A Summary Report on a Review of Recent National Dugong Action Plans to Inform Revision of the Dugong Memorandum of Understanding Conservation Management Plan

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Executive Summary

- A preliminary analysis of the 2007 Conservation and Management Plan (CMP) for The Memorandum of Understanding on the Conservation and Management of Dugongs (Dugong dugon) and their Habitats throughout their Range (Dugong MoU) ([download link](#)) suggested that the following topics were in most need of updating: (1) threats to dugong and seagrass habitats, and (2) the effects of climate change on dugong and seagrass.

- Focusing on those topics, we analysed the most recent available documents reporting on actions done and/or planned for dugong and seagrass management, for 23 dugong range states (hereafter "range states").

- Threats to dugong and seagrass habitats were rarely quantified or mapped even though studies were often reported as urgently needed. Conducting adequate studies was often hindered by lack of funding and knowledge.

- Bycatch and illegal hunting were reported as major threats to dugong. Destructive fishing methods were most often reported as the main threat to seagrass habitats. Mitigating those threats appeared challenging for many states.

- Climate change was mentioned by half of the range states, often as a possible threat to dugong and seagrass, but climate change adaptation was generally not addressed.

- Most countries had some form of legal protection for dugong at the national level. The effectiveness of legal protection was hindered by a lack of financial and human capacity to ensure adequate law enforcement and surveillance.

- At the local level, marine reserves of various types were most often reported as the main management tool. However, these reserves were rarely designed to protect dugong and/or seagrass, and their effectiveness at doing so was not evaluated.

- All but four range states included in this study had a low or medium Human Development Index (HDI). Many relied on fishing as a primary source of livelihood. Dugong were of strong cultural importance in most range states.

- Our analysis demonstrated that while many range states defined actions to evaluate and mitigate threats to dugong and seagrass communities, implementation was hindered by difficulties in allocating scarce resources towards the most relevant actions for their specific national circumstances. We suggest changes to the CMP for the Dugong MoU to account for this gap, and to provide better guidance in using the CMP in manner appropriate to the social, economic and environmental context of individual range states.

Introduction

The Convention on Migratory Species (CMS) is a multilateral environmental agreement of the United Nations, which has provided a global platform for the conservation and sustainable use of migratory animals and their habitats since it came into effect in 1983. The Convention brings together the countries through which listed animals pass, known as dugong range states (hereafter "range states"), and lays the legal foundation for internationally coordinated conservation measures throughout the ranges of species listed under the Convention.

The CMS acts as a framework convention that encourages the range states for listed species to develop agreements including legally binding treaties and less formal instruments, such as Memoranda of Understanding. The dugong, which is listed as Vulnerable to Extinction at a global scale by the IUCN, has been listed in Appendix II of the Convention since 1979. The Memorandum of Understanding for the Conservation and Management of Dugongs (Dugong dugon) and their Habitats throughout their Range (hereafter Dugong MoU) entered into effect on 31 October 2007. The Dugong MoU is administered by a secretariat-based CMS's regional office in Abu Dhabi, United Arab Emirates.

Conservation activities implemented by signatories to the Dugong MoU are guided by a Conservation and Management Plan (CMP) annexed to the Dugong MoU ([download link](#)). This report provides one of the lines of evidence we used to make recommendations to inform a revision of the 2007 CMP. We analysed the most recent national dugong action plans of signatory and non-signatory range states. This report is a companion to the document prepared by Tol and Marsh (2022) that summarises the information provided in the most recent National Reports submitted to the Dugong MoU Secretariat between 2016-2019.

Methods

Documents were collated for 23 range states (20 signatory and three non- signatory states) (Appendices, Table 1). Documents were not available for eight signatory states. The Thailand National Dugong Conservation Action Plan was available in the Thai language and was reviewed by a native Thai speaker. The Mayotte and New Caledonian National Dugong Action Plans were available in French and were reviewed by Hamel; a French national. The remaining documents were in English and also reviewed by Hamel.

Dugong-specific plans of actions and reports were available and analysed for 18 range states. Two regional dugong-specific reports covering several range states were analysed where individual reports were not provided: a joint report for Madagascar and Comoros, and a report on the Red Sea (Egypt, Saudi Arabia, and Yemen). A book chapter on dugong in the Red Sea was analysed instead of the provided joint report as it was more recent and more complete. Three states did not have dugong-specific documents and their national biodiversity strategies were searched instead.

We targeted two main themes in analysing these documents: (1) threats to dugong and seagrass habitats, and (2) the effects of climate change on dugong and seagrass communities. The rationale for this approach was that these were the areas that our

preliminary analysis of the 2007 CMP suggested were in most need of updating. More specifically, we collated information on: 1) whether threats were evaluated/monitored; 2) how specific threats were managed; 3) whether climate change was mentioned; 4) whether climate change was considered to be affecting dugong and their seagrass habitat; and 5) where possible, the way adverse effects of climate change were evaluated and managed. It is worth noting that the information collated is not exhaustive. Rather, it is used to provide specific examples to enhance our thematic analysis.

We also collated information on the reported dugong population size and Human Development Index (HDI) in the relevant range state to provide a context for understanding that state's challenges in evaluating, monitoring and managing threats to dugong and their habitats and the adverse effects of climate change on these assets.

Results

The results of our analysis are presented in Table 2 (Appendices). The main points are summarised below.

- Threats to dugong were mentioned by 18 signatory and non-signatory range states. By-catch was seen as a major direct threat to dugong by 89% (n=16) of range states that mentioned threats to dugong in their report, followed by illegal hunting (39% of range states, n=7).
- Assessing and adequately managing threats to dugong was found to be a challenge for many range states. Lack of data on dugong populations and their associated threats at the national level was a major issue. Out of 17 range states that mentioned threat mitigation solutions, the need for baseline studies was recognised by 41% (n=7), but funding was often lacking or insufficient (e.g., projects ending and not renewed). When mentioned, threat mitigation was mostly done or planned incidentally or deliberately via marine reserves of varying forms and protection levels (e.g. National Parks, Locally Managed Marine Areas, seasonal fishing closures) by 41% of range states (n=7).
- Out of the 23 range states analysed (including signatory and non-signatory), 26% (n=6) did not have (or did not report) any form of legal protection for dugong or their habitats. 71% (n=12) of the 17 range states that reported some form of such legal protection were doing so at the national level; 35% (n=6) reported local targeted or incidental protection in the form of Marine Protected Areas (MPAs).
- A key challenge to effective marine reserves at the local level, and dugong conservation at the national level, was a general lack of capacity for adequate surveillance and law enforcement. Instead, awareness campaigns were often seen as easier, less costly ways to foster changes in behaviours and/or indirectly improve compliance with regulations by increasing community engagement with conservation actions. As such, extensive awareness and education campaigns were often reported in range states documents (not quantified in this analysis).
- Threats to seagrass communities were mentioned by 12 range states. Of these, 60% (n=7) reported destructive fishing activities (e.g., trawling, beach seines, dynamite) as a major threat. Two states reported virtually no threats to seagrass habitats within their boundaries. Other major threats to seagrass reported included

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climate change and coastal development. Threats to seagrass were often inferred but rarely mapped or quantified.

- Seagrass threat mitigation was not specified or non-existent in 59% of all analysed documents (n=10). Where mentioned (n=13), seagrass threat mitigation was mostly conducted or planned incidentally or deliberately via marine reserves (46%, n=6), similar to dugong threat mitigation. Some states mentioned habitat restoration (n=3), environmentally friendly moorings (although not directly targeting seagrass or dugong areas, n=2) and pollution monitoring (n=2).

- Change in fishing practices was suggested by one signatory range state as a means of conserving seagrass. Studies on seagrass were urgently needed (a few such studies are already in progress) in 54% (n=7) of states that mentioned seagrass threat management.

- Climate change was mentioned in 43% documents (n=10). Most range states provided a general statement, and only four range states explicitly mentioned the possible degradation of seagrass habitat as a result of climate change. Only two range states suggested that the adverse effects of climate change were or would be ameliorated through marine reserves within their boundaries; the remainder provided no information on how climate change would be considered in future dugong and seagrass management.

- The Human Development Index (HDI) was low in 48% of the 23 range states included in our analysis (≤ 0.549), medium in 35% states (0.550–0.699) and not available in 17% states (n=4). None of the 23 range states had a high (0.700–0.799) or very high (≥ 0.800) HDI. Thus, all these states had limited resources for dugong conservation.

- Most communities in the analysed documents value dugong for their cultural/traditional or socioeconomic importance (86% or n=12 of n=14 states that mentioned socioeconomic values).

Analysis and recommendations

- Assessing and managing threats to dugong and their seagrass habitats appeared challenging for signatory and non-signatory states. The quantitative analysis above, as well as relevant sections in the analysed reports, provide guidance as to what those challenges are, and how the CMP and Dugong MoU could account for them in the future.

- Many range states seemed to be planning or undertaking actions mentioned in the CMP to manage threats to dugong and seagrass without having a clear understanding of their capacity to undertake those actions, and of their likely effectiveness in their specific context. For instance, where a dugong population is known to be small, the extensive aerial surveys designed for large dugong populations such as in Australia are unlikely to provide useful results and could waste precious (scarce) resources that could be better utilized elsewhere. Yet, because such aerial surveys are seen as best practice for assessing dugong abundance, they are included in action plans. In our opinion, prompting range states to critically assess their capacity, objectives and measures of effectiveness should be an integral component of any action plan to ensure that the (often scarce) resources assigned to conservation and management actions will make a

difference for dugong and their seagrass habitats. The Dugong and Seagrass Research Toolkit (http://www.conservation.tools/) provides advice in this context.

- The Dugong MoU stipulates topics that the CMP must address, while the CMP lists Example Actions that could be implemented at local, national and regional scales. Some of the examples are applicable only in some contexts, and signatory and non-signatory range states to the Dugong MoU will need to assess the relevance of particular approaches in the context of their circumstances. Because of the restricted applicability of the examples, it is strongly recommended that each range state formally articulates the context for implementing the Dugong MoU (e.g., governance structure for marine megafauna management, size of dugong population, management and research capacity) before deciding which examples are applicable to its national circumstances. The importance of the dugong population in some range states will warrant dedicated programmes for dugong. In others it will be more appropriate to develop research, management and education programmes for dugong as part of more generic programmes for marine megafauna.

- Unsurprisingly, our analysis also revealed that in dugong range states, local communities are both highly connected to dugong culturally and/or spiritually, and highly reliant on fishing as a primary source of income and livelihood. This means that solutions to dugong and seagrass conservation in those states should be worked out with local people (bottom-up approaches favoured over top-down approaches). For example, some states suggested that local governance is/would be better received by local communities, using tools such as Locally Managed Marine Areas (LMMAs), community-led Beach Management Units, community-driven incentivised bycatch reduction schemes, and increasing community capacity for law enforcement. All these approaches should increase trust and compliance. The Example Actions list in the CMP should be reviewed to ensure they are relevant and adapted to such contexts.

- The following specific challenges, also linked to the need to promote a better evaluation of context prior to undertaking planning or actions, were identified:
  - o Many action plans stressed the importance of dedicated studies on threats to dugong and their seagrass habitats, yet such studies were often lacking. A likely cause is that it is difficult to quantify and map bycatch and illegal take (two key threats to dugong in many states). Various reasons make such studies challenging such as captured animals being consumed without being reported, low levels of surveillance, strong kinship. Not evaluating threats prevents thoroughly assessing the population viability and therefore designing appropriate management actions that will effectively reduce mortality.
  - o Marine reserves were the most widely used tool to help protect seagrass and dugong. Seagrass beds were sometimes mapped or assessed using rapid methods, but trends or threats to seagrass were rarely evaluated. This suggests a lack of awareness of the importance of knowledge on seagrass habitats to help manage dugong populations
  - o Finally, the lack of mentions of climate change in some documents and, consequently, the lack of capacity to address potential adverse effects on dugong and seagrass is concerning.

- We conclude that the following matters should be addressed in the revision of the CMP:
    - o Assist signatory range states in formally articulating the context of implementation of the Dugong MoU in order to decide which actions are applicable to their national circumstances. We suggest this could be added to the preamble to the CMP (see companion document for CMP 2022). The preamble should refer to The Dugong and Seagrass Research Toolkit (http://www.conservation.tools/) to provide practical advice.
    - o Provide range states with more relevant Example Actions in the CMP.
    - o Encourage range states to conduct climate vulnerability analyses of seagrass habitats of importance to dugong and use them to develop climate adaptation plans to inform their responses to climate change.

Appendices

Key data used in the analysis

Table 1. Summary of documents analysed.

Country	Language	Reference used	Comments
Bahrain	English	Elsa Sattout (2016). The National Biodiversity Strategy and Action Plan, Kingdom of Bahrain, 2016-2021. 37pp.	
Comoros	English	C3 Madagascar and Indian Ocean Islands Programme (2010) Dugongs without borders – Building capacity for Indian Ocean sirenian conservation. A Report submitted to the BP Conservation Leadership Programme. 53pp.	Joint report (Comoros and Madagascar)
Egypt	English	Dirar Nasr, Ahmed M. Shawky and Peter Vine (2019) Status of Red Sea Dugongs, N. M. A. Rasul and I. C. F. Stewart (eds.), Oceanographic and Biological Aspects of the Red Sea, Springer Oceanography.	Joint report for Red Sea (Egypt, Saudi Arabia, Yemen) was from 2006. Book chapter was analysed instead.
Eritrea	English	The State of Eritrea, Ministry of Land, Water and Environment, Department of Environment (2015) Revised National Biodiversity Strategy and Action Plan for Eritrea (2014-2020). 15pp.	
India	English	Sivakumar, K. and Nair, A. (2013): Dugong Distribution, Habitat and Risks Due to Fisheries and Other Anthropogenic Activities in India. Wildlife Institute of India – Technical Report. 74pp. Ministry of Environment and Forests, Government of India (2012). National Conservation Strategy and Action Plan for the Dugongs and their Habitats in India, The Task Force for Conservation of Dugongs in India. 45pp.	Complementary information collected from both documents.

Country	Language	Reference used	Comments
Indonesia	English	Directorate of Marine Conservation and Biodiversity, Directorate General of Marine Spatial Management, Ministry of Marine Affairs and Fisheries (2018). National Plan of Action for Conservation of Dugong and its habitat (seagrass) in Indonesia 2018-2022. Research Center for Oceanography (Jakarta) and The Institute of Environmental Sciences (Leiden) (2008). National Dugong Conservation Strategy and Action Plan for Indonesia. Final Report. 61pp.	Complementary information collected from both documents.
Kenya	English	Awadh , A., Mwakumanya, S., Omar, M. (2021). Dugongs in Kenya – a survey on status and Trends. American Journal of Environment Studies, 4(1), 76 - 87. https://doi.org/10.47672/ajes.758. Ochiewo, J., Mohamed, M.O.S., Munyi, F., Kimanga, F., Waiyaki, E., Karani, N., Awadh, A., Angwenyi, R. (2017). Kenya Country Report. 23pp. Awadh, A.H., Said, M.O., Mwakumanya, M.A., Ochiewo, J., Munyi, F., Onyango, H., Mwakamsha, S., Shee, S., Katello, J., Kimanga, F., Waiyaki, E., Karani, N. (2017). Dugongs in Kenya: A social perspective on status, distribution and threats. Oral presentation for the WIOMSA Symposium, JNICC. 20pp.	Complementary information collected from all three documents.
Madagascar	English	C3 Madagascar and Indian Ocean Islands Programme (2010) Dugongs without borders – Building capacity for Indian Ocean sirenian conservation. A Report submitted to the BP Conservation Leadership Programme. 53pp.	Joint report (Comoros and Madagascar)
Malaysia	English	Website: https://www.dugongseagrass.org/where-we-work/malaysia/ .	No report available but Action Plans are existing (2020). Relevant information could be collected online.
Mayotte	French	Wickel J., Wickel A. (2019). Evaluation du Plan National d'Actions 2012- 2017 en faveur du Dugong à Mayotte. Rapport Marex/Oceanide pour le compte de la DEAL Mayotte. 45pp.	Data mostly based on evaluation document only (reports on actions done).

Country	Language	Reference used	Comments
Mozambique	English	Trotzuk, E., Matos, L., Araman, A., Gaylard, A. (2021) Bazaruto Archipelago National Park 2021 aerial survey report. 27pp. IUCN Marine Mammal Protected Areas Task Force (2019). Working to Implement Conservation Actions in the Bazaruto Archipelago to Inhambane Bay Important Marine Mammal Area (IMMA), Mozambique, 16th– 24th November 2019. Unpublished report. 44 pp. Associação para a Conservação e Protecção dos Dugongos e Espécies de Mamíferos Marinhos / Association for Conservation and Protection of Dugongs and Marine Mammal Species, Cockcroft, V., Findlay, K., Guissamulo, A., Taju, A. (2018) Dugongs (Dugong dugon) of the Western Indian Ocean Region: – Identity, Distribution, Status, Threats and Management. 17pp.	Complementary information collected from all three documents.
Myanmar	English	Tun, T., Ilangakoon, A.D. (2006) Capacity building and preliminary assessment on dugong (Dugong dugon) occurrence off the Rakhine Coast of Myanmar, Report to the Society for Marine Mammalogy. 23pp.	
New Caledonia	English	Grima D., Gardes L. (2016). Bilan de la phase 1 du Plan d'Actions Dugong en Nouvelle-Calédonie – période 2010-2015. Rapport Agence des Aires Marines Protégées. 71 pp. + appendices.	
Palau	English	National Environmental Protection Council (2019). 2019 State of the Environment Report, Republic of Palau. National Environmental Protection Council (NEPC), Government of Palau: Koror, Palau. 100 pp. Coral Reef Research Foundation (2013). Palau Dugong dugon Awareness Campaign 2012-2013. Technical Report. 48pp. Coral Reef Research Foundation (2012). Palau Dugong dugon Awareness Campaign 2010-2011. Technical Report. 38pp.	Complementary information collected from all three documents.

Country	Language	Reference used	Comments
Saudi Arabia	English	Dirar Nasr, Ahmed M. Shawky and Peter Vine (2019) Status of Red Sea Dugongs, N. M. A. Rasul and I. C. F. Stewart (eds.), Oceanographic and Biological Aspects of the Red Sea, Springer Oceanography.	Joint report for Red Sea (Egypt, Saudi Arabia, Yemen) was from 2006. Book chapter was analysed instead.
Seychelles	English	Government of Seychelles (2014). Seychelles Wetlands Policy and Action Plan 2019-2022. 39pp. Government of Seychelles (2014). Seychelles Biodiversity Strategy and Action Plan 2015-2020. Ed. John Nevill, Jacques Prescott, Nirmal Jivan Shah, Marie-May Jeremie. 115pp.	Complementary information collected from both documents. Report (1) focuses on wetlands, including seagrass beds.
Solomon Islands	English	WorldFish (2018). Conservation strategy for dugongs and seagrass habitats in Solomon Islands. Penang, Malaysia: WorldFish. Strategy: 2018-22. 16pp.	
Somalia	English	Ministry of Fishery and Marine Resources of Somalia (2006) Somalia Dugong Overview. Oral presentation. 11pp.	
Tanzania	English	Unknown (2018). Dugongs (Dugong dugon) of the Western Indian Ocean Region: – Identity, Distribution, Status, Threats and Management. Country report. 9pp.	
Thailand	Thai	Department of Marine and Coastal Resources (2020) Thailand National Dugong Conservation Action Plan: Phase 1 (2020 – 2022). 31pp.	Non exhaustive. Analysed from a summary of the report in English language.
Vanuatu	English	Unknown (2019) Vanuatu's 6th National Report for the Convention on Biological Diversity. 335pp.	
Viet Nam	English	Quang, V.V., Ben, H.X, Vy, N.X., N. J. Cox (2005). Conservation of the Dugong (dugong dugon) in Phu Quoc Islands, Vietnam. 32pp.	English language was challenging to read in this document.

Country	Language	Reference used	Comments
Yemen	English	Dirar Nasr, Ahmed M. Shawky and Peter Vine (2019) Status of Red Sea Dugongs, N. M. A. Rasul and I. C. F. Stewart (eds.), Oceanographic and Biological Aspects of the Red Sea, Springer Oceanography.	Joint report for Red Sea (Egypt, Saudi Arabia, Yemen) was from 2006. Book chapter was analysed instead.

Table 2. Key action types, organised by theme (non-exhaustive).

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Bahrain	2nd largest population after Australia.	No mention.	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified
Comoros	Unknown	No mention.	Bycatch	Not specified	Not specified	Not specified	Not specified	None
Egypt	5800 (Red Sea)	Seagrass die-off due to floods.	Bycatch? traditional hunting? (need studies)	Elba National Park (not efficient), Change NP's IUCN category, increase surveillance	Not specified	Not specified	Not specified	Through MPAs (Red Sea) only?

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Eritrea	Unknown	At national level: CC among greatest threats, adaptation to CC is priority. Mitigation through MPAs.	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
India	Unknown	Studies needed on impact of CC on dugong and their habitat.	Habitat destruction. Bycatch reducing because population reducing from hunting in past.	Legal protection but inadequate penalty process. Proposition of new gears, net retention and recycling scheme, illegal take assessment.	Damage from tsunamis, trawling (interviews)	MPAs include some dugong habitats. Need studies. Monitor water quality. Restore habitats.	Traditionally hunted in the past. Population too small now. Bones (tusk, rib bones, pelvic/pectoral girdle) used as ornament. Myth: carrying decorated dugong bones make hunting successful.	National

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Indonesia	1000	No mention.	Illegal hunting, bycatch, blast, poison fishing, captures for tourism	Increase local capacity for law enforcement, for studies, MPAs, outreach, etc.	Coastal development (UNEP)	Seagrass restoration, MPAs	Captured for meat (religious or custom events), claws and tears (magical power to attract opposite sex, bring money to businessmen). Tusks for decoration, tobacco pipes, medicine. Dugong captured for use as tourism attraction.	National

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Kenya	Unknown (small)	Decline in seagrass attributed to CC and other threats.	Bycatch, habitat destruction	MPAs but marine environment degraded	Trawl nets, climate change	MPAs, better enforcement needed, pollution prevention, control destructive gear	Many myths: meat has medicinal value, sexual intercourse with dugong	Through MPAs only?
Madagascar	Unknown	No mention.	Bycatch	MPAs, community-driven incentivised bycatch reduction schemes, LMMAs	Not specified	Not specified	Local taboo: sexual intercourse with dugong	National (forbidden to kill, injure, capture)

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Malaysia	Unknown	No mention.	Boat strikes and boat disturbance, bycatch	MPAs (not dugong-targeted: incidental protection)	Placement and dragging of anchors and unintentional human damage, improper management of waste disposal, run-off and oil spills	MPAs (not seagrass-targeted: incidental protection)	Hunted in the past. Hides = quality, meat = delicacy, tusks = tool handles. Medicines: asthma cure, aphrodisiac. Superstitious beliefs: dugong released when accidentally caught.	National
Mayotte	Unknown	CC will impact dugong through degradation and modification of seagrass distribution.	Bycatch, vessel collisions?	Increase surveillance effort, awareness with fishers, new fishing technique tested	Not specified	Studies in progress, moorings in place (not targeted for dugong/seagrass)	No customary value.	National

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Mozambique	300	Only mentioned in IMMA submission: IMMA will help with monitoring CC effect on affected species.	Bycatch, seismic surveys (guessed impact)	IUCN regional listing, enlarge World Heritage site coverage with help of IMMA	Beach seines	Increase national park coverage	Tourism value.	Through a National Park.
Myanmar	Unknown (frequent sightings)	No mention.	Not specified	NA	None	NA	No customary value.	National
New Caledonia	700-800	No mention.	Collision, bycatch, illegal hunting	MPAs, increase surveillance, studies	Not specified	ecological moorings (not targeted for dugong/sea grass), studies	Monetary value - driving illegal hunting.	National

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Palau	200	Seagrass cover is declining from CC. Currently mitigated through the use of MPAs but "not large enough". Community-based adaptation efforts. Monitoring. MPAs based on local needs thus don't consider areas of productivity.	Illegal hunting?	Improvement of law enforcement, awareness	Climate change	MPAs (inadequate).	Legends.	National

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Saudi Arabia	5800 (Red Sea)	No mention.	Bycatch? traditional hunting? (need studies)	Not specified	Not specified	Not specified	Not specified	Through MPAs (Red Sea) only?
Seychelles	20-25	Mentioned in policy objective to monitor change over time in the context of climate change.	Not specified	Baseline study	None	NA	Not specified	Not specified
Solomon Islands	unknown (widely distributed)	Monitored but not directly mitigated.	Targeted killing.	Awareness of law, illegal take reporting, inshore fishery compliance unit, capacity building, etc.	Runoff, coastal development.	Not specified	Cultural significance (taboo animal).	National

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Somalia	Unknown (migrating groups between Kenya and Somalia)		Studies needed. Bycatch?	Studies needed. Change fishing methods to sustainable practice?	Studies needed. Beach seine?	Studies needed. Change fishing methods to sustainable practice?	Not specified.	None
Tanzania	Unknown (rare sightings)	No mention.	Bycatch, motor boats, illegal destructive practices (blast fishing, poison)	Seasonal fishing closures, awareness for fishers, community fishery managers (Beach Management Units)	Destructive (fishing) activities, motor boats, commercial harvesting, dredging	Awareness on value of seagrass	Myths, meat and medicine.	National?

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Thailand	250	No mention.	Studies, bycatch, tourism	MPAs, studies, develop surveillance technology to reduce bycatch, capacity building (dugong protection, monitoring, rescue).	Studies.	Studies, monitoring, restoration.	Existing (no details available).	National? MPAs.
Vanuatu	Unknown	Mentioned in the general report but not in relation to dugong conservation.	Not specified	Studies, awareness	Not specified	Studies, awareness	Not specified	National

Country	Estimated pop size	Climate Change (CC)	Main threat to dugong	Mitigation of dugong threats	Main threat to seagrass	Mitigation of seagrass threats	Community value	Legal protection in place
Viet Nam	Unknown (commonly seen in the past)	No mention.	Illegal fishing techniques (blast, electric trawl), bycatch	MPAs in progress, studies needed on distribution, community awareness	Damage from trawlers, seine nets, boat traffic, dynamite fishing, coastal development.	MPAs in progress, studies needed	Meat. Skin dried and eaten. Bone sometimes used as a medicine. Spiritual value (ward off evil spirits). Tusks very valuable (brings luck to fishermen).	None
Yemen	5800 (Red Sea)	No mention.	Bycatch? traditional hunting? (need studies)	Not specified	Not specified	Not specified	Not specified	