentially high conflict methods (i.e. gillnets and bottom trawling) should be banned forms of fishing.

- Commercial fishery is licensed by government, requires sufficient oversight and enforcement to ensure compatibility with regulation and monitor potential impacts on dugong or seagrass sustainability.
- At present, there is no mechanism in place whereby community and district level officers can report dugong inidents or potential violations to regulation that threaten dugong or seagrass habitat.

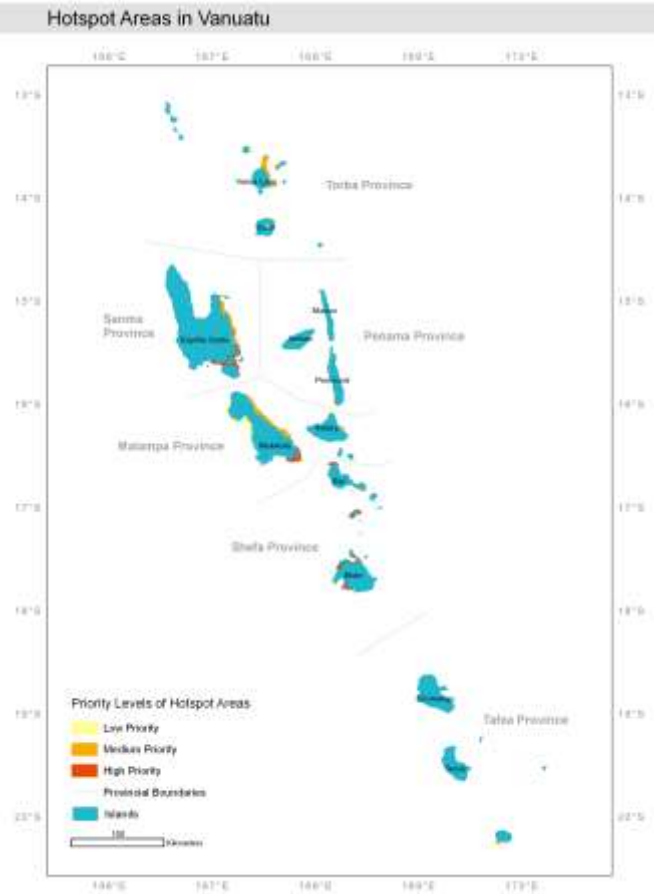
Planning

- As a young and developing country, the pressure for growth and coastal development will likely be high, and project proposals may arise that will threaten seagrass habitat and dugong sustainability.
- Spatial plans and planning processes should recognize the value of seagrass habitat and accommodate its protection, and further incentivize the placement of activities that are compatible with dugong and seagrass sustainability.
- The communities of Timor-Leste have created over 22 marine protected areas under traditional law. It is not clear at present if/whether these sites provide adequate protection (i.e. extent, regulations, enforcement) to sustain seagrass habitat and dugong.
- In Timor-Leste, seagrass habitat areas are small and interspersed with areas of coral reefs, mangroves, mudflats, and sand. Government-established marine protected areas appear to be very limited, given the spatial distribution and number of seagrass sites. The current extent of protection within existing sites through regulation and enforcement is unclear.

Vanuatu

Vanuatu did not complete a DPSIR analysis or policy gap analysis at this time. There is not sufficient information in other reports provided to the DSCP Project Coordination Team to conduct a full analysis within this report.

The DSCP in Vanuatu focused on survey work and education. The project team used the Convention on the Conservation of Migratory Species of Wild Animals (CMS) Standardised Dugong Catch / By-Catch Questionnaire to increase the understanding of dugong and seagrass distribution and potential threats. Both dugongs and patches of seagrass are reported to exist throughout the archipelago, with the general perception that the numbers of dugong are not decreasing.



Fishing with gillnets is common, including in areas known to have dugongs which may pose a significant threat, particularly as many nets are left unattended. There is some understanding that the presence of dugongs could be good for tourism and guidelines and a code of conduct for tourism interaction with dugongs has been created and made available.

Twenty dugong conservation hotspots have been mapped and prioritized using the survey data. Now more detailed and scientific studies are required. Awareness materials such as a workbook that functions as a toolkit for community workshops has been created to support awareness raising and a total of 29 community workshops have been conducted in five of the dugong conservation high priority hotspots with 1151 people attending the workshops.

Several policies have been developed and implemented including a National Biodiversity Strategy and Action Plan 2018-2030, National Environment Policy and Implementation Plan 2016-2030, marine spatial planning, including for marine protected areas, under the Oceans Policy and in the development of the Global Environment Facility (GEF) 6 project Expanding Conservation Areas Reach and Effectiveness.

Vanuatu became a signatory to the Dugong MOU in 2010.

Appendix: Contributors to DPSIR

Country	Name	Position	Institution
Indonesia	Mr. Ferry Kurniawan		Bogor Agricultural University, Indonesia
Sri Lanka	Dr. Lakshman Peiris	Deputy Director (Research and Training)	Department of Wildlife Conservation Battaramulla, Sri Lanka
Sri Lanka	Mr. Arjan Rajasuriya	Coordinator Coastal and Marine Programme	IUCN Sri Lanka country office
Mozambique	Lily Bunker	Founder and CEO	Tuya Consulting
Mozambique	Chambalson Jorge	Research and Monitoring and Evaluation Associate	Tuya Consulting
Madagascar	Ms Ralalaharisoa Christine Edmée	Director General for the Environment	Ministry of Environment, Ecology and Forests
Madagascar	Ms RANARISON Rota Manitriniaina Zoeline,	Dugong National Focal Point	DG Environment, Ministry of Environment, Ecology and Forests
Madagascar	Mr. DAMA	Director Pollution Management	DG Environment, Ministry of Environment, Ecology and Forests
Madagascar	ZARASOA	CMS National Focal Point	Ministry of Environment, Ecology and Forests
Madagascar	RATSIMISARAKA Télésphore	Consultant	Directorate General of Environment, Ministry of Environment, Ecology and Forests