UNEP - NAIROBI CONVENTION

# Western Indian Ocean Science to Policy Platform

5 – 7 December 2023 | Maputo, Mozambique

***Theme: Addressing Global Targets in the WIO in support of a Sustainable Blue Economy***

# Discussion Papers

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# 2023 Western Indian Ocean Science Policy Platform (WIO-SPP)

***Theme: Addressing Global Targets in the WIO in support of a Sustainable Blue Economy***

**Maputo, Mozambique 2023**

**Provisional Agenda**

| **Tuesday 5 December 2023** | | |
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| **Time** | **Event** | **Responsible** |
| 08:00 – 08:55 | Registration | Nairobi Convention Secretariat/INOM |
| **Session 1: Official Opening of the Meeting** | | |
| 09:00 – 09:30 | **Opening statements** | Nairobi Convention Secretariat |
| | • Oceanographic Institution of Mozambique<br>• Nairobi Convention Secretariat<br>• WIOMSA<br>• Government of Madagascar<br>• Government of Mozambique | |
| 09:30 – 09:45 | Adoption of the Agenda | Chair of the Bureau Supported by Government of Mozambique |
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| 11:15 – 11:30 | Incorporating mangroves into the national climate and biodiversity agenda of WIO countries | Dr James Kairo |
| 11:30 – 11:45 | Transboundary conservation area (TBCA) Economic Valuation | Jackie Crawford |

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| 11:45 – 12:00 | Milestones and urgent needs in the development of the Kenya-Tanzania marine transboundary conservation area – Proposal for the next 5 years | Vera Horigue et al |
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| 12:15 – 13:00 | General Discussion | |
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| 10:00 – 10:15 | Advancing Conservation through Community-Led Area-Based Fisheries Management: A Pathway to Achieving 30x30 Targets and Recognizing the Role of Local Knowledge and Participatory Science Tools | Atanasio Brito et al |
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| 11:15 – 11:30 | Improving shark and ray management in the Western Indian Ocean - | Rhett Bennett et al |
| 11:30 – 11:45 | Towards a regional MSP vision and roadmap for the Northern Mozambique Channel | Samantha Peterson |
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## 1. Introduction

Acknowledging the important role that science plays in policy and decision-making, and the barriers that limit the uptake of science into policy, the Western Indian Ocean (WIO) Science to Policy Platform (hereafter referred to as WIO-SPP), was established by the Contracting Parties of the Nairobi Convention during the 8th Conference of the Parties, Decision CP8/12: The objective of the platform is to integrate relevant scientific evidence and findings into national and regional efforts to protect, manage and develop the coastal and marine environment sustainably.

A meeting of the WIO-SPP is scheduled to take place from 5th to 7th December 2023 in Maputo, Mozambique. The meeting is jointly organized by the Secretariats of the Nairobi Convention and WIOMSA with the support of other partners and programmes. In addition to promoting the linkages between science and policy for evidence-based decision-making, the meeting is also intended to facilitate and promote a better understanding of on-going and emerging regional environmental challenges and opportunities, and of the strategies needed to address them in line with global protocols and best practice.

### 1.1. Overall objective of the meeting

The overall objective of the meeting is to promote the linkages between science and policy for evidence-based decision-making as well as providing timely technical advice and policy recommendations for consideration in the development of decisions in the upcoming COP of the Nairobi Convention. The meeting is also intended to facilitate and promote a better understanding of on-going and emerging regional environmental challenges and opportunities, and of the strategies needed to address them in line with global protocols and best practice.

### 1.2. Themes and organization of this document

The overarching theme of this meeting is ***"Addressing Global Targets in the WIO in Support of a Sustainable Blue Economy."*** The organizers of this meeting reached out to technical and policy experts to prepare discussion papers on selected initiatives of relevance to this theme and the associated sub-themes, as well as papers that will potentially provide the scientific basis for decision-making at the national and regional levels. These papers are contained in this document which is arranged according to the sub-themes of the meeting.

The sub-themes of the meeting are;

i. Implementation of the Kunming-Montreal Biodiversity Framework at regional and national levels in the WIO

ii. Locally Managed Marine Areas (LMMAs) as Other Effective Conservation Measures (OECMs)
iii. Approaches for collaborative regional ocean governance for a sustainable blue economy
iv. Opportunities for implementation of the High Seas Treaty (BBNJ) in the WIO;

The discussion papers attempt to make recommendations of a technical and/or policy nature in the context of national, regional and global dimensions.

## 2. Discussion Papers

### 2.1. Sub-Theme 1: Implementation of the Kunming-Montreal Biodiversity Framework at regional and national levels in the WIO

#### 2.1.1. Aligning the national and regional biodiversity targets with the new Global Biodiversity Framework: science informing policy making in Mozambique

**Authors**: Eleutério Duarte, Hugo Costa, Ivan Nerantzoulis, Hermenegildo Matimele, Acácio Chechene, Erwan Sola, Muaule Chuluma

**Background**

The Western Indian Ocean (WIO) is renowned for the richness of its marine biodiversity harboring a wide variety of marine and coastal ecosystems, from mangroves to coral reefs, seamounts and coastal dune systems that are crucial for the survival and well-being of the population. These ecosystems are currently under threat due to the combined impacts of unsustainable local use and destructive fishing practices, in addition to global threats, including increasing pressures from coastal infrastructure development, extractive industries (coastal mining and oil&gas), population growth and climate change.

For the particular case of Mozambique, the government recognizes the importance of these ecosystems and has committed itself to meeting a number of national and international conservation targets, such as those of the Convention on Biological Diversity (CBD), through the National Biodiversity Strategy and Action Plan (NBSAP) 2015-2035.

Considering that the new Global Biodiversity Framework-Kunming-Montereal (GBF) was recently adopted, setting 23 ambitious targets to be achieved by 2030 and four long-term goals for 2050 aimed at safeguarding and restoring global biodiversity, the government of Mozambique has been making a national effort to ensure that national targets are duly aligned with these new global commitments outlined in the new GBF and other CoP15 Decisions, duly incorporating the updated progress monitoring indicators corresponding to each target.

**Breakthroughs in Mozambique**

Since 2021 the Wildlife Conservation Society (WCS) has been supporting the government and other relevant sectors, providing training, technical and financial resources to ensure effective participation of the Mozambican delegation in the CBD CoPs, including CoP 15 which happened in 2022. About 12 capacity building sessions and preparatory meetings have been organized so far aimed at a group of technical staff from entities selected by the National Directorate for the Environment (DINAB), which is the national institution responsible for implementing most of the conventions related to biodiversity (including the Convention on Biological Diversity and the Nairobi Convention). These sets of trainings

and preparatory meetings resulted in the development of a roadmap to guide the negotiations and implementation of the CBD global biodiversity framework, considerably increasing knowledge at the level of government institutions regarding negotiations in COPs and the implementation of decisions in the national context.

At the technical level, a set of technical-scientific tools has also been developed with support from WCS, to inform national policies and legislation aimed at achieving national targets and aligning them with global and, potentially, future regional targets. The main examples in the marine sector are:

- **Development of the new biodiversity web portal**, known as Mozambique Biodiversity Information System (SIBMOZ) which is available online at https://sibmoz.gov.mz/ centralizing all relevant information (technical, policy, strategic plans, databases, among others) on biodiversity in Mozambique, with the main objective of facilitating technical and scientific cooperation and sharing of knowledge and data, supporting the decision-making process and promoting the sustainable use of biodiversity in the country. This platform is also the Mozambican Clearing House Mechanism.

- **Identification of 30 Key Biodiversity Areas (KBAs) of which 4 are marine and 9 coastal**, which were in turn integrated into the National Marine Spatial Planning (POEM) as areas that should be avoided by development projects that compromise their key biodiversity elements and were also used to inform the scenarios for the strategic expansion of the national network of Marine Protected Areas (MPAs). In terms of legislation, KBAs have been recognized under Decree 51/2021 (birds and their habitats protection) as avoidance areas and under the Ministerial Diploma on Biodiversity Offsets (Ministerial Diploma n. 55/2022 of 19 May), as areas to be avoided by development projects and as biodiversity offset recipient areas, particularly for cases in which they are used to establish new protected areas.

- **Conducted a spatial prioritization analysis to support the government in making informed decisions on how to expand the network of Marine Protected Areas (MPAs) to achieve the conservation goals** to which the country has committed under various conventions and initiatives while balancing the different human uses of the ocean (e.g. oil & gas, fishing, shipping, etc.). Three different scenarios were designed, identifying areas suitable for declaring or expanding MPAs. This process also resulted in the development of Mozambique's first integrated national marine ecosystem map, with 47 marine ecosystem types identified, which can be improved as more information becomes available for a region. All the relevant results and data from the analysis (ecological and socio-economic) were used to inform the National Marine Spatial Plan (POEM). Additionally, recognizing the urgent need to expand the national network of MPAs, strengthening the sustainability of human uses, especially fishing and oil&gas, and

securing the benefits and opportunities associated with marine biodiversity for generations to come, the Mozambique Government made the decision to develop a national strategy and action plan to expand the national network of MPAs, using information from the spatial analysis developed, specifically, and for now, the scenario of reaching 10-12% of EEZ protected till 2030. Finally, to facilitate the dissemination/accessibility of relevant and public information collected or produced during the spatial prioritization analysis, a Marine Biodiversity Atlas was also developed and made available through the SIBMOZ platform. As marine ecosystem and species data are now more easily accessible, it will be easier for developers and decision-makers to reduce impacts of projects in the marine ecosystems, such as oil & gas. It can also inform community fisheries planning and reduce impact of industrial fisheries.

- **Support for the Government in achieving national and international targets and commitments for the protection of coral reef biodiversity** through the development of the National Coral Reef Management and Conservation Strategy (ECOR 2022-2032), to promote the effective integrated management of coral ecosystems in Mozambique including support in developing a set of technical tools to assess and monitor the ecological status of coral reefs.

**Conclusions**

The development of the technical tools and capacities listed above is the result of two Memoranda of Understanding signed between WCS and the Government of Mozambique: one with the Ministry of the Sea, Inland Waters and Fisheries (MIMAIP), and another with the Ministry of Land and Environment (MTA). The country has a now a suite of technical-scientific tools that are ready to be used for decision-making by different types of stakeholders, including private and public sectors. In addition, it provides Mozambique the opportunity to align its national efforts with the new global conservation goals, particularly for the marine realm, contributing to reconcile marine biodiversity conservation with economic development. Ultimately, these tools, policies and capacity will allow the country to increase the protection and conservation of key marine and coastal species and ecosystems, while contributing to increasing resilience to climate change, safeguarding the community benefits of living resources.

### 2.1.2. Delivering the Kunming-Montreal Global Biodiversity Framework: Mainstreaming Marine Spatial Planning and Data Support Process into Marine Biodiversity Conservation in the Western Indian Ocean Region

**Authors: UNEP - Early Warning and Assessment Division**

**Background and Rationale:**

The Western Indian Ocean (WIO) is endowed with highly diverse ecosystems that provide a wide range of services vital for nature's integrity and human-wellbeing. The ocean capital assets of the WIO region are valued at over US $ 300 billion[1]. However, like many of the ocean regions, the WIO region is under threat from anthropogenic as well as natural drivers. The three planetary crises: climate change, biodiversity loss, and pollution, have undeniable direct and detrimental impacts on our ocean and coasts. Critical ecosystems such as the mangroves and coral reefs are deteriorating due to combined effects of local use and global threats. The major threats facing the region include over-fishing, illegal fishing activities, coastal development coupled with land-use change. Ocean and coastal zones are deteriorating further despite the existence of comprehensive global policy frameworks like the UN SDG 2030 Agenda, Convention on Biological Diversity (CBD) and the Nairobi Convention protocols. Consequently, these novel initiatives of the social agenda of UN SDG Agenda 2030 and ambitious commitments of CBD can hardly thrive in a degraded ocean environment including the realization of the recently endorsed biodiversity targets under the Kunming-Montreal Global Biodiversity Framework (GBF) could face serious challenges.

Nonetheless, conservation and sustainable management of the ocean and coastal environments offer huge opportunity for addressing the biodiversity crisis. To realize this aspiration requires urgent management regime shifts underpinned by sustainable ocean planning. Effective sustainable ocean planning entails three critical attributes, viz; i) **process** (inclusive, integrative, and iterative), ii) **content** (place-based, ecosystem-based, and knowledge-based) and iii) **impact** (endorsed, financed, and capacitated)[2] . In addition, the enhanced framework of coordination of ocean observation through partnerships, collaboration and capacity development offers a great opportunity of minimizing disparities in ocean observation, improving access to reliable, accurate and interoperable ocean data, thereby improving uptake of ocean knowledge and information for improved policy and decision making by member states, stakeholders, and the society at large. Therefore, it is critical to embrace the innovative approach of cooperative and partnership framework which would ensure better coordination, communication and shared agenda amongst the multi-stakeholder landscape and thereby resulting in a collective impact of ocean conservation and sustainable management of marine resources. The development and implementation of

[1] Obura et al 2017

[2] Ocean Panel 2021. 100% Sustainable Ocean Management

management tools such as marine spatial planning (MSP) benefit immensely from this collective impact organization and coordination infrastructure. The MSP tool is very critical for biodiversity conservation, and this is expected to be enhanced significantly with the emergence of novel approach of MSP development involving the use of the digital twinning of the ocean technology. Therefore, it is imperative that this new approach be embraced in the WIO region to accelerate biodiversity conservation.

**2. Linkage to regional and global processes:**

The development of effective ocean knowledge and information management for sustainable ocean planning aligns well with the following policy processes:

i.Kunming-Montreal GBF targets[3] including TARGETS 1, 2, 3, and 14.

ii.The UN Decade on Ocean Science for Sustainable Development (2021-2030)[4] with the ultimate goal to provide a global framework to help generate oceanographic solutions to societal problems and challenges for sustainable development.

iii.The Ocean Decade Africa Roadmap[5] Provides a vision and plan for various stakeholders from government, industry, philanthropy, UN agencies, civil society, and the scientific community to convene around a common set of objectives for the implementation of the Ocean Decade in Africa[6]. The aims of the roadmap are to 1) provide a coordinated and optimized framework for ocean science planning and delivery; 2) enhance coordination between agencies and build synergies between research initiatives, and users of ocean science and knowledge; 3) provide a foundation to monitor the achievement of priorities and outcomes. The focal areas of the road map include a) Sustainable Ocean Management in Africa; b) Ocean and Human Health in Africa; c) Ocean Observations and Forecasting Systems for Africa; d) Digital Twin for Africa - Establishing an African Ocean Knowledge Hub and e) Regional Ocean Literacy Programme for Africa, among others.

iv.African regional frameworks, e.g., Decade of African Seas and Oceans (2015-2025); African Union Agenda 2063: 'The Africa We Want'; Africa's Integrated Maritime Strategy (2050 AIM Strategy) and Africa Blue Economy Strategy (2019).

**3. Subject Matter Being Addressed**

"MSP is not an end in itself but a practical way to create and establish a more rational use of marine space and the interactions among its uses, to balance demands for development with the need to protect the environment, and to deliver social and economic outcomes in an

[3] Kunming-Montreal GBF Targets
[4] UN Ocean Decade 2021-2030
[5] Ocean Africa Roadmap
[6] https://unesdoc.unesco.org/ark:/48223/pf0000381488.

open and planned way.[7]" MSP processes have gained traction as the best practices of addressing spatial components of ocean management and have received significant uptake across governance scales from local, regional to global levels. However, a number of challenges constrain the formulation and implementation of MSP, in the WIO region, including i) An inefficient governance system, ii) Lack of integration of multi-scale socio-ecological systems in planning and policy making, iii) Limited access to data/information to support evidence-based policy making, iv) Lack of funds/effective financing mechanisms, v) Limited technical and human capacity and resources, vi) Unwillingness of country leaders to put regional issues ahead of national interest, among others[8]. One of the most critical limitations impairing effective MSP process is inadequate data and disparity in data generation amongst different regions.

Marine spatial planning (MSP) and UN Sustainable Development Goals (SDGs) have been promulgated as high-level responses to the deteriorating ocean health. In the UNESCO-IOC, Africa Gap Analysis report one of the priority areas identified included MSP. MSP is a conduit for sustainable use of the marine environment because it determines "the viability of spatial and temporal exercise of human activities against the long-term health of the natural environment". It is expected that by 2030, a third of the world's exclusive economic zones will be managed with the framework of approved marine area plans. MSP is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that have been specified through a political process[9]. The increased awareness on the critical role of the ocean as well as the potential loss of critical

services it provides has generated heightened interest in sustainable ocean management. A new blue awakening is emerging, bringing in unprecedented international momentum for sustainable ocean management through effective protection, sustainable production, and equitable prosperity[10].

## 4. Strategic Interventions

Of critical importance is the new approach of collective impact organization and coordination infrastructure for sustained ocean knowledge and information management. This provides a platform to i) convene, build, and maintain a transdisciplinary partnership approach ii) strengthen capacity development and iii) provide access to high quality, accurate and easily interpretable data, and information. Coupled with this approach is the emerging technology of using the concept of digital twinning of the ocean (DTOs) including the which can revolutionize management strategies such the MSP process. By consolidating

[7] https://www.ioc.unesco.org/en/marine-spatial-planning
[8] UNEP-Nairobi Convention et al. 2021. A regional MSP Strategy
[9] https://www.ioc.unesco.org/en/marine-spatial-planning
[10] Stuchtey et al 2020

a variety of ecological and human use data layers into a single interactive platform, a digital twin offers users the ability to create models and DITTO mission, which is a programme under the UN Decade of Ocean Science[11] simulations that assess the impact of human activities, management decisions and user interactions.

The Global Environment Monitoring System for the Ocean and Coasts (GEMS Ocean) Programme[12], with its partnership platform, provides an opportunity for enhancing MSP process in the WIO region using the DITTO tool. GEMS Ocean focuses on integrating global observation systems to provide fit-for- purpose information and data to its member states and regional bodies, key areas include MSP, Ocean Forecasting, and the Sustainable Blue Economy. As an endorsed UN Ocean Decade programme, it is paired with the Decade Collaborating Centre on Ocean Prediction [13](DCC) and linked to UN Ocean Decade challenge seven-7, Expand the Global Ocean Observing System, and eight-8, Create a digital representation of the Ocean. Through the partnership with the DCC on ocean prediction, GEMS ocean is working on co-development and world-wide integration of ocean prediction activities in collaboration with the decade endorsed actors and other stakeholders. In addition to this there is a focus cooperation with regional conventional areas on ocean observation, prediction and forecasting to support early warning for coastal sustainability in Africa.

GEMS Ocean Programme has recently partnered with UNEP's Cartagena Convention Secretariat/Caribbean Environment Programme (CEP), UNESCO-IOC (IOCARIBE), Breda University of Applied Sciences (BUas), and The Netherlands Ministry of Infrastructure and Water Management (IWM) to demonstrate the potential of this technology for regional and national MSP purposes and to identify use cases for the wider Caribbean region. A two-and-a-half-day Hackathon/workshop has been held part of a larger Caribbean Sea Digital Twin Prototype[14] CSDTp) initiative in the margins of the Cartagena Convention COP 2023 from 3rd to 5th October 2023, in Aruba[15]. The MSP Challenge is also one of the GEMS Ocean, in collaboration with UN Coordinating Body on the Seas of East Asia (COBSEA) is pursuing a similar initiative for the East Asian Seas, focusing on key thematic issues including the coral reefs of Indonesia.

It is in this regard then GEMS Ocean Programme would like to use the opportunity of the WIO Science Policy Platform, using the CSDTp case study, to demonstrate how the MSP Challenge framework could be adopted in the region to catalyse effective implementation of the WIO Region MSP Strategy as well as the implementation of the existing Data Information Strategy. A preparatory data workshop/hackathon for the region will help

[11] UN Ocean Decade Digital Twinning of the Ocean Programme
[12] GEMS Ocean Programme
[13] UN Decade Collaborative Centre on Ocean Prediction
[14] https://wesr.unep.org/article/ocean-seas-and-coasts
[15] ILIAD Digital Twins of the Ocean

identify the critical environmental factors, including the state of the ocean, the health of the marine ecosystem and the impact of human activities on these ecosystems and the priority needs of the region. The results supported by capacity building activities could then be used to develop the digital twin prototype that can monitor, model, and manage the use of the region's coastal and marine ecosystems.

The innovative development of a Digital Twinning of the WIO Region prototype (WIODTp), will harness available data and information resources in the region, building on existing resources such as the Clearing House Mechanism, the WIO Symphony and other existing initiatives. This will in the long run, improve our understanding of the WIO region's coastal and ocean environment and ultimately support the Science Policy interphase as well as policy making.

### 2.1.3. Incorporating mangroves into national climate and biodiversity agenda of WIO countries

Author: Dr James Kairo; Blue Carbon Lab/KMFRI

**Background and rationale;**

Following expiry of the Aichi Biodiversity Targets (2011-2020), Parties to the Convention of Biological Diversity (CBD) negotiated for the post-2020 Kunming-Montreal Global Biodiversity Framework (KM-GBF). The framework sets an ambitious plan to implement broad based actions to bring about transformations in society's relationship with biodiversity and to ensure that by 2050, the shared vision of **living in harmony with nature** is fulfilled.

Biodiversity underpins the fundamental aspects of human wellbeing, including food security, human health, and access to clean water. There is scientific evidence that nature can provide at least 37% of the solutions of climate change; and that at least 30% of Sustainable Development Goals (SDGs) cannot be achieved without healthy ecosystems[16]. A report by Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) alerts us of the worrying status and conditions of coastal ecosystems (such as coral reefs, mangroves, and seagrasses), and how their losses and degradations have impacted on biodiversity and food security. KM-GBF presents a good opportunity for inclusion of blue carbon ecosystems (such as mangroves) that contributes greatly to human wellbeing, climate change and biodiversity conservation.

[16] UNEP, 2021. Making Peace with Nature. A scientific blue print to tackle climate, biodiversity and pollution emergencies. Nairobi. https://www.unep.org/resources/making-peace-nature

Mangroves are vital but fragile coastal ecosystems found in the sheltered areas of tropical and sub-tropical coasts around the world. They are 'superheroes' in providing goods and services that could be viewed at both local, national, regional, and global levels. Mangroves are critical ecosystems for biodiversity, providing habitat for 341 threatened species around the world. They also serve as habitats for fish and other marine creatures. It is estimated that nearly 80% of commercial fish catches around the world depend in one way or another on mangroves. Mangrove also support the health of associated ecosystems, facilitating connectivity between ecosystems and may also act as refugia for species whose habitats have been lost.

In the context of climate change, mangroves are carbon rich ecosystems. Despite occupying only 0.7% of the tropical forest area, mangroves account for about 3% of global carbon sequestration by forests, and 10–15% of total carbon sequestration in the coastal ocean. This is in addition to the support value of mangrove to coastal fisheries, shoreline protection, and in the provisions of harvestable wood and non-wood resources to coastal communities. Loss and degradation of mangroves affect local and national economies as indicated by shortages of firewood and building poles, reduction in fisheries, and increased shoreline erosion, and enhanced greenhouse emissions. There is an urgent need, therefore, to manage mangroves as multiple use systems for climate, community, and biodiversity benefits.

Mangroves in the Western Indian Ocean (WIO) region occupy about at 1.0 million hectares; representing some 5% of global mangrove coverage. Across the WIO region, mangroves provide harvestable wood and non-wood products such as fuel wood, poles, timber, honey, and traditional medicine. Fishing, aquaculture, salt extraction and ecotourism are economic activities developed in the mangrove areas across the region. Stable and resilient mangrove ecosystems support the associated ecosystems such as seagrass beds and coral reefs thus maintaining ecosystem health, functioning and integrity of coastal areas[17]. Contributions of mangroves to the people of Mozambique has been estimated at US$7.8 billion/yr., followed by Tanzania (2.1 billion/yr.), Madagascar (530.4million/yr.) and Kenya (85.8 million/yr.)[18] [19]. Incorporating mangroves in climate change and biodiversity agenda of a country will ensure budget allocation for their sustainability.

**Linkage to regional and global processes;**

Countries in the WIO region are signatories to regional and international conventions and agreements that are relevant to mangrove conservation, including; the Ramsar Convention on Wetlands of International Importance, the Sendai Framework for Disaster Risk

[17] Lee, S. Y., Primavera, J. H., Dahdouh-Guebas, F., McKee, K., Bosire, J. O., Cannicci, S., ... & Record,S 'Ecological Role and Services of Tropical Mangrove Ecosystems: A Reassessment. Global Ecology and Biogeography, 23(7), 726-743.', 2014.

[18] Sathirathai, S. & Barbier, 'Valuing Mangrove Conservation in Southern Thailand', *Contemp. Econ. Policy*, 19.109–122 (2001).

[19] UNEP-WCMC, *The Importance of Mangroves to People: A Call to Action*, *United Nations Environment Programme World Conservation Monitoring Centre.*, 2014 <https://doi.org/ISBN: 978-92-807-3397-6>.

Reduction (DRR), the Convention on Biological Diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC), and the Sustainable Development Goals (SDGs). With regard to climate commitments, apart from Mayotte, all the other countries in WIO have included mangroves either in mitigation or adaptation options of their Nationally Determined Contribution (NDCs) to the Paris Agreement. The next step would be to actualize the 'paper' NDCs by implementing actions to support rehabilitation, conservation, and sustainable utilization of mangrove resources.

Countries in WIO identifies mangroves and associated blue carbon ecosystems as critical ecosystem and have set goals of protecting and restoring them as part of their National Biodiversity Strategy and Action Plan (NBSAP) commitments. Kenya, Tanzania, and Mozambique have moved further and developed national mangrove management plans and action plans. The challenge has been to monitor and report progress made on mangrove conservation in respective countries. Having mangroves included in NBSAP reporting would enhance resource mobilization that can support conservation and management of mangroves i WIO.

KMFRI participated in the development of 'Guidance of mangrove indicators in post-2020 Global Biodiversity Framework. The guidance provides scientifically robust data and resources for consideration by countries in national monitoring and reporting and identifies opportunities to effectively capture the contributions of mangroves in the monitoring of progress towards achievement of the 2050 vision for biodiversity. The guidance has been endorsed by major NGO's including IUCN, TNC, WWF and Wetlands International who are also champions of mangrove conservation in WIO. This paper will be seeking further endorsement of the guidance document; with a bid to develop a common reporting template for WIO.

**The subject matter being addressed – i.e. state-of-the-art; etc.**

Current estimate of global area of mangroves is 13.6 million ha, which is less than 50% of what it once was; and what remains is in degraded conditions. The continued loss and degradation of mangroves and coastal habitats have been driven by human and natural causes. Around 35% of global mangroves were lost between 1980 and 2000 and the forest has been declining at faster rate than any other natural ecosystems pitying a world without mangroves in the next century[20].

Major cause of mangrove loss in the WIO region is non-productive conversion of their habitat. This entails conversion of mangroves to unused land because of human influences

[20] Duke et al. 2007. Science 317: 41-42. DOI: 10.1126/science.317.5834.41

(e.g., over-utilization of mangrove wood products or human-driven hydrologic disturbance). Human induced mangrove drivers are responsible for over 60% of mangrove loss. Natural drivers make up the remainder, including erosion, sea level rise, and storms, many of which are being exacerbated by climate change[21]. Important ecosystem goods and services provided by mangroves are diminished or lost when mangroves are degraded. It is critical that mangroves are included as part of the goals, targets, and indicators **in the post-2020 GBF in order that they can be prioritized for restoration, conservation, and sustainable management; in support of the shared 2050 Vision.** It is also important that countries in WIO can monitor extends and conditions of mangroves; and the flow of ecosystem services they provide using a common framework.

## 4. Recommendations

Parties to CBD are updating their NBSAPs by 2024 following the adoption of the KM-GBF. At the same time countries are updating their NDCs by 2025 in support of Paris Agreement goals. These provide opportunities to align commitments and acknowledge linkages and contributions to relevant goals and targets of the Paris Agreement, GBF, SDGs, Ramsar and blue carbon. We recommend Parties to:

- Set priority actions for blue carbon conservation, restoration, and sustainable management.
- Enhance ambition via inclusion of mangroves and associated blue carbon ecosystems in the Nationally Determined Contributions (NDCs), National Biodiversity Strategies and Action Plans (NBSAPs) among other processes.
- Develop and implement national policies to enable generation and trade of high-quality blue carbon credits.
- Scale climate finance and mobilize increased financial flows for blue carbon.
- Endorse guidance on mangrove inclusions in Post 2020 GBF as a tool to support national reporting on blue carbon

### 2.1.4. Milestones and urgent needs in the development of the Kenya-Tanzania marine transboundary conservation area – Proposal for the next 5 years

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**Background**

Eight years have passed since the Kenya – Tanzania border region was identified as a priority area for conservation and management by the Conference of Parties to the Nairobi Convention (see CP8/6-1a and CP9/7a). Since 2015 there have been a few projects undertaken to support the development and establishment process of the proposed Kenya-Tanzania marine transboundary conservation area (TBCA). While these projects have provided crucial information that included social, ecological and policy research that mapped the governance context of the border region and determined the enabling conditions to initiate development (e.g., WCS, 2019; Tuda et al., 2021), there have been limited progress on the design and planning of the TBCA overall. Over the past two years, the Western Indian Ocean Marine Science Association (WIOMSA) in partnership with the Wildlife Conservation Society (WCS), Macquarie University (MQU), and the UNEP Nairobi Convention, collaborated with the Kenya Wildlife Service (KWS) and the Tanzania Marine Parks and Reserves Unit (MPRU) to initiate the planning process for the TBCA with financial support from the Blue Action Fund (BAF). The project implemented the systematic conservation planning framework (Margules and Pressey, 2000) to develop the marine spatial plan for the TBCA using a co-development approach with the stakeholders from the border region (Horigue et al., 2023). As the technical and participatory planning process for the spatial plan development took place, it was found that it was necessary to engage the relevant government agencies apart from the KWS and MPRU to initiate the discussions on the institutional arrangements for the TBCA. In this discussion paper, we describe the lessons we learned from the BAF project, particularly the need to address the institutional limitations that hinders progress of the TBCA development. Moreover, this discussion paper aims to present key research and development recommendations that can help expedite the planning and establishment process of the TBCA.

## Linkage to regional and global processes

Various international organisations through different policy instruments have recommended the establishment of TBCAs and other transboundary management measures to be able to protect ecosystems and ecological processes and regulate human activities that straddle multiple jurisdictions more effectively. In addition to the Articles 118 and 123 of the United Nations Convention on the Law of the Sea (UNCLOS) and the Sustainable Development Goal 6.5 (Guerreiro et al., 2010; Maina et al., 2020), the recent Kunming-Montreal Global Biodiversity Framework also strongly encourages transboundary cooperation to address conservation and management objectives. These global policies align with the transboundary policies within the East African Community (EAC) Framework to which the governments of Burundi, Kenya, Rwanda, Tanzania and Uganda are members. More specifically, the Joint Communique signed by Hon. Keriako Tobiko the former Minister of Environment and Forestry in Kenya and Hon. January Makamba the former Minister of State for Union and Environment in Tanzania in 29 November 2018 in Nairobi, signifies the strengthened commitment of both countries to transboundary conservation and

recommended the creation of mechanisms to establish joint initiatives and common practices for enhanced co-management.

These global and sub-regional policies, including the joint agreement signed by both Kenyan and Tanzanian governments, serves as the guiding governance frameworks for the development and implementation of the TBCA. These policies, especially the Joint Agreement on Transboundary Environmental Management already provide the supporting foundations for the creation of institutional arrangements to support TBCA establishment. However, vertical policy integration and coordination and organisation across multiple levels (i.e., from the KWS and MPRU to the ministerial levels) and scales (i.e., across neighbouring districts/ counties, KWS and MPRU, and respective equivalents of ministries) have been very limited. More specifically, greater support is needed to improve rapport between the KWS and MPRU, and to also assist them individually to engage their respective government ministries.

**Stakeholder processes and updated roadmap for the development of the TBCA**

From 2021 to 2023, the KWS and MPRU with assistance from WIOMSA, WCS and MQU have organised and held a series of stakeholder workshops to create the spatial conservation plan for the TBCA (Figure 1). The workshops involved discussions on the data and local context of the TBCA region, as well as the conservation and management objectives that will inform the design process. As the technical and participatory planning processes took place, additional stakeholder workshops with relevant stakeholders from the academe, non-government organisations, and government agencies were also organised to revisit the agreements and update the roadmap for the TBCA. This included the first workshop in May 2021, which aimed to revive the discussions on the TBCA. With assistance from the current partners and the African Union, the last high-level stakeholder workshops were held in 24-25

(A)

(B)

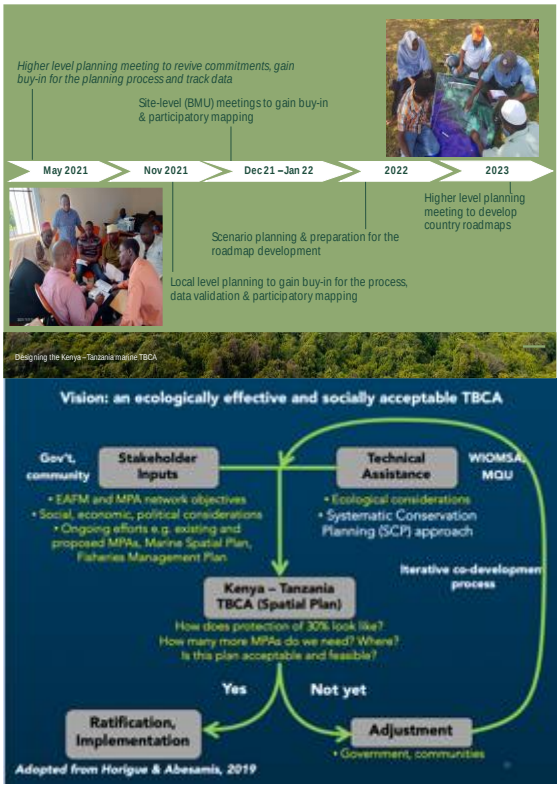


**Figure 1.** (A) Timeline of stakeholder workshops to develop the TBCA; and (B) the co-development process used to create the design for the proposed TBCA using the systematic conservation planning framework

August 2023 in Dar es Salaam, and 28-29 September 2023 by MPRU and KWS, respectively.

The individual country workshops held this 2023 aimed to create individual country roadmaps to pave the way for the development of the TBCA. The country level workshop also engaged government research institutions and development partners to present different initiatives within the TBCA region. Table 1 summarises the common observations and identified milestones from the country level workshops. These milestones were agreed to be achieved from 2023 to 2024 to expedite the TBCA planning and establishment process.

**Table 1.** Commonalities in the country-level roadmap discussion and development workshops organised by MPRU and KWS.

| **R&D initiatives** | **Common activities and milestones identified** |
|---|---|
| Research and collaboration | **Activities.** There are multiple research projects and initiatives undertaken by different institutions within the TBCA region, which can also serve as opportunities for collaboration. Stakeholders also recognised some key knowledge gaps and the importance of knowledge management, data sharing and validation, and discussion on methods, tools and approaches used.<br><br>**Milestone 1.** Organise and engage researchers within the TBCA region to discuss data gaps, opportunities for collaboration, and common methods and tools that can be used to ensure consistency in research outputs and potential outcomes. |
| Institutional arrangements and partnerships | **Activities.** Stakeholders at both workshops recognised that process of setting up the inter-governmental committee requires engagement at multiple governance levels and scales.<br><br>**Milestone 2.** Both the KWS and MPRU were tasked to initiate discussions with their respective departmental directors to identify joint activities. **Milestone 3.** Regional partners, particularly the Nairobi Convention Secretariat was also identified to assist organisation of the bilateral ministerial meetings. |
| Legal and policy frameworks | **Activities.** Workshop participants recognised the differences across existing policies and policy gaps that could affect implementation of the TBCA. |

| | |
|---|---|
| | **Milestone 4.** It was recommended that there should be a review of existing legal and policy instruments to identify conflicting and synergistic laws and policies across both countries. |
| Communication and management strategy | **Activities.** Stakeholders discussed the need to strengthen the partnership between the KWS and MPRU, and enhance communication pathways.<br><br>**Milestone 5.** An MOU between KWS and MPRU was proposed to implement a communication and joint management strategy to enhance cooperation between the two institutions and to facilitate consistent application of management strategies. |

**Research and policy recommendations**

The development of the TBCA had very little progress prior to 2021. Now that there is drive to strengthen partnerships and further advance the TBCA and move towards its legal establishment, we found that there are critical elements that could assist in the planning and development processes. We urgently recommend that regional and national development partners and government agencies address the following research and policy gaps to not lose the momentum gained over the past two years and support steady advancement of the TBCA development process.

i) **Identify the main partner and provide financial support to assist the facilitation and coordination of the TBCA development process from an institutional arrangements perspective** – Based on our experiences navigating the governance systems of each country and as well as the regional stakeholders acting in the region, it is important to identify the strategic partners that could help raise and accelerate decision-making and coordinate actions to support TBCA development at the higher level, and also set up mechanisms to improve effective management of the border region while waiting for the TBCA to be legally established.

ii) **Establish a coordinated approach to research and development across Kenya and Tanzania by creating a platform for collaboration, data- and information sharing** – Based on the presentations from stakeholders and the data collated for the TBCA region, there are big differences in data availability, quality and resolution across both countries. There are projects that also benefit just one country (i.e., just in Kenya, just in Tanzania), which often uses different methods and approaches. The lack of consistency of R&D initiatives across both countries affect the data for the border region, which limited planning activities and required the use of assumptions.

iii) **Minimise ecosystem degradation and threats to community well-being by creating and implementing mechanisms to support effective and coordinated management of the human activities in the region.** Respective government agencies, NGOs, etc., are encouraged to prioritise enhancing the management effectiveness of both the established marine protected areas (MPAs) and locally-managed marine areas (LMMAs). Threat mitigation activities, through the use of integrated coastal management, fisheries management and land and water-use management strategies should also be applied to regulate activities outside the boundaries of MPAs and LMMAs until the TBCA is legally established and/or recognised.

4. **Identify and set aside resources to continue the TBCA development process, which includes R&D funds to address gaps in knowledge and to encourage education and awareness of stakeholders as well as communities, and for facilitating bilateral and multilateral discussions to set up transboundary institutional arrangements.** R&D in the region should include social, ecological, economic and governance research that should be consistent across countries, and should also be used to inform the development of the TBCA spatial management and operations plan.

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### 2.1.5. Recommendations for the implementation of the Kunming-Montreal Biodiversity Framework in the Western Indian Ocean.

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**Preamble**

Area-based conservation, through marine protected areas (MPAs) and other effective area-based conservation measures (OECMs), can help to conserve threatened species, maintain ecosystem health and productivity, while safe-guarding social and economic development. The coverage of MPAs and OECMs has grown rapidly in the Western Indian Ocean (WIO) region in the last decade, currently about 8% of the WIO's Exclusive Economic Zone (EEZ) are MPAs and OECMS. The potential OECMs are predominantly Locally Management Marine Areas (LMMAs). In the WIO 143 MPAs and more 300 locally managed marine areas protect marine biodiversity and sustain coastal communities' food and income.

MPAs and LMMAs are expected to increase in the WIO region as countries aim to achieve the ambitious Target 3 under the UN Convention on Biological Diversity (CBD) Kunming-Montreal Global Biodiversity Framework (GBF), which aims to conserve 30% of marine and coastal areas. The WIO countries' commitment to the broader GBF also aims to address the unprecedented loss of marine biodiversity, which threatens ecosystem function and human life. While the WIO countries work to expand MPA and LMMA coverage, an equal priority remains the need to strengthen the equitable governance and effective management of existing ones. According to the WIO MPA Outlook report, approximately 40% of MPAs in the WIO region are managed effectively. The same is reported for OECMs managed by communities. Effective Management refers to MPA and OECMs achieving the objectives for which they were established.

In order for MPAs and OECMs to be effective in the protection of marine and coastal ecosystems and their resources, it is necessary to build capacity at regional, national, and site levels. Many MPA and LMMA managers and policymakers, including local and indigenous communities and other stakeholders, have insufficient access to new knowledge, skills, information, and guidelines coming out of science, traditional knowledge, and field experience, to effectively manage their areas. A study by Western Indian Ocean Marine Science Association (WIOMSA) shows that MPA practitioners are not effectively collaborating in the WIO region, and MPA managers and communities at the national and regional levels work in silos, limiting the ability of MPAs and OECMs to contribute to connectivity conservation. One reason for this is that previously there was little opportunity for MPA and LMMA managers to share what they had learned from their own experiences in various contexts with other managers. As a result, common challenges that necessitate collaboration among managers are not well known, expertise is not shared, and best practices and solutions are not shared.

Towards increasing management effectiveness for MPAs and OECMs in the region, the Western Indian Ocean Marine Protected Area Network (WIOMPAN), in collaboration with the Nairobi Convention and multiple other partners, conducted its first regional meeting. With more than 80 participants overall, the region was represented by more than 20 MPA managers from the 10 WIO countries, the directors of MPAs for Tanzania, Kenya, South Africa, Reunion (France), Comoros, and Seychelles, and organisations and partners with marine conservation mandates in the region. The participants prioritised the main challenges and solutions at regional, national and site level, distinguishing where necessary priorities apply to MPAs versus LMMAs. A set of clear recommendations emerged from the meeting towards increased management effectiveness and the implementation of the Kunming-Montreal Biodiversity Framework in the Western Indian Ocean.

**Current Evaluation Tools and Standards for management effectiveness**

The WIOMPAN workshop in early November 2023 brought together a vivid community of practice, committed to improving the management effectiveness of their Marine Protected or Conserved Areas (P/CA). Data collection and monitoring programmes were identified as very important, but having clear objectives or questions to address for defining data collection approaches and systematic data analysis were said to be even more crucial. The MPA managers also mentioned the need to have regional level evaluation tools and standards, that can enable a good level of comparison between sites and enable reporting to national, regional and global levels.

Existing adopted evaluation tools (such as IMET, METT4, SAGE) as well as Global Standards have the potential to provide a strategic framework with performance targets

and indicators towards high Marine P/CA performance. This strategic framework can act as a guidance tool for data collection, monitoring and measuring of conservation and social well-being outcomes. Standards can either show what success looks like (e.g. the Green List Standard[22]), or provide managers with tools and best practices on how to design, plan and implement actions to improve (e.g. the Conservation Standards). It is therefore essential to ensure that sites use tools that are fit for their purpose, and therefore to promote, support and strengthen the use of these tools and standards in an integrated and sound manner for the whole region. In the light of the CBD Target 3, evaluation tools and standards contribute to reporting on the Quality of Marine P/CA: quality of their management effectiveness, but also quality in terms of inclusiveness, diversity, and compliance with IPLC rights. Evaluation standards can also mobilise support partners and catalyse diverse sources of fundings towards needs and priorities identified at site level for actions and capacity development.

**Challenges and priorities for the WIO**

National leaders of MPA systems from 9 nations in the Western Indian Ocean, along with regional and international NGO and donor partners, held discussions to: 1) define MPA management effectiveness and rank importance of elements of effectiveness, 2) prioritise the top five needs for improving MPA effectiveness in the WIO, and then evaluate solutions. Engagement was structured to evaluate input at regional, national and site level. Management effectiveness was defined with 13 elements that overlapped with key elements from the 2021 WIO MPA Outlook report based on interviews with over 100 MPAs in the WIO and the IUCN Management Effectiveness Tracking Tool. Eight of the themes were overlapping with key needs identified in the 2021 MPA Outlook Report, and all 13 were independently ranked above average in terms of importance for MPA effectiveness. The highest scoring theme based on means was secure and adequate budget (all 9 directors ranked this as the highest importance). Other items scoring above 4.5 were qualified and adequate staff (4.7) and management plans being implemented (4.6).

The group then ranked the top 5 needs for WIO MPAs in order of importance by voting. These were: 1) Qualified and adequate staff, 2) Secure and adequate budgets, 3) Adaptive management practice, 4) Proactive law enforcement and compliance, and 5) Adequate information and infrastructure. For the MPA needs, the group further explored reasons for challenges and solutions for three of the five needs: qualified and adequate staff, adaptive management practices, and proactive law enforcement and compliance. At a regional level several of these solution-based discussions linked to the successful implementation of the

[22] Reference to Kigali Declaration 2022 (APAC): Assessment of the effectiveness of protected areas and other conserved areas including their governance and management benchmarked against universal standards such as the IUCN Green List Standard and to prioritise actions, capacity development and funding based on the findings

Kunming-Montreal Framework (captured below).

## Implementation of the Kunming-Montreal Biodiversity Framework in the Western Indian Ocean: Key Themes.

### *Key Theme 1: Need for MPA Institutional Review*

The challenges outlined above relate to MPA institutional structures that present barriers to delivery of national commitments in relation to MPAs (e.g. GBF target 3). These included inadequate staffing in terms of numbers and qualifications (including inadequate recruitment and retention), inadequate budgets for MPA operations, and lack of outcome-driven management based on evidence (e.g. adaptive management). Root causes of these challenges varied among nations but included lack of institutional focus on improving MPA ecosystem and social outcomes and little requirement for evidence-based management, along with human resource and budget allocation decisions often dissociated from MPA needs due to decision-making in departments outside of the MPAs themselves. A number of training initiatives and courses in the region have also identified barriers to progress in outcome-driven management in WIO MPAs going back to 2007 (IUCN evaluation of regional MPA effectiveness) that persist in 2023 despite numerous training courses and programs.

WIO MPA practitioners proposed a WIO-wide review of MPA institutional structures (focusing on MPA organisations) to understand the institutional constraints to effective MPA management. The practitioners further noted that many of the MPA organisations may not be well -structured to deal with the complex, rapidly changing marine environment in which MPAs are presently embedded. The institutional review should include identifying best practices and success stories as well as institutional strengths and weaknesses. Such a review will help in aligning MPA organisational structure with the global and regional biodiversity policy and commitments. The institutional review will highlight cases where application of best-practices in institutional structure has led to improved MPA outcomes and will evaluate opportunities for each nation to work with institutional strengths as well as feasible ways to create efficiencies in operations that will to ensure delivery of effectively managed MPAs that provide ecological, social, and economic benefits as part of a regional and national blue economy strategy.

### Key theme 2: Build capacity and peer to peer learning through WIOMPAN

Effective management requires that MPAs organisations have the capacity to reduce threats, specifically, the daily activities implemented by managers as well as larger, community-wide efforts to address problems such as local pollution, poorly planned coastal development, and destructive fishing practices. To share knowledge through peer-to-peer networking, and MPA practitioners' networks are recognised as a cornerstone of MPA performance. The Western Indian Ocean Marine Protected Areas Network is integral to this process. Through its first regional meeting, the capacity gaps and strengths of representative MPAs were identified, allowing for the development of tailored regional, national and site

training initiatives. Training in evidence handling, intelligence-based patrols, and confrontation reduction techniques were but a few of the critical gaps identified for the region. Training in adaptive management and the development of management plans were identified as crucial. Establishing a regional capacity development program with the guidance of WIOMPAN could address those and other critical capacity gaps identified for the region.

**Key theme 3: Recognise LMMAs, OECMs, MPAs as critical to conservation targets as outlined under the Kunming-Montreal Biodiversity Framework**

The CDB defines OECMs as "geographically defined areas other than Protected Areas, which are governed and managed in ways that achieve positive and sustained long-term outcomes for in-situ biodiversity conservation" (CBD 14/8). Among areas that are likely to be recognised as OECMs are coastal and marine areas that are not protected, but which nonetheless achieve area- based conservation outcomes for reasons other than conservation. Such CCAs could include many locally-managed marine areas (LMMAs). To be formally reported as OECMs under Target 3, LMMAs legal framework has to be clearly defined and effected by a strong governance structure, and LMMA management requires strengthening.

LMMAs provide an alternative community-led governance mechanism, delivering positive socio- economic and ecological outcomes and are an inclusive, equitable and participatory approach to marine resources management. These small conservation areas cover approximately 11 000 $Km^2$ of in the WIO and collectively increased MPA area coverage to 11% by 2014. The areas therefore present an opportunity for the region to reach its GBF targets but their management in most WIO

countries is not clearly defined and legal frameworks often undermine their management effectiveness.

The process of involving local communities in LMMA management is unclear, and jurisdictional responsibilities among relevant authorities overlap. The roles of various stakeholders involved in co-managing these areas are confusing and poorly coordinated. This lack of clarity and diversity in regulatory forms hinders the effectiveness of the LMMA approach, especially in cross-sectoral or cross-border initiatives. The existing legal framework does not support reporting LMMAs as formal OECMs. Furthermore, LMMA management lacks collaboration with sector-specific stakeholders, such as development partners, NGOs, CBOs, and private sectors. As a result, some LMMAs may not qualify as OECMs.

Initially, the LMMA approach aimed to secure local communities' usage rights and livelihoods, with simplified governance and management structures. Over time, the LMMA approach has become a broad term for community management or co-management, with diverse models across countries. Some LMMAs lack formal legal

recognition but are enforced through their own by-laws.

There is a growing trend towards community-based marine governance in the WIO region, with local communities taking a leading role in marine resource management. WIO LMMAs cover various ecosystems and often have high biodiversity values. They complement existing MPAs, create a blue belt protection for MPAs, and function as connecting corridors for seascape species while also contributing to livelihood goals. These natural and social values, coupled with the appropriate legal framework, support the inclusion of some LMMAs into the OECM category.

**Requests to the Convention**

In light of the above, and the emerging and urgent need to work effectively toward achieving Target 3, the following requests are made:

1. More inclusive policy for LMMAs and OECM, hence better recognition for their work and positive results from a local to regional perspective
2. Identify institutional best practices and develop roadmaps for their adoption, including governance
3. Establish regional capacity development programs with the guidance of WIOMPAN
4. The expansion of effective area-based measures in an integrated manner
    a. Articulate roadmaps
    b. Take note of CBD, 2018 report
5. Develop regionally coordinated measurement update of management effectiveness by country and site
6. Increase understanding of economic, social and ecological benefits of effective management in LMMAs, OECMs and MPAs
    a. By means of national audits or studies
    b. They are to be contextualized to coastal management

## 2.2. Sub-Theme 2: Locally Managed Marine Areas (LMMAs) as Other Effective Conservation Measures (OECMs)

### 2.2.1. Enhancing Compliance and Enforcement to Safeguard Small-Scale Fisheries and Biodiversity for Improved Livelihoods in the Western Indian Ocean Region

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**Focal themes:**

- Approaches to collaborative regional ocean governance for a sustainable Blue Economy.
- Progress made in the implementation of the Sustainable Development Goals (e.g. SDGs 11,13, & 14)

### 1. Background and Rationale

There is growing concern over the persistence of unsustainable fishing practices in small-scale fisheries in the Western Indian Ocean (WIO) as fish populations decline with direct and widespread impacts on livelihoods and economies. Common violations in these fisheries have broadly been identified to emanate from:

- Illegal fishing, such as fishing with the wrong gear, harvesting fish out of season, and using fishing techniques that are banned.
- Polluting.
- Poaching.
- Going over the specified catch limits.
- Fishing in closed areas or during closed seasons, etc.

These violations are partly attributed to major weaknesses in enforcement by regulatory authorities, and little incentive for compliance by marine resource users.

The WIO governments' efforts have been evident in the introduction of good legislation around fisheries, improved and revised regulations, and the implementation of new policies. Full community engagement and management of marine resources through establishment of co-management structures and Locally Managed Marine Areas (LMMAs) has also gained momentum in the last ten years, and the co-management approach has resulted in noteworthy progress especially in voluntary compliance to the by-laws thereto. Examples abound; for example, in Kenya's Mkunguni, Munje and Wasini Beach Management Units (BMUs).

However, despite these positive developments, improvements not reflected in fish stocks. Fish populations are declining, and the livelihoods of fishers are not improving. Lack of adequate enforcement and low levels of compliance with regulations are considered as significant factors contributing to this state of affairs.

To understand the drivers of weak enforcement and compliance in small-scale fisheries across the WIO region, CORDIO East Africa commissioned a rapid assessment study in 2022. The study "A "*Rapid Assessment and Review of Enforcement and Compliance in Marine Small-Scale Fisheries in Comoros, Kenya, Madagascar, Mozambique and Tanzania"* looked at the enforcement and compliance architecture in small-scale fisheries, with a focus in Kenya and Tanzania. The findings of this study were presented and discussed at a regional multi-stakeholder workshop held in April 2023 in Dar es Salaam, Tanzania ("*Enforcement and Compliance as a mechanism to safeguard Small Scale Fisheries and biodiversity for improved livelihoods*") attended by stakeholder representatives from Comoros, Kenya, Madagascar, Mozambique, and Tanzania.

## 2. Linkage to regional and global processes

The Nairobi Convention, in a forum workshop held in Zanzibar in 2022 titled "Improving the understanding and regional awareness of IUU fishing occurring in small-scale fisheries" recognized that there is an urgent need for collective regional effort (in the form of long-term support to national Governments) prioritizing research, information sharing, capacity building and the strengthening of Monitoring Control & Surveillance (MCS) systems. An integrated and participatory approach to sustainable development and management of small-scale fisheries involving all stakeholders (resource users, academia, civil society, and Governments) was recommended.

The successful implementation of these recommendations is anchored on regional and international frameworks including:

a) The Nairobi Convention.
b) FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication.
c) SWIOFC Minimum Terms and Conditions for Granting Foreign Fishing Access in the Southwestern Indian Ocean Region.
d) FAO Code of Conduct for Responsible Fisheries.

## 3. Findings of the study

The main objective of the workshop was to find common ground and the best approaches towards collaboration in order to safeguard Western Indian Ocean Small Scale Fisheries and biodiversity for improved livelihoods. The specific objectives included the following:

a. To develop a shared understanding on the enforcement architecture/landscape in the countries while highlighting best practices;
b. To profile the persistent drivers undermining in-country and regional enforcement efforts;
c. To deliberate on potential solutions to addressing the identified challenges; and
d. To expand on the opportunities presented by co-management and locally led mechanisms in strengthening enforcement and compliance.

The workshop brought together 45 participants, including representatives from government, community, and NGOs from Kenya, Tanzania, Mozambique, Madagascar, and Comoros. Delegates from represented States delivered presentations on the status of SSF enforcement and compliance in their respective countries. Further, working group sessions were organized to look at various aspects of compliance and enforcement, identifying the gaps, challenges, and providing recommendations accordingly. This information was then consolidated into a technical report and contributed to the development of a policy paper.

Four major drivers that contribute to the weak enforcement and non-compliance in the marine small-scale fisheries sub-sector in the WIO region were identified:

1. Lack of awareness;
2. Social and cultural ties;
3. Corruption; and,
4. Lack of synergy (inadequate coordination) between different ministries and state departments.

Key policy and technical recommendations for addressing the four major drivers are as follows:

**a) Lack of awareness**

**Policy recommendations**

- Ensure deliberate concerted effort for active involvement, participation and representation of small-scale fishing and coastal communities in the development and review of pertinent laws and regulations as well as when decisions are made on the fisheries and other marine resources.
- Embed inclusion of social communication, information dissemination and education outreach in the pertinent laws and regulations to increase public access to information, access to decision-making and opportunity to participate, as well as access to judicial and administrative redress and remedy**.**

**Technical recommendations**

- Continuous capacity building of fisher co-management groups to enhance understanding of their role and responsibilities in fisheries governance and management.
- Promote learning exchanges between communities on best practices on compliance.
- Promote bottom-up and interactive multi-stakeholders' forums for improved information flow.
- Improve scientific knowledge of government officers on the importance of conservation to promote political will.

**b) Social and cultural ties**

**Policy recommendations**

- Establish a clear and elaborate framework for fisher co-management groups accountability, and amicably address social-cultural ties and relationships that generate conflicts that promote non-compliance among members (for example, use of ring nets in shallow water lagoons in Kenya contravening existing guidelines on minimum depth of 30m, which occurs because the guidelines are not enforced, partly due to corruption and that fishers do not understand the guidelines).
- Review and amend fisher co-management groups by-laws to integrate existing local and national intelligence administration which is currently assumed in BMU operations. This integration is key in intelligence sharing, prosecutions, political influence, and collective social learning among others.

**Technical recommendations**

- Involvement of community members in collection and analysis of socio-ecological data on marine resources to promote behaviour change in compliance.
- Utilize the local and religious groups to educate the community on their role in protection and conservation of marine resources.

**c) Corruption**

**Policy recommendations**

- Develop and enforce ethics and anti-corruption laws.
- Strengthen whistle-blower protection at the local level.
- Strengthen committees in fisher co-management groups, e.g. BMUs/CCPs, Shehia/DINA to address corruption at the local level.
- Empower patrol enforcement officers to issue on-the-spot fines for arrested offenders.

**Technical recommendations**

- Conduct joint enforcement patrols with government agencies and communities.
- Conduct training for judiciary on fisheries matters to enhance informed and fair judgement process.
- Encourage reporting of corrupt officers publicly.
- Introduce an anti-corruption sub-committee within the fisher co-management groups.
- Incorporate qualification (knowledge, skills, competence and experience) of the duty bearers/officeholders occupying established offices and positions in pertinent laws and regulations.

**d) Lack of synergies (inadequate coordination) between different ministries and state departments**

**Policy recommendations**

- Review fishery law and regulations to ensure text is well defined, precise and without ambiguity of (mis)interpretation on roles and responsibilities of the different duty bearers and right-holders.
- Anchor local and community regulatory mechanisms in national laws and transcribe legal national texts into local and community regulations for consistency, coherence, positive relationship, and good judgement.

**Technical recommendations**

- Set up an inter-ministerial and inter-agency platform and create technical groups at different levels to enhance the coordination and effectiveness of the enforcement linkages amongst agencies and key stakeholders including the communities.

## 4. General recommendations

The pilot study identified systemic challenges affecting small scale fisheries governance. Participating States and delegates also took note of some general policy and technical issues that needed to be addressed.

**General policy recommendations:**

1) SSFs need to achieve the desired recognition and agreement by the member states of the Nairobi Convention, and that low enforcement and lack of compliance in SSF fisheries is a threat and should be addressed.
2) There is need to develop a WIO regional plan of action by the member states of the Nairobi Convention to address issues of enforcement and compliance in SSF fisheries.

**General Technical recommendations:**

1) Conduct a WIO regional threat assessment that focuses on enforcement and compliance practices in SSFs.
2) Establish a regional inter-sectoral expert panel on SSF fisheries' threats and solutions that will facilitate sustainable ocean-based economic, social and environmental benefits.

### 2.2.2. Enabling effective coastal and marine protection conservation and expansion through OECMs: piloting OECM legal recognition and implementation in Madagascar

**Authors: Government of Madagascar**

**Context**

Madagascar is unique and well placed to share lessons and best practices on marine protected areas. With 5,600 kilometres of coastline and an Exclusive Economic Zone that extends over more than a million square kilometres, Madagascar is a cradle of biodiversity with more than 80% endemism and substantial marine and coastal resources. Marine Protected Areas (MPA) and Other Effective area-based Conservation Measures (OECM) are essential for enhancing the resilience, integrity, and connectivity of natural ecosystems. An OECM is a geographically defined space, not recognised as a protected area, which is governed and managed over the long-term in ways that deliver the effective and enduring in-situ conservation of biodiversity, with associated ecosystem services and cultural and spiritual values" (CBD, 2010[23]). In 2018, the fishing sector in Madagascar accounted for almost 7% of national gross domestic product, representing 6.6% of the total exports and supported the livelihoods of 1.5 million people (World Bank, 2020[24]). The coastal and marine ecosystems add immensely to human well-being, to environmental justice, to environmental rights, to jobs and development, and to mitigating and adapting to climate change.

The National Biodiversity Strategies and Action Plans (NBSAPs) constitute some of Madagascar's policy instruments, demonstrating commitment to preserving the country's biodiversity. The National Biodiversity Strategy and Action Plan 2015-2025 point out that more than 18 million people depend on biodiversity for their livelihood needs, with 80% being entirely dependent on natural resources. About one million of Malagasy people live from fishing. 83% live in coastal areas and practice small-scale fishing. The largest component of total domestic fisheries catches is taken by small-scale artisanal and subsistence fishers, which account for 75% of total catches that include traditional fishing, artisanal fishing and industrial fishing. Malagasy coastal populations are among the most

[23] Convention on Biological Diversity (CBD). 2010. Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets. Montreal.
[24] World Bank, 2020. Madagascar: Balancing Conservation and Exploitation of Fisheries Resources. The World Bank Group

vulnerable. In most of the cases, they do not have arable land and are entirely depend on marine resources to insure their food security (MIHARI, 2017)[25].

**Addressing coastal and marine conservation through partnership and institutional arrangement**

Two main ministries share the responsibilities for marine environment and related activities. The Ministry of Environment and Sustainable Development (MEDD) is in charge of the protection of habitats and species, as well as the establishment of marine protected areas, while the Ministry of Fisheries and Blue Economy (MPEB) is in control of the development, management and marketing aspects of fisheries. The national policies of these two ministries promote sustainability, the preservation of natural resources and the involvement of all stakeholders in the decision-making processes relating to their use.

The existing partnership between MEDD and MPEB allows the creation of the bureau named "*Cellule de Coordination Environnement Pêche* (CCEP)". This structure coordinates interventions, exchange of information and good practices in the marine environment with a view to "supporting the Malagasy Government achieve effective coastal and marine biodiversity conservation measures, while delivering sustainable socio-economic benefits at the local, regional and national level. CCEP would easily lead and coordinate on coastal and marine initiatives in Madagascar. Similarly, national research institutions and NGOs play a big role in supporting the implementation of interventions at local level and actively participate towards developing relevant legislative and regulatory frameworks, standards, and guidelines in their areas of jurisdiction.

**The LMMA Network in Madagascar**

Madagascar has developed specific policies for delegating management rights for natural resources to local user associations. For coastal and marine resources, Locally Managed Marine Areas (LMMAs) have been put in place since 2004. These LMMAs are interconnected in the MIHARI network, which brings together associations of small-scale fishers and partner NGOs. Associations are based on internal and specific regulations that are binding the members to the associations.

The approach spearheaded a rapid increase in the number of LMMAs, enabling coastal communities to work in collaboration with government and other stakeholders to protect their coastal resources. A LMMA is defined as "a predominantly marine and/or coastal area that is managed at the local level by coastal communities, landowners and/or local government representatives who reside or are based in the area in question". There are now over 280 Community Associations involved in LMMAs management, alongside 22 Marine Protected Areas. Madagascar has protected approximately, 22,000 $km^2$ of coastal and

[25] MIHARI, (2017). Assemblée générale du réseau MIHARI à Fort-Dauphin- Madagascar. Création d'un droit de pêche communautaire exclusif sur la bande littorale

marine areas in the expansive 1,147,712 $km^2$ economic exclusive zone and is committed to bringing more areas under protection.

Madagascar endorsed the December 2022 Kunming-Montreal Global Biodiversity Framework (GBF), committing to scale areas under MPAs and OECMs. The positive impacts of these areas are increasingly being documented for biodiversity, climate action and human livelihoods.

Madagascar aspires to achieve Target 3 of the Global Biodiversity Framework on effective conservation and management of at least 30% of the world's lands, inland waters, coastal areas and oceans, with emphasis on areas of particular importance for biodiversity and ecosystem functioning and services. The Target prioritises ecologically-representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation. Consideration of the contribution of LMMAs to the Target should be recognized for the health and integrity of coastal and marine ecosystems. We will put in place tools and solutions for implementation and mainstreaming of LMMAs to reduce the threats to biodiversity by engaging local communities in resource management and governance. We must ensure that marine biodiversity is used sustainably to meet people's needs, through enabling conditions, and adequate means of implementation (including financial resources, capacity, and technology).

The approach taken by Madagascar on LMMAs provides relevant examples of OECMs which integrate Indigenous Peoples and Local Communities (IPLC) within marine conservation and seascape development. It illustrates a multi-layered governance from the highest levels of government to meaningful community-based decision-making. Notably, LMMAs are being championed at the highest levels of government on management measures being taken by local coastal communities to support and contribute to strengthening fisheries governance and to safeguard marine biodiversity. LMMAs have proven to be a cost-effective, scalable, replicable, and socially acceptable solution to the challenge of managing marine resources. The MIHARI network continues to promote for protection of marine areas and for small-scale fishers' rights to be respected. It gives small-scale fishers a voice that influences the development of national policy and brings together LMMA managers to share experiences through learning exchanges.

**The Nairobi Convention Conference of Parties**

Madagascar actively participated in the implementation of Decision CP.9/11 of the Contracting Parties to the Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean Region (Nairobi Convention) on the development of a regional Marine Protected Areas Outlook. The follow up Decision CP.10/12 urged Contracting Parties to establish partnerships and programmes on ocean action and requested the secretariat of the Convention to support and agree to develop new projects, including the strengthening of existing partnerships for the implementation of 2022-2024 programme of work with the support of its partners.

The 2021 Marine Protected Area (MPA) Outlook for the WIO region (UNEP-Nairobi Convention and WIOMSA. 2021[26]) highlighted increasing emphasis on community-led conservation initiatives which are making notable contribution to coastal and marine conservation in Madagascar. These LMMAs have considerable potential, and with the right support, may form a viable foundation for increasing the coastal and marine areas under formal protection. The MPA Outlook further noted that locally-managed efforts have the potential to contribute to improving representation and achievement of targets because of the direct involvement of communities in decision-making and management.

The MPA Outlook further noted that community-managed areas have a direct influence on overall marine protection and resource governance. The Outlook listed weaknesses and gaps that hinder the effective management and quality of LMMAs and called for enabling policies and legislative framework to help communities enforce the LMMAs. Governments and non-government partners may provide the necessary institutional support and networks to help increase local community managers' capacity and skills.

**The IUCN mechanism to advance OECMs in the Western Indian Ocean region**

The Great Blue Wall initiative serves as a catalytic roadmap to accelerate and upscale ocean conservation actions to enhance socio-ecological resilience and the development of a regenerative blue economy. The initiative is currently spearheading the establishment of a connected network of regenerative seascapes in Madagascar, Comoros, Kenya, Mozambique and Tanzania that will enable a climate-nature-people positive ocean economy. Among its key objectives are to halt and reverse the current trends of biodiversity loss through the establishment of inclusive and productive Seascapes (or Regenerative Seascapes) that encompass networks of ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, and that recognize the rights of indigenous and local communities.

Stakeholders with varying mandates for MPAs and LMMAs at a recent Western Indian Ocean Marine Protected Area Network (WIOMPAN) forum held in October 2023 prioritized the key elements towards enabling implementation of OECMs in the WIO region. These include the need to enhance the legal recognition of OECMs, removing barriers towards approval of related management frameworks and plans, and enhancing capacities for their effective planning and management processes. Through the promotion and establishment of equitably and well-governed Seascapes, the WIO region can achieve the scaling of protected and conserved areas at the local and Seascape levels in the face of increasing scepticism around MPAs.

Science has shown that establishing OECMs that blend a mix of broad-based multilevel governance frameworks and locally appropriate protection measures provide an ideal

[26] UNEP-Nairobi Convention and WIOMSA. 2021. Western Indian Ocean Marine Protected Areas Outlook: Towards achievement of the Global Biodiversity Framework Targets. UNEP and WIOMSA, Nairobi, Kenya, 298 pp.

pathway to effective and equitable biodiversity conservation. Currently, countries in the WIO have not yet established frameworks to recognize OECMs. An initial effort needs to focus on promoting and advocating for creation of legal and policy frameworks that enable recognition of such mechanisms and to facilitate for site-level identification, recognition, and reporting on OECMs. Secondly, it is to enhance awareness on standards and guidelines to support OECMs recognition, promoting cross-country learning on their establishment, and equipping local stakeholders with capacities to lead, manage and evaluate the performance of OECMs. The aim will be to set WIO countries on a concrete pathway for strengthening overall conservation of protected and related areas in the long-term.

**It is recommended that:**

- The Nairobi Convention, working with IUCN and other partners support the development of a national roadmap for Madagascar (and then the other countries of the Western Indian Ocean) to achieve effective, inclusive and equitably governed regenerative Seascapes that encompass networks of ecologically representative, well-connected and equitably governed systems of MPAs and OECMs that recognize the rights of indigenous and local communities.

- The Nairobi Convention, working with IUCN and other partners support the Government of Madagascar in her efforts to achieve the legal recognition of OECMs for improvement of coastal and marine biodiversity and improvement of coastal livelihoods, and further support Madagascar through the journey to achieve the full suite of tools, frameworks and platforms for effective governance of its LMMAs.

- The Nairobi Convention, IUCN, and other partners to consolidate and synthesize from international best practices, including from Madagascar and other countries, appropriate guidance on design, establishment and achievement of equitable, inclusive and gender-responsive regenerative Seascapes and LMMAs, integrating nature-based solutions for climate adaptation.

- The Nairobi Convention, working with IUCN, WIOMSA, and other partners to support the adoption and use of the IUCN Green List Standard as a performance metric to assess the achievement of efficiency and effectiveness of Seascapes and their networks of MPAs and LMMAs for successful conservation outcomes.

- The Nairobi Convention in close collaboration with IUCN, WIOMSA and other partners spearhead the development and roll out of an integrative and standardized training course, capacity building and training of LMMA managers and practitioners for enhancement of skills and establishment of lasting and impactful OECMs.

### 2.2.3. Navigating 30x30 – building bridges between conservation and small-scale fisheries

Authors: Maya Pfaff, Annika Mackensen, Stephen Kirkman, Hugh Govan, Estradivari, Vatosoa Rakotondrazafy, Carina Martens, Deidre de Vos and Arthur Tuda

## 1. Background and rationale

In December 2022, a landmark agreement to guide global action on biodiversity was reached with the adoption of the Kunming-Montreal Global Biodiversity Framework (GBF) of the Convention on Biological Diversity (CBD)(CBD 2022) and its 23 action targets. A primary focus of GBF implementation in many countries has been on target 3 ("30x30"), which aims at conserving 30% of terrestrial, inland water, coastal and marine areas by 2030 "through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures" (OECMs). The target makes provision for sustainable use in conservation areas, provided there are positive conservation outcomes, consistent with the CBD's guiding principles for OECMs (CBD 2018). Currently the coverage of Marine Protected Areas (MPAs) globally is <8.2% (UNEP-WDPA & IUCN 2023) and in the WIO region ca. 7% (UNEP-Narobi Convention and WIOMSA 2021), however, many MPAs are ineffective (Campbell and Gray 2019). Many coastal and small-island developing states are exploring options for recognising various area-based management practices as OECMs, which are compatible with sustainable use, and fisheries management zones are mooted as obvious candidates (e.g. Estradivari et al. 2022). Many questions have arisen, including which measures should qualify as OECMs, where they should fit within national governance and management schemes, and whether they actually contribute to transformative change. Evidence-based guidance is thus needed to direct regional, national and local policy development on OECMs and their role in the implementation of 30x30.

As with protected areas, successful implementation of OECMs critically depends on the buy-in of local communities (Obura 2023). However, antagonistic attitudes commonly exist towards conservation, especially in post-colonial settings, where it is often associated with top-down measures, the loss of traditional user-rights and dispossession of traditional territories. With a will to build bridges between conservation and small-scale fisheries, the authors of this paper, who represent both conservation and small-scale fishery perspectives, held an interactive webinar on 5 October 2023 to identify the potential and pitfalls of marine and coastal OECMs in a WIO region context (Pfaff et al. 2023). The majority of the >250 registered participants were from the WIO region and included representatives of government, conservation agencies, small scale fisheries and NGOs. Key messages and recommendations that emerged from these discussions, as captured in this paper, are intended to assist policy makers in the region on how to navigate 30x30 in the context of small-scale fisheries.

## 2. Linkage to regional and global processes

Various guidance materials have recently been developed to direct the implementation of target 3 (WWF & IUCN WCPA 2023; Dudley & Stolton 2022). For the marine context, the Food and Agricultural Organisation (FAO) produced a handbook for identifying, evaluating and reporting marine fisheries-related OECMs (FAO 2022), to support recognition of fisheries measures that align with criteria for OECMs, as contribution to 30x30. While some global and generic principles apply to fisheries-related OECMs in general, national systems of OECMs identification that can best harness or adapt to local social or economic realities will likely be more appropriate in many cases (Rice et al. 2022; Gurney et al. 2021). On a regional level, policy development can be guided through exchange of information and best practices, with opportunities for trans-boundary conservation measures, and coordinated design of regionally cohesive networks of MPA and OECMs.

In the WIO region, a regional network of locally-managed areas (LMMAs) has been developing over the past decade, providing an information-sharing and support platform for community-based marine management. Madagascar is taking a leading role with regards to recognising LMMAs, with ca. 280 having been established as part of the MIHARI network (V. Rakotondrazafy, *pers comm*). Replicating and expanding LMMA recognition in the WIO might involve the formation of national LMMA country networks, or the use of suitable existing initiatives. Cooperation with international organisations (e.g. IUCN through the Great Blue Wall Initiative) could assist small-scale fishing communities in gaining access to funding, e.g. through government and private funding and blue entrepreneurship. While advocacy of small-scale fishers and local communities is the priority for expanding and sustaining people-centered approaches such as promoted through LMMAs, their synergetic alignment and reconciliation with the global conservation agenda are considered critical, at least from a conservation perspective.

## 3. Navigating 30x30 in context of small-scale fisheries - key questions and answers

In context of the recent webinar "Navigating 30x30 - building bridges between conservation and small-scale fisheries" (Pfaff et al. 2023), three key questions were addressed that guide this discussion:

### *(i) How can 30x30 be meaningfully achieved in the African context?*

With the adoption of the GBF, many countries have decided to mainstream 30x30 in updating their policies and National Biodiversity Strategic Action Plans (NBSAPs). Difficulties associated with 30x30 include the challenge to demonstrate biodiversity benefits, with the risks of focusing on labels, blue-washing, and compartmentalization of conservation efforts (Claudet et al. 2022). How 30x30 is implemented, including the role of

OECMs, is likely to vary between countries according to national priorities and circumstances, including prevailing socio-cultural settings, governance systems, traditional knowledge systems and advocacy of Indigenous Peoples and Local Communities (IPLCs). Such factors influence whether countries address 30x30 with a focus on merely achieving the target of 30% coverage, or whether qualitative elements, such as the ecological representativeness of conservation areas, their management effectiveness or the inclusion of IPLCs are more important. To "bend the curve on biodiversity loss" and secure the future of human survival on Earth, it is however critical that biodiversity is more effectively conserved than is presently the case, and not just on paper (Obura 2023; Ban et al. 2023).

A key element of the GBF's target 3 (and other targets) is the importance of inclusive and equitable implementation by recognizing and respecting the rights of IPLCs over their traditional territories (CBD 2022). This underpins the need to carefully engage with resident resource users, such as artisanal fishers, regarding conservation objectives and their implications for user rights and livelihoods. In many areas, the willingness of fishing communities to cooperate with area-based conservation is challenging due to legacies of colonial conservation, mistrust, failures of protection measures and resistance against top-down approaches. However, experience with Locally-Managed Marine Areas (LMMAs) in the Pacific (Govan et al. 2009, Govan and Lalavanua 2023) and Madagascar (Gardener 2020) has shown that strong tenure rights may ensure long-term sustainability, particularly in countries where governments lack resources to enforce conservation measures. Setting up functioning and effective co-management systems between local communities and governments is based on mutual trust, which is not built in a hurry. Conservationists and proponents of community-based management therefore recommend caution to not rush the implementation of target 3, and rather set realistic context- and country-specific milestones, including stakeholder engagement, as steps in the right direction.

### *(ii) What contribution can Locally Managed Marine Areas (LMMAs) make to 30x30?*

A LMMA is defined as an "area of nearshore waters and its associated coastal and marine resources that is largely or wholly managed at a local level by the coastal communities, land-owning groups, partner organisations, and/or collaborative government representatives who reside or are based in the immediate area" (Govan et al. 2009). The scope of the definition allows for a wide variety of locally appropriate (co-)management systems, based on coastal communities being placed at the heart of managing their own territories and resources. They build on communities legal or *de facto* rights to land and sea and the power to develop regulations that ensure their own nature-based livelihood priorities. LMMAs embrace a suite of fisheries management tools, such as temporary or permanent closures; species restrictions, gear and/or access restrictions; and (mangrove) habitat restoration. In addition, LMMAs commonly have social objectives, such as development of alternative livelihoods (e.g. aquaculture); disaster preparedness; climate adaptation; family planning; village

governance; and agriculture. Currently, some countries (e.g. Fiji, Solomon Islands, Madagascar) include LMMAs in their reporting of MPAs (Govan and Lalavanua 2023) on the basis that they are consistent with the definition of IUCN Category VI protected areas (protected areas with sustainable use of natural resources). Considering this, they appear likely to also meet OECM criteria and as such contribute to conservation area targets for countries with more exclusive definitions for protected areas.

### *(iii) What benefits can OECMs bring for small-scale fishers?*

A benefit of the current political momentum of OECMs is the opportunity provided to strengthen co-management partnerships between governments and local leaders, while achieving long-term outcomes for biodiversity as well as poverty alleviation, food security and other global priorities. From this perspective, supporting existing local stewardship initiatives on the ground, such as those achieved through LMMAs, may in many cases present a better use of limited resources than designation of formally protected areas that come with challenges of getting effective management in place, and local acceptance and compliance. There is a concern that the identification, recognition and reporting of OECMs may in themselves be resource-intensive and divert limited funds away from community-based management objectives. Ideally however, OECMs will also provide opportunities to leverage funding for stewardship, for generating enabling environments for sustainable development and for addressing capacity limitations. Finally, OECMs may offer an opportunity for communities to find allies against external threats from other human uses under the ocean economy umbrella, such as industrial fishing or mining. In particular, a government reporting OECMs against global conservation targets would want to safeguard their long-term status by preventing short-term threats.

## 4. Recommendations for regional, national and local participants in the 30x30 challenge

In concluding, we highlight the following key messages and recommendations for navigating 30x30 by building bridges between conservation and small-scale fisheries:

- National-level scoping studies are needed as a first step to identify the extent of existing area-based management measures (other than MPAs), which could potentially be recognised as OECMs, and assess what their socio-ecological impacts would be. On a regional level, knowledge exchange, technical assistance and replication of best-practice are recommended.
- Policymakers need to engage early on with key stakeholders, including small-scale fishers, LMMA representatives and those implementing other forms of local area based management to assess whether development of OECM frameworks is useful

at the national or regional levels. NGOs and development cooperation can play a facilitatory role in enabling crucial participatory processes.

- To address confusion that still exists among key stakeholders about various aspects of OECMs, knowledge-sharing and communication are key.
- Governments need to fulfil a critical role in supporting and recognizing community-based conservation efforts. Successful implementation of OECMs will require focus on updating and implementing of policies, addressing external threats to livelihoods and the environment, providing funding and resources (particularly to those who manage and enforce - communities and government), and cooperating with regional environmental organizations to align local efforts with global targets.
- Conserved-area networks have been highlighted as a potentially successful approach to encourage and support resource (co-)management, improve coastal livelihoods and enhance sustainability. National or subnational networks seem to be the most (resource) effective, herefore, development of a regional (WIO) LMMA Network should avoid diverting limited funds from potentially more impactful (sub-)national networks. A regional network could focus mainly on knowledge transfer.
- Effective implementation of 30x30 requires that national governments set realistic timelines and targets. Too much focus on reaching the quantitative targets may lead to paper OECMs and compromise long-term benefits to people and nature.
- Mechanisms need to be set up whereby small-scale fisheries are supported in getting direct access to funding. This could be through the creation of a locally-driven trust fund that mobilize and engages funders to look into grassroots communities needs
- Incentives need to be developed to generate interest of communities to contribute to global conservation targets. These can take various forms of support, including recognition and support in implementing locally-determined management measures.

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### 2.2.4. Advancing Conservation through Community-Led Area-Based Fisheries Management: A Pathway to Achieving 30x30 Targets and Recognizing the Role of Local Knowledge and Participatory Science Tools

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**Abstract:**

This discussion paper delves into the dynamic relationship between conservation science and policy with a focus on community-led area-based fisheries management (CMA+R/LMMA) and its critical role in achieving the global 30x30 conservation targets. It underscores the need for more significant recognition of the linkage between CMA+R/LMMA as Other Effective Conservation Measures (OECMs) while emphasizing the importance of effective governance. The paper also explores the integration of local knowledge and scientific tools, highlighting Rare's Network of Marine Reserve Planning Tool (NMR) and process as a pivotal participatory framework for optimizing community-led networks of no-take marine reserves. Finally, it underscores the significance of partnerships, behavior adoption, and participatory data collection in enhancing the effectiveness of community-led area-based management, emphasizing the urgent need for policy support for equitable biodiversity conservation and sustainable resource use.

**Introduction:**

The global community has set ambitious 30x30 conservation targets to protect and conserve 30% of the world's oceans by 2030. Community-led area-based fisheries management (CMA+Rs/LMMA) presents a unique opportunity to contribute to these targets. However, the full recognition of the linkage between CMA+Rs/LMMAs and Other Effective Area-Based Conservation Measures (OECMs) is yet to be realized. This discussion paper aims to highlight the importance of achieving effective governance of community-led area-based monitoring, evaluation and management. by integrating local knowledge and participatory science tools for achieving the 30x30 targets.

The effectiveness of governance in community-led area-based management and no-take reserve for biological diversity protection has been a precondition for the full acceptance of CMA+Rs as OECMs. By empowering local communities to actively participate in decision-making processes, CMA+Rs can effectively conserve marine and coastal areas. Recognizing the linkage between CMA+Rs and OECMs is crucial for ensuring the successful implementation of conservation strategies. We argue that the effectiveness of governance of CMA+Rs can be achieved through three measures:

1) Inclusive science-based methods and tools;
2) Equitable partnerships and decision-making;
3) Sustainable behavior adoption and
4) Equitable development policy

**Inclusive science-based methods and tools:**

Integrating local knowledge and science digital tools is essential for effective management in the marine and coastal areas. Participatory data collection, including citizen science initiatives, surface species and areas of ecological, economic, social, and cultural importance for a diversity of community stakeholders. At Rare, this information is used as input in the Network of Marine Reserve (NMR) Planning Tool an area-based, interactive digital tool that creates maps where stakeholders can visualize how larval connectivity, critical habitats, current protection status and administrative boundaries interact with each other. Through a Marxan analysis, it weighs conservation benefits against the potential costs to fishers' livelihoods. The NMR tool presents the information in 1x1 km grids that are used to discuss and select potential Reserve location and boundaries, enabling community-led fisheries management bodies to explore overlapping socio-ecological factors, discuss the trade-offs of Reserve locations, and collectively define no-take areas to protect stocks while still supporting the fishing economy.

To eliminate 'digital divides' faced by many fishing communities with low internet access, the tool can be used off-line. In this way, the tool's design considers local needs, and its implementation has successfully demonstrated user accessibility, cost-effectiveness, and participatory design of community-led networks of no-take marine reserves optimized to improve fish catch and ecosystem health.

Community-based catch data collection and surveillance efforts are critical to facilitate integrated, adaptive management approaches across diverse coastal ecosystems. Furthermore, practical, hands-on learning opportunities and peer exchanges will further enable empowerment of communities for effective biodiversity conservation and sustainable exploitation of marine and coastal resources.

**Equitable partnerships and decision-making:**

Partnerships between local communities, NGOs, government agencies, and research institutions are essential for the success of community-led area-based management. These partnerships facilitate knowledge exchange, resource sharing and opportunities for implementation of networked approaches for conservation and collaborative decision-making. Central to partnership success is the genuine participation of marginalized groups and gender integration.

The Rare Mozambique Program increased women's information technology (IT) skills to fill in an important gap in the Community Fishing Councils (CCPs) functions: data-based decision-making. The women are trained to use Fish Forever's open-source, web-based data portal to access and interpret fish catch data reports the CCP uses in their discussions. Resulting in a secure role for women in the CCP as managers of the groups' digital tools.

**Sustainable behavior adoption:**

The health of an ecosystem largely depends on the degree to which sustainable fishing practices are adopted by the people that use its resources. Oftentimes, the most frequent motivators of behavior change are driven by sources that are either not meaningful to community-based stakeholders or unsustainable, such as informational campaigns and material incentives, respectively. Rare's behavior-centered approach surfaces and addresses deeper motivations and barriers to change such as increasing a sense of agency and ability to manage resources, household economic vulnerability and pride in being a responsible fisher. These measures mobilize and empower local communities to actively contribute to management, monitoring and evaluation efforts, ensuring the long-term effectiveness of management actions that are key for recognizing CMA+Rs as OECMs.

**Equitable development policy**:

Finally, to enhance the functionality and effectiveness of community-led area-based management, policy gaps need to be recognized and addressed. Policy interventions are necessary to support the equitable development of biodiversity conservation and sustainable resource use. In Mozambique, policy that granted preferential rights and devolved authority for CCPs to manage coastal waters was a critical first step. Now, local adaptive and flexible monitoring and evaluation solutions, coupled with opportunities for citizen science, should be embraced. Policymakers must act swiftly to provide the necessary support and resources for the successful implementation of community-led area-based management.

**Conclusion:** Community-led area-based fisheries management, supported by effective governance, local knowledge, and participatory digital science tools, is a critical pathway to achieving the 30x30 conservation targets. Recognizing the linkage between CMA+Rs and OECMs, integrating gender perspectives, and fostering partnerships and behavior adoption will contribute to the effectiveness of community-led management. Policymakers must prioritize the adoption of adaptive monitoring and evaluation solutions and act swiftly to support the equitable development of biodiversity conservation and sustainable resource use.

## 2.3. Sub-Theme 3: Approaches for collaborative regional ocean governance for a sustainable blue economy

### 2.3.1. Conservation, Surveillance and Monitoring in the High Seas - Implications for the Western Indian Ocean Region

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**Introduction**

The conservation and sustainable use of marine biological diversity in the ocean beyond national jurisdiction, as envisaged under the Treaty (Tiller, & Mendenhall, 2023), requires expeditious identification, establishment and management of area-based management tools (ABMTs). An ABMT is "a tool, including a marine protected area, for a geographically defined area through which one or several sectors or activities are managed with the aim of achieving particular conservation and sustainable use objectives [and affording higher protection than that provided in the surrounding areas]". Fully including such protection of the High Seas will be required if we are to meet the global target of protecting at least 30% of the ocean as part of a healthy interconnected seascape that mitigates the impacts of ocean use, as being articulated in the Kunming Montreal Global Biodiversity Framework (GBF) (CBD 2022). Conservation efforts under Aichi biodiversity conservation policy notwithstanding, the GBF come in the face of a continuing decline in biodiversity over the last decade. One of the causes of lack of success was inadequate capacity for acquiring data and information to inform conservation actions.

As part of GBF, Target 3, which calls for 30% of lands and oceans being protected by 2030, is supported by Target 21, which explicitly calls for access to the best available data, information, and knowledge for decision-makers. Specifically, The Area BAsed Management Tools (ABMTs), including MPAs will be expanded by 2030. The planning and implementation of ABMTs in the high seas will require an adaptive management approach, taking into account best available science, traditional knowledge, the precautionary [principle] [approach] and an ecosystem approach. The ecosystem approach must be underpinned by robust data and information on resources and uses (e.g. fishing activities) for conservation planning purposes but also for the effective implementation of area-based protection. In terms of ecosystem impact, fishing is undoubtedly the most important activity taking place on the high seas. Implementing area-based protection in order to enhance ecosystem resilience would therefore require spatial information about fisheries activities. To effectively conserve the broad

diversity of life in marine areas beyond national jurisdiction requires a good understanding of fisheries activities in the high seas.

High seas (in the WIO region) ABMT implementation will be complicated due to limited capacity for monitoring human activities and compliance, critical for successful conservation outcomes. Despite the fact that fishing is one of the most prevalent human activities on the high seas, the parties have limited capacity to monitor fishing activities there. The lack of information and data for monitoring, control and surveillance (MCS) of fisheries can be addressed by harnessing existing technologies and Big Data through partnerships with private sectors, NGOs, and governments. The result will not only be a successful implementation of marine conservation areas across maritime jurisdictions, but also a sustainable fishing industry, security and equitable governance of the high seas.

Satellite and data science technology, including data fusion and artificial intelligence has been applied successfully to identify fishing and inform fisheries management, particularly on the high seas (Kroodsma et al. 2018, Taconet et al. 2019). In particular, The Global Fishing Watch (GFW) has implemented this technology successfully to track fishing vessels on the high seas in near real time (72 hours delay). Subsequently, this data has been applied to quantify high-seas fishing effort, costs, and benefits, and assess whether, where, and when high-seas fishing is likely to impede conservation (Sala et al. 2018, Seto et al. 2022, Welch et al. 2022, Seto et al. 2023, Kroodsma et al. 2023). Data on the distribution of fishing effort would help countries to understand the degree of overlap between fishing grounds and critical areas to be placed under area-based protection and potential conflicts. Collaborating with partner countries, GFW can facilitate a comprehensive understanding of the region's marine resources and fisheries, bolstering their management, providing insights for marine spatial planning purposes and supporting monitoring, control and surveillance (MCS) activities. Such data, when combined with other public databases (e.g. fisheries registries, RFMO authorisation lists) can be helpful in providing complete information useful for ecosystem-based management and governance of the high seas in the WIO. This data-driven approach aids in filling critical knowledge gaps, essential for informed decision-making related to biodiversity conservation and resource management in the WIO. For this to become possible, there must be willingness and efforts towards collaboration with governments within the UNEP Nairobi Convention regional sea. Such partnership would include data sharing agreements, verification and capacity building. Moreover, the partnerships should be broadened to include the private sector, including the fishing industry, to encourage sustainable fisheries practices.

**Monitoring and surveillance**

Effective monitoring, control and surveillance (MCS) is an essential element for the implementation of the BBNJ Agreement and for the success of marine conservation and management especially for deep and distant waters beyond national jurisdiction that are difficult to observe directly. MCS regimes must be comprehensive and integrated and ideally provide real-time, accurate, fit-for-purpose, verifiable information in a cost-effective and non-discriminatory manner. Open data and information sources can be used to enhance national and regional MCS regimes and provide a more comprehensive picture of human activity at sea.

**Technology and big data**

Transparency, that is making information, as well as related policies and decision-making processes, openly available and accessible, is widely recognized as a fundamental principle in effective governance. Fisheries transparency can serve as a progressive means to enhance ocean governance, fostering greater accountability and inclusivity. The availability of accurate data has always played a pivotal role in guiding the management of shared resources that move across international jurisdictions, such as in the case of international fisheries. To formulate and implement policies that are transparent, rooted in science, and encourage equitable participation, extensive and accessible datasets are essential, as are open science software or infrastructure to enable data driven decision-making. By combining new scientific advances such as machine learning algorithms and remote sensing data with online platforms (e.g. Global Fishing Watch Map) to increase the accessibility of these data, GFW enhances the tracking of fishing activity within national and regional waters. Through collaborative efforts with regional partners, GFW is capable of identifying and mapping critical areas for marine biodiversity. This, in turn, contributes to painting a comprehensive picture of human activities at sea.

Global Fishing Watch provides an easy access and free platform called Marine Manager that can support MPA managers, governments and civil society to visualize activity at sea in relation to environmental variables and biodiversity information of interest in time and space.The Marine Manager can support countries to collect quality information in a standardized format that could be shared and used internationally to inform collective decision making, allowing decision-makers to effectively govern their shared resources. Another free-accessible platform is the GFW map, through which countries can access relevant information on existing fishing activity and possible threats to biodiversity. Interoperability of data and information plays a pivotal role in advancing transboundary decision-making, specifically concerning the establishment, management, and monitoring of ABMTs for BBNJ. This highlights the crucial need to facilitate the exchange of information, fostering a common

understanding of biodiversity conditions and threats within the region. Organizations such as Global Fishing Watch can support and facilitate countries and regional organizations to harness existing global repositories of biodiversity data and make the information readily accessible and in some instances integrable with locally collected datasets. This approach will contribute to important but difficult discussions on issues related to data format discrepancies, which if left unaddressed will limit the scalability of cross border related monitoring and enforcement. Timely advances in transparency related fisheries policies and capacity development to work with open data can both incentivize and bolster the collaborative process among nations and stakeholders to derive key indicators, especially in the context of Target 3 within the Global Framework for Biodiversity. The accessibility and visualization of indicators through knowledge web platforms empowers countries to track and measure their progress and achievements, providing a transparent and insightful view of the processes and advancements each nation is making.

**Application**

Information and data scarcity on fisheries and their impacts in areas beyond national boundaries have hampered their effective management. Applying machine learning algorithms to AIS tracked vessels allow us to characterize fishing activity in the WIO High Seas region. In the 1-year period between October 1 2022 to September 30, 2023, 1.2 million fishing hours from 601 AIS tracked fishing vessels were detected in the WIO High Seas region (Fig 1). A total of 22 flag states were active in the region, with Taiwan, Sri Lanka, China, and Seychelles being among the top four flags by apparent fishing effort and the number of vessels (Fig 2a, 3). Several hotspots of AIS-based fishing activity were detected outside the EEZs of Maldives, Seychelles, and South Africa.

A variety of fishing gears were detected in the WIO high seas, drifting longlines were the most dominant fishing gear with 1.18 million fishing hours representing 99% of the total fishing effort (Fig 2b). However, the fishing pattern highlighted here is dependent on AIS use, and is hampered where particular fleets have poor AIS use such as the WIO tuna purse seine fleets (Bunwaree, 2023). Fishing activity of purse seiners in the WIO is underrepresented as the vessels normally switch off their AIS during fishing operations (Murua et al., 2019). We quantified gaps in AIS transmission in the past 1 year in the WIO High seas region; 1316 gaps from 441 vessels were detected and ranged from 12 hours to 5800 hours (Fig 4). Hotspots of AIS gaps were detected in the Northern WIO High seas region. Further extending the application of AIS data to fisheries, we are able to quantify potential transhipment between fishing and carrier vessels. There were 663 encounter events between carriers and fishing vessels in the WIO High Seas region (Fig 5). The data can be further checked with the relevant regional

fisheries management organizations, to confirm transhipment authorizations during the time when they occurred. AIS derived fishing data can be useful in characterizing spatial patterns of fishing activity in the WIO high seas to complement other available datasets, to inform biodiversity conservation and fisheries management.

An unknown number of vessels do not broadcast AIS messages. GFW has developed methods to enhance large scale open ocean monitoring by combining satellite-based Synthetic Aperture Radar imagery and AIS to estimate the number of non-broadcasting vessels (Kroodsma et al. 2022). In the Indian Ocean region between 32 and 40% of longline vessels in the region were not broadcasting on AIS, particularly those flagged to Taiwan and Seychelles (Kroodsma et al. 2022). A similar approach is used to highlight the activity of vessels by matching AIS to night time imagery detected using the Visible Infrared Imaging Radiometer Suite (VIIRS) sensors aboard the Suomi National Polar Partnership satellite (Seto et al. 2023). An analysis of the WIO High seas revealed 70% of the VIIRS detections were unmatched to AIS. This suite of tools and technologies helps to build a more complete understanding of human activity at sea including vessels that do not broadcast on AIS.

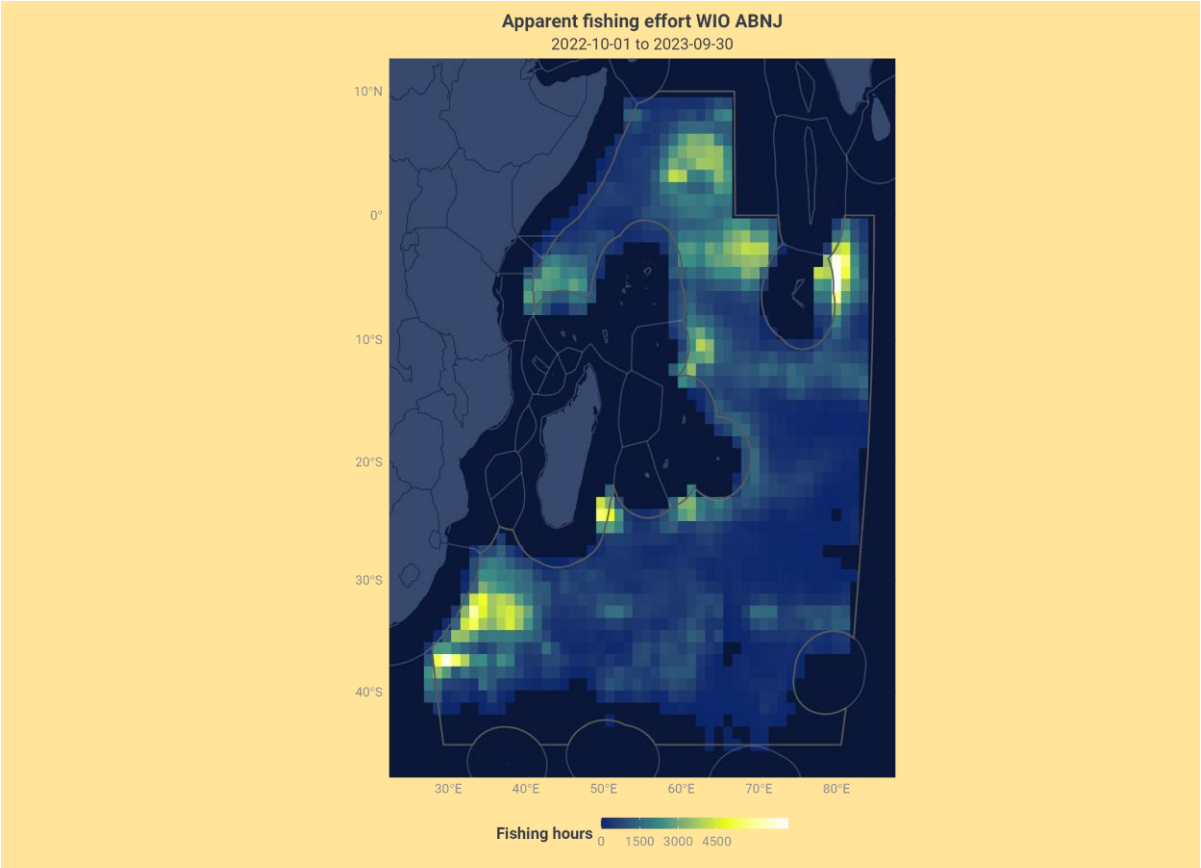


Fig 1. AIS based apparent fishing effort in WIO ABNJ areas as determined by GFW

machine learning algorithms for the period Oct 2022 to October 2023 binned to 0.5 degree grids.

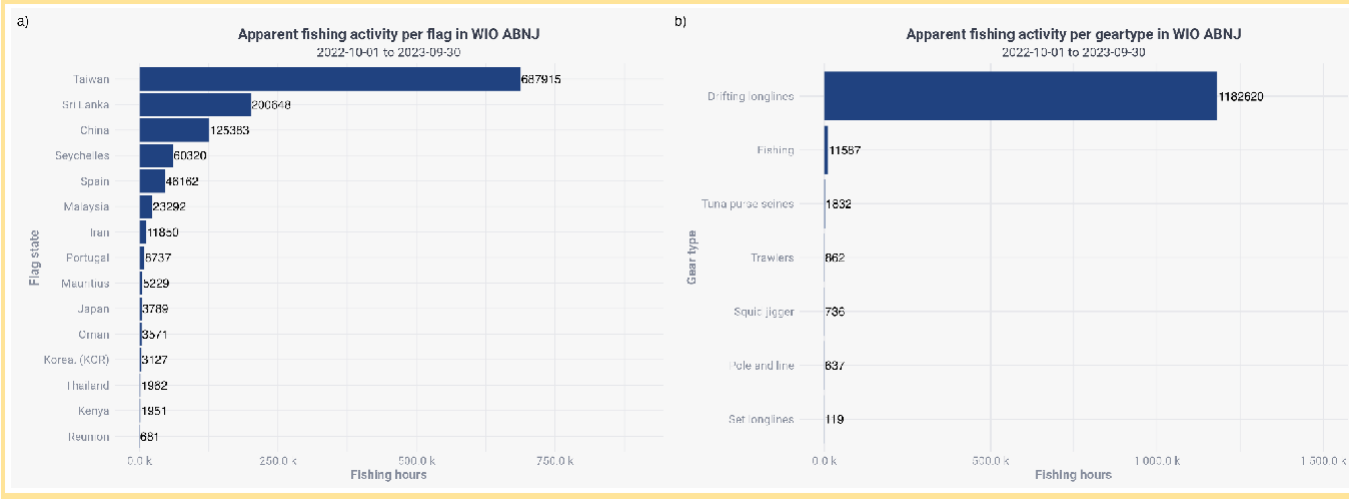


Fig 2. AIS based apparent fishing effort aggregated by a) Vessel flag state, and b) fishing gear types for the period Oct 2022 to October 2023.

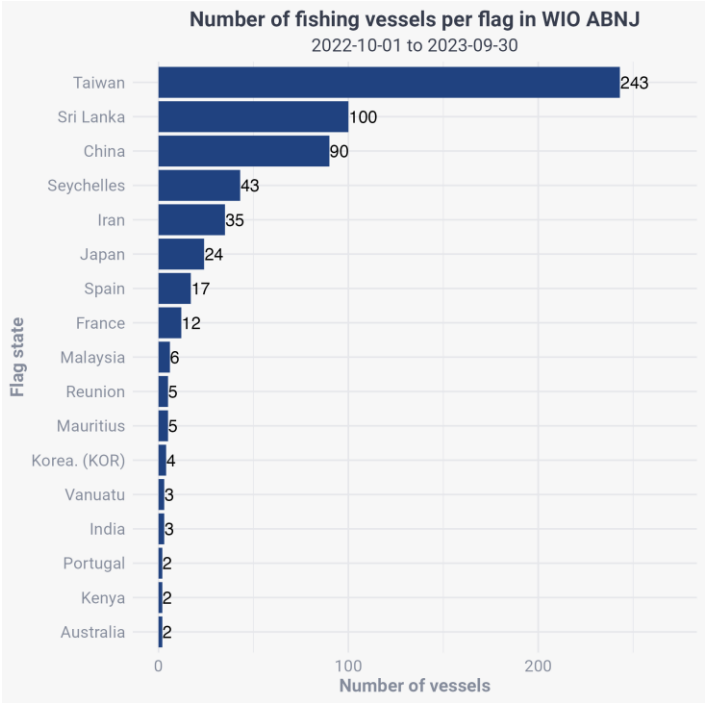


Fig 3. Number of fishing vessels active on AIS in WIO ABNJ aggregated by flag state.

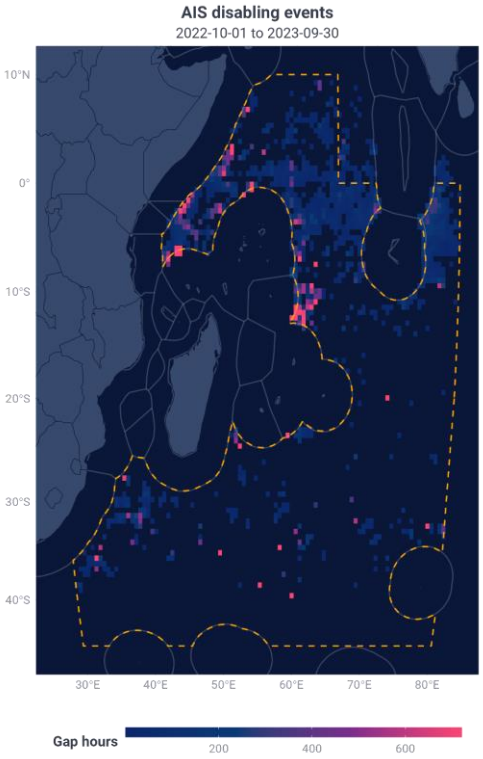


Fig 4. Gaps > 12 hours in AIS transmission binned to 0.5 degree grids.

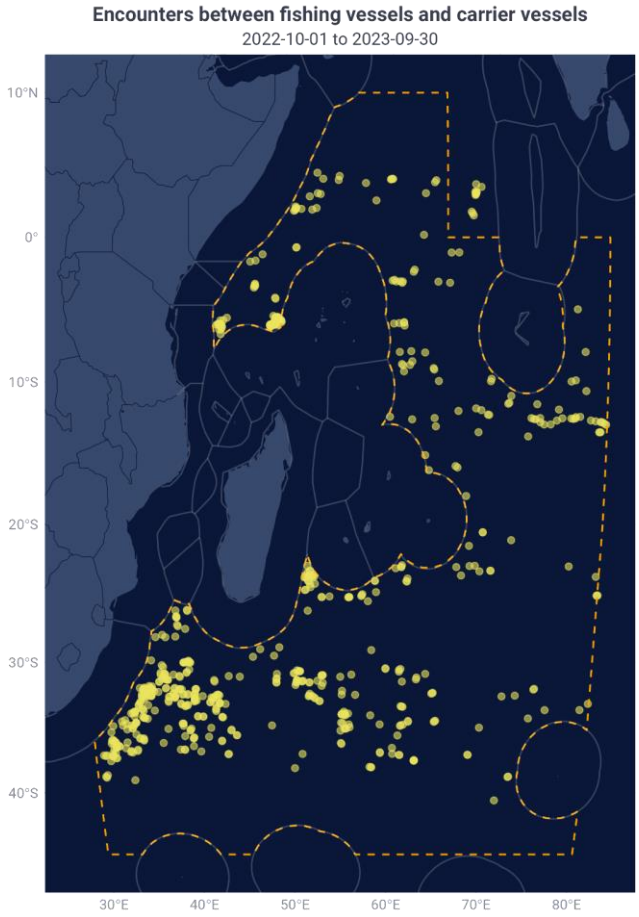


Fig 5. Encounters between carriers and fishing vessels in the WIO High seas.

**Technical recommendations for WIO**

While tight alignment exists between western Indian Ocean research and the thematic areas of the Africa Blue Economy Strategy (fisheries, aquaculture, and ecosystem conservation; environmental sustainability; and policies and governance, there is a gap in relation to information requirements for an ecosystem approach to area based management, namely shipping, transportation and trade, sustainable energy and extractive industries (Manyilizu 2023). Addressing this gap will require not only more information on these sectors, but also greater cross disciplinary collaboration in the form of increased accessibility and interoperability of existing data information and technology, so that an informed approach to establishing and managing high seas managed areas is possible. Access to information, data and novel tools is not enough, particularly as a major barrier to the efficacy of existing MPAs, and remote monitoring of the ocean is a lack of capacity (Gill et al. 2017, Bax et al. 2019).

Effective capacity development is however complex. Using the focal areas identified by Harden-Davis et al. 2022, GFW made the following recommendations to turn the

opportunity offered by the need to expand the ABMTs by 2030 in the Western Indian Ocean into meaningful long-standing capacity development in the region.

i) **Encourage the Nairobi Convention Secretariat and capacity building implementation programs to co-produce a definition of how their capacity building measures will meet the identified needs for achieving the high seas ABMT in the western Indian Ocean and establish partnerships appropriately**

Global Fishing Watch adopted an independently facilitated needs assessment method to design their recent capacity development partnerships. For example, the co-design of a training course that focuses on specific job-related skills and responsibilities, and by developing and training on standard operating protocols for staff who sit within the fisheries monitoring centers tasked with monitoring.

ii) **Acknowledge the different motivations of actors participating in capacity development projects and build consistency and synergies across projects and countries.**

While partnerships between the private sector, NGOs or philanthropically or technology funded non-profit organizations and governments will be an integral part of the future implementation of the BBNJ agreement, this brings together actors with a range of motivations to implement capacity development. Injecting novel methods, datasets and tools into courses can make for meaningful two-way exchange of capacity and expertise. WIOMSA hosts comprehensive MPA manager courses, and within such a context, GFW is in a position to make a valuable contribution proposing the inclusion of a dedicated module focused on the use of satellite datasets for effective marine protected area management. By integrating this satellite dataset module into the training program, we seize the opportunity to better understand the potential adjustments required for the Marine Manager functionalities. These adaptations are crucial to ensure that the Marine Manager can effectively provide for the specific needs and challenges encountered within high seas marine protected areas in the Western Indian Ocean region. Additionally, GFW can act as both a platform for data visualization across boundaries and a data provider. As an example, the Global Fishing Watch data could be integrated into the well-established open access geospatial data repository for the Western Indian Ocean, specifically the Marine Spatial Atlas for the Western Indian Ocean (MASPAWIO). Acknowledging these differences and two-way benefits can inform powerful partnerships.

iii) **Develop regional reporting metrics that focus on the long-term benefits experienced by WIO member countries tasked with proposing, establishing and implementing the high seas ABMTs**

Defining and measuring capacity development success and failure in relation to Nairobi convention member states, rather than providers, will facilitate a laser focus on the multi-scalar (individual, institution, national and regional) outcomes required to implement high

seas ABMTs. Global Fishing Watch has and will continue to contribute to regional initiatives targeted at decision-makers to encourage institutional change in approach to open science and skills to work with open data, whilst also mentoring and coaching young scientists interested in data handling and coding skills and open source tools (e.g gfw-R, using APIs, Ocean Hackathons).

Policy recommendations

The effective management of fisheries in areas beyond national jurisdiction and the high seas faces significant challenges stemming from governance framework fragmentation and the lack of coordination among different States and actors. These challenges underscore the crucial need for a cohesive and transparent fisheries management system. This system should not only address existing gaps but also harness transparency as a powerful tool for driving compliance and enhancing enforcement actions. In this context, when transparency is integrated into a broader strategy, it becomes a valuable tool for authorities. Transparency as a tool for a sustainable ocean economy seeks to share how satellite data and machine learning can complement domestic regional and international monitoring, control and surveillance, and outline how cutting-edge technology can support fisheries transparency to drive compliance and assist enforcement efforts. These sources facilitate a more comprehensive understanding of human activities at sea, enabling precise targeting of compliance and enforcement actions for heightened effectiveness in marine conservation and resource management. However, the assessment of compliance and delivery of consequences for non-compliance requires an understanding of a vessel's identification, authorization, ownership, registration, tracking and transshipment data as well as compliance history and policies that govern its activities. With this overarching framework and challenges in mind, we propose a set of policy recommendations aimed to address the critical gaps identified:

Incorporate Transparency in National Legislation: Countries should define transparency in their national legislation, emphasizing the availability and accessibility of specific ocean and vessel data, policies, and decisions. These elements should inform actionable measures. A definition may outline transparency as the act of making specific ocean and vessel data, as well as the policies and decisions that surround them, both available and accessible to those that need it, and using these policies and data to inform action.

Mandate Public Vessel Tracking: Implement public transparency for vessel tracking by mandating the use of the automatic identification system (AIS) and/or the publication of vessel monitoring system (VMS) data for industrial fishing vessels. Technical criteria for tracking data, tailored to the target fishery, should be specified in regulations.

Ultimate Beneficial Ownership: whilst registry information is extremely valuable to ensure correct identification of vessels, ultimate beneficial ownership data is required for authorities to ensure those benefiting from the profits of infractions are the ones that are sanctioned appropriately.

Enhance Transparency in ABMT Proposals: For Marine Protected Areas (MPAs) and Areas Beyond National Jurisdiction (ABMTs), countries should provide and make transparent

relevant information about existing human uses and potential threats to biodiversity before designation. This transparency informs the development of management measures addressing these threats and fosters a comprehensive understanding of monitoring and enforcement implications.
Transparent Management and Monitoring Plans: The transparency of management and monitoring plans, along with their resource allocation and responsibilities, should be upheld.
Inclusive Proposal and Designation Process: The proposal and designation process for MPAs and ABMTs should be organized in a transparent, inclusive, and participatory manner, allowing stakeholders, including area users, to engage in the process, securing greater buy-in for established measures.

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### 2.3.2. Advancing Seagrass Conservation and Management Across the Western Indian Ocean

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Seagrass meadows provide a range of environmental, economic, and community benefits to our global society. This ecosystem is crucial for biodiversity and supports both food production and livelihoods across the Western Indian Ocean (WIO). Seagrasses are also nature-based solutions to climate change, capable of locking away carbon into ocean sediments and providing numerous climate adaptation benefits including coastline stabilization, improving water quality, and reducing wave impacts. The management and conservation of this ecosystem can play a vital role in advancing multiple Sustainable Development Goals (SDGs) and signatories to the United Nations Paris Agreement can include the protection and restoration of seagrasses as a nature-based solution toward achieving the mitigation or adaptation goals within their nationally determined contribution (NDC). There is an urgent need across the WIO to improve the understanding of seagrasses, including: advancing the development of a regional seagrass map with enhanced resolution at the national level, increasing regional dialogue and knowledge sharing, including this ecosystem more broadly into coastal and marine ecosystem management and climate frameworks, and enhancing research and innovation to support the integration of seagrasses within regenerative blue economy frameworks. To help advance the science on seagrass, The Pew Charitable Trusts (Pew), along with the Western Indian Ocean Marine Science Association (WIOMSA), University of Oxford, and regional partners are developing a field verified seagrass map for several WIO countries. Maps developed through this work would have significant impact towards several regional initiatives and priority areas, including efforts by the International Union for Conservation of Nature (IUCN), and the Nairobi Convention's COP10 Decision 8 (Area-based Planning Tools for Sustainable Blue Economy) and Decision 9 (Monitoring of the Marine and Coastal Ecosystems).

**Background and rationale**

Seagrass meadows found in the coastal waters across much of our planet are one of the most important ecosystems on Earth. In the Western Indian Ocean (WIO), a region rich in

seagrass diversity with an estimated 13 species of seagrass, this ecosystem fringes an approximate 12,000 km of coastline 1 and is often interconnected with mangroves and coral reefs forming critical coastal eco-infrastructure. Across the WIO, seagrasses play a crucial role in biodiversity, food security, climate regulation, shoreline defense, local economies, among others. Unfortunately, seagrasses have historically received less scientific attention and are among the least protected.

Seagrass serves as fish habitat for one fifth of the world's largest commercial fish species, providing a valuable source of food and livelihoods to communities 2. Small scale and artisanal finfish fisheries that operate in coastal waters constitute the majority of the landings across the WIO with many seagrass dependent species such as rabbit fish (Siganidae), emperors (Lethrinidae), and mullets (Mullidae) forming a significant part of the landings 3,4. Invertebrate gleaning of oysters, clams, mussels, and snails is also common and important to overall food security of residents, particularly in Madagascar and Mozambique 5-7.

Seagrasses, along with mangroves and saltmarshes, are considered blue carbon ecosystems and are globally important carbon sinks 8. In the WIO, seagrasses may play a role towards blue carbon financing, but country specific data on carbon stocks, sequestration rates and activity are limited, and an area for further scientific exploration. Research suggests that the amount of carbon stored in meadows vary 9, sediment carbon from seagrass meadows in Gazi Bay, Kenya ranges between 160.7-233.8 Mg C ha-1 10, and unfortunately, as meadows degrade this stored carbon is remobilized, potentially releasing decades worth of carbon into the environment.

As rooted plants, seagrasses hold ocean sediments in place helping with coastal defense and climate adaptation. An assessment from Dar es Salaam, Tanzania indicates that intact seagrass and other coastal ecosystems like mangroves are highly suitable for preventing coastal erosion 11. Additionally, the canopy of intact seagrass beds provides a buffer from the full impact of waves while trapping sediments 12, thereby improving water quality for coral reefs 13.

Increasing coastal development, boat traffic, cyclone impact, sea urchin herbivory, destructive fishing practices, and unsustainable tourism are all impacting WIO seagrasses. An estimated 26% of seagrass cover has been lost from 1986-2016 across East Africa 14, but data on localized rates of loss is limited. In Kenya, seagrass is estimated to cover around 317 km2 with losses increasing from 0.29% per year in 2000 to 1.59% per year in 2016, releasing up to 2.17 Tg of carbon since 1986 15. Site-specific studies indicate that seagrass loss can be higher, in Inhambane Bay, Mozambique an estimated 51% of seagrasses was lost between 1992-2013 16.

**Linkage to regional and global processes**

Protecting and restoring seagrasses play a vital role in advancing multiple United Nations Sustainable Development Goals (SDGs) and can help countries achieve 26 targets and

indicators associated with 10 SDGs including improving food security, supporting biodiversity, and strengthening both climate adaptation and mitigation actions 17. Advances in seagrass science including mapping can serve as a United Nations Ocean Decade Action to meet local and regional needs. Restoration also provides the opportunity for countries to achieve commitments within the upcoming United Nations Decade on Ecosystem Restoration. Moreover, seagrass management and conservation support several regional objectives including the Nairobi Convention's COP10 Decision 8 (Area-based Planning Tools for Sustainable Blue Economy) and Decision 9 (Monitoring of the Marine and Coastal Ecosystems).

In recent years countries have sought to better include seagrass meadows within policy and management frameworks. For example, in Kenya seagrasses have been included within the National Coral Reef and Seagrass Conservation Strategy (2013) 18, and in Mozambique seagrasses have been mentioned in the National Strategy and Action Plan of Biological Diversity 19. Projects from across the WIO region also demonstrates the growing regional ambition to protect and manage seagrass. For example:

In Seychelles, a partnership between government, Pew, Seychelles Conservation and Climate Adaptation Trust (SeyCCAT), the University of Oxford, the University of Seychelles and others, led to the development of the first field-validated seagrass map and soil carbon stock assessment for the country 20,21. These seagrass maps have informed protection commitments in the country's updated NDC22 and are being included into national marine spatial planning.

In Mozambique, a research and demonstration project by the University of Eduardo Mondlane, with support from the Nairobi Convention and other agencies, aims to develop a draft management action plan for seagrass meadows. This project is being carried out in a multi-stakeholder approach involving university departments' researchers and students, NGOs, municipalities and relevant government directorate, local communities to develop a plan that delivers sustainable seagrass invertebrate fisheries, value to community wellbeing, and testing blue carbon seagrass restoration in southern Mozambique.

In Mauritius, the Nairobi Convention is supporting an assessment of blue carbon specifically investigating the status of seagrasses and evaluating its carbon sink potential to develop relevant management strategies.

Regional efforts include those by the IUCN and partners on bridging the knowledge gaps on seagrass through studies on ecological connectivity, threat assessment and ecosystem valuation, supporting site-level seagrass conservation initiatives and overall capacity building for seagrass experts in the region. This project also seeks to develop a regional seagrass strategy and aim to increase regional political ambition for seagrass conservation and restoration, promoting the contribution of seagrass to socio-ecological resilience and the development of a regenerative blue economy in the Western Indian Ocean through the WIO Coastal and Ocean Resilience Project (WIOCOR project).

Subject matter: Seagrass mapping, conservation, and management in the WIO

Improving seagrass mapping and regional dialogue can help move the needle on conservation as there is no standardized field verified seagrass map for the wider WIO region 23. Advancing seagrass mapping in partnership with policy makers can help with multiple policy objectives such as seagrass inclusion more widely into management, marine protected areas, and NDCs.

**Mapping of seagrass**

Mapping seagrass coverage and the services they provide (including regulatory services such as climate adaptation) is critical for tracking their changes over time and space. Furthermore, presenting services in a spatially explicit manner is an effective method of informing policy- and decision-making processes. Seagrass distribution maps are still poorly resolved in many areas in the WIO, making habitat mapping a top priority for assessing seagrass ecosystem services. Furthermore, a better understanding of the relationships between seagrass extent, status, and service provision, as well as well-defined indicators of the services and their benefits, are critical for mapping ecosystem services at various temporal and spatial scales.

Taking a region-wide approach, Pew, in partnership with WIOMSA, University of Oxford, IUCN and partners, seek to develop a seagrass map for Kenya, Tanzania, Mozambique, and Madagascar using satellite imagery and in-country field validation. These methods have been applied in Seychelles with success and is scalable to the region. The project is actively inviting the participation of local government officials, scientists, NGOs, and other key stakeholders to set the stage for accelerated seagrass conservation and management throughout the WIO. The project has had an initial consultation with Nairobi Convention Focal Points for Tanzania, Mozambique, and Madagascar in April 2023.

**Protection using area-based tools**

Marine protected areas (MPAs) are a widely used tool to conserve critical habitats and biodiversity. They are commonly used for fisheries and coral reefs but have been less intentionally used for seagrass as field-verified seagrass maps often do not exist. Protected areas aimed at critical seagrass areas can positively impact fisheries and critical local biodiversity. For example, seagrasses within the Bazaruto Archipelago National Park in Mozambique are central to health of dugong populations. There is also scope for community level management such as locally managed marine areas (LMMAs) whereby coastal communities work in partnership with government to protect their coastal resources. The establishment of seagrass based LMMAs has also been initiated in Madagascar and Kenya and the need to strengthen the capacity of the communities involved for surveillance and protection of these areas cannot be overemphasized.

**National Climate Agendas**

There is opportunity for countries to take global leadership on seagrass protection and restoration as a climate action. One of the central instruments under the Paris Agreement is the development of NDCs, which gives the opportunity for each country to outline the set of actions they will take to achieve the goals of the Agreement. Several countries in the region have included blue carbon ecosystems into the NDCs. Kenya for example has committed to conduct a blue carbon readiness assessment for full integration of blue carbon/ocean carbon into NDCs, while Seychelles' NDC took the ambitious approach to protect all seagrass meadows by 2030, account for the associated carbon in the country's greenhouse gas inventory, and establish a long-term monitoring program for seagrass.

**Recommendations:**

Call on the Nairobi Convention Parties to address data and knowledge gaps for seagrass by helping to produce physical accounts of spatially explicit seagrass extent through collaboration with planned mapping efforts, help to improve carbon stock and sequestration rate data, and improve understanding on threats to seagrass.

Call on the Nairobi Convention Parties to commit to facilitating and strengthening locally-led management measures for seagrass and adjacent ecosystems for improved health and functioning of coastal and marine ecosystems and sustained delivery of ecosystem goods and services to local communities.

Call on the Nairobi Convention Secretariat, Parties and partners to strengthen integrated measures toward the protection and restoration of blue carbon seagrass and mangrove ecosystems as nature-based solutions, including but not limited to, technical support to aid countries seeking to promote and preserve the services and climate benefits of these ecosystems within frameworks such as national biodiversity action plans and nationally determined contributions.

Call on the Nairobi Convention Secretariat, Parties and partners to commit to facilitating, and strengthening where appropriate, the institutional arrangements necessary between research, community, and policy stakeholders to mainstream seagrass maps into national management frameworks, such as marine spatial planning and protected areas, including through establishing and strengthening a collaborative WIO Seagrass Network, and enhancing research and innovation to support the integration of seagrasses within regenerative blue economy frameworks.

Urge the Nairobi Convention Secretariat, Parties and partners to commit to supporting development of a regional seagrass strategy, vision and action plan through engagement with ongoing regional efforts such as the WIOCOR seagrass project, Pew's upcoming mapping project, along with seagrass experts, NGOs, communities and other key stakeholders to develop a strategy similar to that agreed for mangroves at COP10, that aims

to identify seagrass conservation goals, data and priority needs, and improve institutional arrangements and dialogue at the regional level.

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### 2.3.3. Improving shark and ray management in the Western Indian Ocean

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#### Background and rationale

Sharks and rays represent a highly diverse group of fishes, with over 1,200 species globally. Sharks and rays are ecologically important, as apex and mesopredators, as well as prey for larger species. They are also of socioeconomic importance, being targeted for their high value products, including fins, liver oil, meat, gill plates, teeth, skin and cartilage.

Most shark and ray species are characterised by slow growth rates, late attainment of maturity and few offspring, making them highly susceptible to overexploitation. Extensive

fishing has led to dramatic population declines for shark and ray species, with at least 33% of all species globally now threatened with extinction (i.e., Vulnerable, Endangered or Critically Endangered) according to the IUCN Red List of Threatened Species (Dulvy et al. 2021[27]).

The Western Indian Ocean (WIO) has a rich marine diversity, with 225 known shark and ray species (Bennett et al. 2022[28]). However, extensive fisheries in the WIO have impacted shark and ray populations, with at least 40% of all WIO shark and ray species now listed as threatened (IUCN 2023[29]); a situation considerably worse than the global level of 33%.

Sharks and rays contribute significantly to catches in all fisheries in the WIO region, whether targeted or bycatch. While considered bycatch in many of these fisheries, they are not unwanted bycatch, and there is minimal discarding of shark or ray products, particularly in the small-scale fisheries. Thousands of people in coastal communities in the WIO are dependent on fishing and marine resources, including sharks and rays, for their income and livelihoods, and declines in shark and ray abundance have direct negative impacts on these fishing communities.

The collection of catch and landings data for sharks and rays is poor in most WIO fisheries. The Indian Ocean Tuna Commission (IOTC) requires species-level catch monitoring for approximately 10 species of sharks and rays, while most fisheries do not report sharks and rays at species level. In addition to legal fisheries and trade, sharks and rays form components of illegal fisheries and illegal trade, the magnitude of which is nearly impossible to quantify.

The result is that WIO shark and ray species are under immense fishing pressure, in addition to threats from other factors, such as habitat loss and climate change, and populations have declined considerably as a consequence. However, the magnitude of fishing mortality and trade volumes remain largely unknown. There is therefore a critical need for corrective management and improved conservation of the shark and ray species in the WIO.

**Linkage to regional and global processes**

Improved conservation and management of shark and ray populations in the WIO require dedicated actions that will lead to reduced mortality, particularly of threatened species. There are several multilateral environmental agreements (MEAs) and regional fisheries management organizations (RFMOs) that include measures for shark and ray species, which simultaneously obligate and can guide States to improve management through binding and voluntary measures. Actions to resolve these issues can be grouped into three broad objectives:

[27] Dulvy NK, Pacoureau N, Rigby CL, Pollom RA, Jabado RW, Ebert DA, Finucci B, Pollock CM, Cheok J, Derrick DH, et al. 2021. Overfishing drives over one-third of all sharks and rays toward a global extinction crisis. *Current Biology*.

[28] Bennett RH, van Beuningen D, Bräutigam A, Bürgener MCR, Bladon A, Kiszka JJ, Leeney RH, Okes N, Samoilys M. 2022. *Chondrichthyans of the Western Indian Ocean: Biodiversity, Fisheries and Trade, Management and Conservation.* A Status Report prepared by the Wildlife Conservation Society for the Nairobi Convention. WCS, New York: 339 pp, 2 appendices. https://doi.org/10.19121/2022.Report.44805

[29] IUCN. 2023. *The IUCN Red List of Threatened Species. Version 2023-2*. https://www.iucnredlist.org. Downloaded October 2023.

1) Protection of highly threatened species to mitigate further population declines;
2) Controlling international trade, to ensure that trade becomes sustainable; and
3) Managing populations of non-prohibited species, to allow for sustainable utilization.

**Actions to improve shark and ray management in the Western Indian Ocean**

**1) Protection of highly threatened species**

There are numerous shark and ray species listed under global MEAs that bind States to protection of such species, while other measures provide a basis for identifying species for which protection should be considered due to the poor conservation status of the species.

The *Convention on the Conservation of Migratory Species of Wild Animals* (CMS[30]) provides a binding global platform for the conservation and sustainable use of migratory animals and their habitats. In the WIO, Somalia, Kenya, Tanzania, Mozambique, South Africa, Madagascar, Mauritius, France (Reunion) and Seychelles are party to CMS. Comoros is not signatory to CMS but is a Range State of many of the species of sharks and rays listed on CMS Appendices. CMS Appendix I lists migratory species threatened with extinction, and CMS Parties are required to strictly protect species listed in Appendix I, conserve or restore their important habitats, mitigate obstacles to their migration and control other factors that might endanger them. Thirteen shark and ray species in the WIO are listed on CMS Appendix I (Annex I) and should be protected at national level in all CMS Party States. However, most WIO countries fully protect few shark and ray species listed on CMS I Appendix, while Mozambique is the only country that protects all CMS I shark and ray species present in its waters.

The *Indian Ocean Tuna Commission* (IOTC[31]), an RFMO under the FAO, is responsible for the management of tuna and tuna-like species in the Indian Ocean. While the IOTC is mandated to the management of tuna and tuna-like species, it also makes provision for bycatch species including sharks and rays that are considered under threat from the IOTC-linked fisheries directed at tuna and tuna-like species. The IOTC imposes binding Conservation and Management Measures on its member states, which include several specific *Resolutions*[32] on the fishing, handling, retention and reporting of selected shark and ray species or families. In the WIO, Somalia, Comoros, Kenya, Tanzania, Mozambique, South Africa, Madagascar, Mauritius, France (Reunion) and Seychelles are Contracting Parties under the IOTC. IOTC Resolutions include retention bans for 12 shark and ray species that occur in the WIO (Annex I), requiring that these species are prohibited from retention in tuna and tuna-like species in WIO States. However, not all species are prohibited in such fisheries in every WIO State.

The *IUCN Red List of Threatened Species*[33] categorises species according to factors such as their population trends and threats faced. The Red List categories of Vulnerable,

[30] www.cms.int
[31] https://iotc.org/
[32] IOTC Resolutions 12/09, 13/05, 13/06, 19/03
[33] www.iucnredlist.org

Endangered and Critically Endangered are considered *threatened* categories, and include species facing a high, very high or extremely high risk, respectively, of extinction in the wild (IUCN 2001[34]). Near Threatened species do not meet the criteria for a threatened category but may do in the near future if populations decline further. While IUCN categories impose no regulatory actions on governments, the precautionary approach, the FAO Code of Conduct for Responsible Fisheries (FAO 1995[35]) and other guiding texts suggest that the harvesting of threatened species should be regulated. This is particularly relevant to shark and ray species, whose life-histories are not resilient to exploitation. Species listed as Critically Endangered and Endangered are considered to face extremely high and very risk of extinction in the wild, respectively, and with such high extinction risk should not be subject to fishing pressure, and should be considered for protection to mitigate further population declines. There are 13 Critically Endangered and 33 Endangered shark and ray species in the WIO, all of which should be considered for protection at national level in their range States (Annex I), and 12 of which should be prohibited by virtue of their listing on CMS Appendix I or having an IOTC retention ban.

### 2) Controlling international trade

International trade in shark and ray products, particularly fresh and frozen shark meat and high-value fins, is one of the main threats to shark and ray populations globally. If uncontrolled, this trade would lead to further population declines, and likely local extirpations of certain species. Globally, there is a move towards sustainable trade in shark and ray products, with stricter trade controls, stricter enforcement and better resources and capacity for enforcement.

*The Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES[36]) is a binding MEA intended to ensure that international trade in specimens of wild animals and plants does not threaten their survival. In the WIO, Somalia, Comoros, Kenya, Tanzania, Mozambique, South Africa, Madagascar, Mauritius, France (Reunion) and Seychelles are Contracting Parties to CITES; however, the 2019 *Status of Legislative Progress for Implementing CITES* indicates that few of these States are implementing CITES effectively.

a. CITES Appendix I by definition includes species threatened with extinction. International trade in specimens of these species is prohibited, other than for scientific or educational purposes, while commercial trade is not permitted. In the WIO, there are no shark species and just two ray species listed on CITES Appendix I (Annex I), both of which are also listed on CMS Appendix I and should be prohibited from capture.

[34] IUCN. 2001. *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 30 pp.
[35] FAO 1995. Code of conduct for responsible fisheries. Rome.

[36] www.cites.org

b. CITES Appendix II by definition includes species not necessarily threatened with extinction, but for which trade must be controlled to avoid utilization incompatible with their survival. In reality, most shark and ray species listed on CITES Appendix II are already threatened, and thus more suited to Appendix I. Among other requirements, all international trade in Appendix II species requires i) a Legal Acquisition Finding (LAF), which is evidence that the products have not been taken in contravention of national or global measures (such as listing on CMS Appendix I), and ii) a Non-Detriment Finding (NDF), which is a confirmation from the CITES Scientific Authority of the State that the trade would not detrimentally affect wild populations of that species. In the WIO, there are 54 shark and ray species listed on CITES Appendix II. Of these, 27 species should not be permitted for international trade, including 14 species that should be prohibited due to their listing on CMS Appendix I or an IOTC retention ban and a further 13 that should be considered for protection due to being Critically Endangered or Endangered (Annex I). For the remaining 27 CITES Appendix II species (Annex II), international trade should be permitted only if it is not detrimental to the wild population. However, no NDFs have been published by any State, for any of these species, despite known international trade in their products.

### 3) Managing populations of non-prohibited species for sustainable utilization

In addition to protecting highly threatened species and controlling trade in shark and ray products, it is necessary to manage catches of other shark and ray species to ensure that populations are fished sustainably, for the benefit of both the species and the fishery.

CMS Appendix II lists migratory species that would benefit from international co-operation. Such species are not required to be protected but are listed to promote management that avoids population declines. CMS encourages multilateral management agreements for such species, to ensure appropriate management throughout their ranges. In the WIO, there are 24 shark and ray species listed on CMS Appendix II (Annex I, II), of which 12 are also listed in CMS Appendix I, three have an IOTC retention ban and six are Critically Endangered or Endangered (Annex I). WIO Range States to these species should consider joint management measures that ensure harvesting is sustainable at a regional level.

CITES has a primary objective to ensure sustainable international trade and does not restrict domestic trade or capture. However, species are listed on CITES Appendices due to threats that international trade poses to their wild populations. These species should therefore also be sustainably managed, to ensure stable populations. Management measures that mitigate negative impacts and ensure sustainable utilization should therefore be considered for the 40 Appendix II shark and ray species in the WIO (Annex I, II) that do not already require protection by virtue of listing in CMS Appendix I or an IOTC retention ban.

IUCN Red List categories do not impose management measures, but the conservation status of each species should be duly considered, and management measures imposed where

relevant. The harvesting of Vulnerable species (facing a high risk of extinction) and Near Threatened species (not yet threatened but which may become so without management intervention) should therefore be regulated, to avoid further population reductions. There are 43 Vulnerable and 28 Near Threatened shark and ray species in the WIO (Annex I, II), of which four Vulnerable species require protection by virtue of listing in CMS Appendix I or an IOTC retention ban (Annex I).

Management measures imposed by CITES, CMS and IOTC are legally binding on Parties, yet most WIO States fall short in their binding commitments and thus in their obligations to implement these MEAs, with generally limited legislation for sharks and rays in most States. There is thus a need for improved legislation for and management of sharks and rays at national and regional levels in the WIO, to reduce the impacts of fishing on these threatened species and to improve adherence to the MEAs to which WIO States are party.

**Recommendations**

WIO States are urged to implement measures at national level towards reduced mortality of threatened shark and ray species, to support stable populations and sustainable fisheries. Recommended actions are listed below, under three broad objectives:

1. **Protect highly threatened shark and ray species**, by:
    a. Fully protecting all CMS Appendix I shark and ray species,
    b. Imposing retention bans in relevant fisheries for all species with IOTC retention bans,
    c. Protecting all Critically Endangered and Endangered shark and ray species.
2. **Control international trade** in threatened shark and ray species, particularly through the effective implementation of CITES trade controls for listed shark and ray species, through:
    a. Prohibiting international trade in CITES Appendix I shark and ray species,
    b. Prohibiting international trade in CITES Appendix II shark and ray species for which harvesting and international trade would be detrimental to wild populations,
    c. Permitting international trade in only those shark and ray species that can be caught and traded legally and sustainably.
3. **Implement management measures and harvesting regulations** for shark and ray species not otherwise required to be protected, that ensure that utilization is sustainable, through:
    a. Implementing management measures for CMS Appendix II species, including regional/multilateral management measures/agreements, where appropriate,
    b. Implementing management measures for the harvesting in non-tuna fisheries of species with IOTC retention bans (i.e., in fisheries not under the IOTC mandate),

c. Developing and implementing management measures for CITES Appendix II species to ensure that populations remain stable,
d. Implementing management measures for Vulnerable and Near Threatened species.

**Annex 1:** Shark and ray species in the Western Indian Ocean that should be protected. This includes species with binding protection requirements based on i) their listing on the Convention on the Conservation of Migratory Species of Wild Animals Appendix I (CMS I) or ii) having a retention ban (X) under an Indian Ocean Tuna Commission (IOTC) Resolution, and species for which protection is not binding but should be considered due to their conservation status of Critically Endangered (IUCN CR) or Endangered (IUCN EN) under the International Union for Conservation of Nature Red List of Threatened Species (IUCN). Also shown are listings on Appendices I or II of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), listing on Appendices I and/or II of CMS, current IUCN Red List status (IUCN) for each species (CR = Critically Endangered, EN = Endangered, VU = Vulnerable), and countries in which the species is confirmed (1) or reported but not confirmed (-) (ZA = South Africa, MZ = Mozambique, TZ = Tanzania, KE = Kenya, SO = Somalia, MG = Madagascar, MU = Mauritius, RE = La Réunion, SC = Seychelles, KM = Comoros, YT = Mayotte, ABNJ = Areas Beyond National Jurisdiction).

| **Family** | **Species** | **Common name** | **Taxonomic reference** | **ZA** | **MZ** | **TZ** | **KE** | **SO** | **MG** | **MU** | **RE** | **SC** | **KM** | **YT** | **ABNJ** | **CITES** | **CMS** | **IOTC** | **IUCN** | **Criteria for protection** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Rays*** | | | | | | | | | | | | | | | | | | | | |
| Dasyatidae | *Himantura uarnak* | Honeycomb stingray | (Gmelin, 1789) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | 1 | | | | | EN | IUCN EN |
| Glaucostegidae | *Glaucostegus halavi* | Halavi guitarfish | Forsskål, 1775 | | | | 1 | | | | | | | | | II | | | CR | IUCN CR |
| Mobulidae | *Mobula alfredi* [d] | Reef manta ray | (Krefft, 1868) | 1 | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | II | I, II | x | VU | CMS I; IOTC |
| Mobulidae | *Mobula birostris* [d] | Giant manta ray | (Walbaum, 1792) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | II | I, II | x | EN | CMS I; IOTC; IUCN EN |

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| Mobulidae | *Mobula eregoodoo* [d] | Longhorned pygmy devil ray | (Cantor 1849) | 1 | - | - | - | 1 | - | - | - | - | - | - | - | I I | I, II | x | E N | CMS I; IOTC; IUCN EN |
| Mobulidae | *Mobula kuhlii* [d] | Shortfin devil ray | (Valenciennes, 1841) | 1 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | - | 1 | | I I | I, II | x | E N | CMS I; IOTC; IUCN EN |
| Mobulidae | *Mobula mobular* [d] | Spinetail devil ray | (Bonnaterre, 1788) | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 | | 1 | 1 | I I | I, II | x | E N | CMS I; IOTC; IUCN EN |
| Mobulidae | *Mobula tarapacana* [d] | Sicklefin devil ray | (Philippi, 1892) | 1 | - | 1 | | | | 1 | 1 | | | | 1 | I I | I, II | x | E N | CMS I; IOTC; IUCN EN |
| Mobulidae | *Mobula thurstoni* [d] | Bentfin devil ray | (Lloyd, 1908) | 1 | - | 1 | | | 1 | | | | | | - | I I | I, II | x | E N | CMS I; IOTC; IUCN EN |
| Myliobatidae | *Aetomylaeus bovinus* | Duckbill ray | (Saint-Hilaire, 1817) | 1 | 1 | 1 | | | | | | | | | | | | | C R | IUCN CR |
| Myliobatidae | *Aetomylaeus vespertilio* | Ornate eagle ray | (Bleeker, 1852) | 1 | 1 | 1 | 1 | | | | | 1 | | | | | | | E N | IUCN EN |
| Myliobatidae | *Myliobatis aquila* | Common eagle ray | (Linnaeus, 1758) | 1 | 1 | 1 | 1 | | | 1 | 1 | | | | | | | | C R | IUCN CR |
| Pristidae | *Pristis pristis* | Largetooth sawfish | (Linnaeus, 1758) | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - | | | | I | I, II | | C R | CMS I; CITES I; IUCN CR |
| Pristidae | *Pristis zijsron* | Green sawfish | (Bleeker, 1851) | 1 | 1 | - | 1 | 1 | | - | - | | | | | I | I, II | | C R | CMS I; CITES I; IUCN CR |

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| Rajidae | *Raja ocellifera* | Twineyed skate | Regan, 1906 | 1 | - | - | - | | | | | | | | | | | EN | IUCN EN |
| Rajidae | *Rostroraja alba* | Spearnose skate | Lacepède, 1803 | 1 | 1 | | 1 | | 1 | | | 1 | | | | | | EN | IUCN EN |
| Rhinidae | *Rhina ancylostomus* | Bowmouth guitarfish | Bloch & Schneider, 1801 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | II | | CR | IUCN CR |
| Rhinidae | *Rhynchobatus australiae* | Bottlenose wedgefish | Whitley, 1939 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | II | | CR | IUCN CR |
| Rhinidae | *Rhynchobatus djiddensis* | Whitespotted wedgefish | (Forsskål, 1775) | 1 | 1 | - | - | - | - | - | - | - | | - | | II | | CR | IUCN CR |
| Rhinobatidae | *Acroteriobatus leucospilus* | Greyspot guitarfish | Norman, 1926 | 1 | 1 | 1 | | | | | | | | | | II | | EN | IUCN EN |
| Rhinopteridae | *Rhinoptera jayakari* | Shorttail cownose ray | Boulenger, 1895 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | 1 | | | EN | IUCN EN |

| **Family** | **Species** | **Common name** | **Taxonomic reference** | **ZA** | **MZ** | **TZ** | **KE** | **SO** | **MG** | **MU** | **RE** | **SC** | **KM** | **YT** | **ABNJ** | **CITES** | **CMS** | **IOTC** | **IUCN** | **Criteria for protection** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Sharks*** | | | | | | | | | | | | | | | | | | | | |
| Alopiidae | *Alopias pelagicus* [a] | Pelagic thresher shark | Nakamura, 1935 | 1 | 1 | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | - | II | II | x | EN | IOTC; IUCN EN |
| Alopiidae | *Alopias superciliosus* [a] | Bigeye thresher shark | (Lowe, 1841) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - | II | II | x | VU | IOTC |
| Alopiidae | *Alopias vulpinus* [a] | Common thresher shark | (Bonnaterre, 1788) | 1 | - | - | - | - | - | - | - | - | - | - | 1 | II | II | x | VU | IOTC |

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| Carcharhinidae | *Carcharhinus amblyrhynchos* | Grey reef shark | (Bleeker, 1856) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | II | | | EN | IUCN EN |
| Carcharhinidae | *Carcharhinus longimanus* [b] | Oceanic whitetip shark | (Poey, 1861) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | II | I | x | CR | CMS I; IOTC; IUCN CR |
| Carcharhinidae | *Carcharhinus obscurus* | Dusky shark | (Lesueur, 1818) | 1 | 1 | - | | 1 | 1 | | | | | | - | II | II | | EN | IUCN EN |
| Carcharhinidae | *Carcharhinus plumbeus* | Sandbar shark | (Nardo, 1827) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | II | | | EN | IUCN EN |
| Carcharhinidae | *Negaprion acutidens* | Sicklefin lemon shark | (Rüppell, 1837) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | | II | | | EN | IUCN EN |
| Carchariidae | *Carcharias taurus* | Ragged-tooth shark | Rafinesque, 1810 | 1 | 1 | 1 | - | 1 | | | | 1 | | | | | | | CR | IUCN CR |
| Centrophoridae | *Centrophorus granulosus* | Gulper shark | (Bloch & Schneider, 1801) | 1 | 1 | 1 | | 1 | 1 | | | 1 | 1 | 1 | 1 | | | | EN | IUCN EN |
| Centrophoridae | *Centrophorus lesliei* | African gulper shark | White, Ebert & Naylor 2017 | | 1 | | | | 1 | | | | | | | | | | EN | IUCN EN |
| Centrophoridae | *Centrophorus squamosus* | Leafscale gulper shark | (Bonnaterre, 1788) | 1 | 1 | | | | | | | 1 | | | 1 | | | | EN | IUCN EN |
| Centrophoridae | *Centrophorus uyato* | Little gulper shark | (Rafinesque, 1810) | 1 | 1 | 1 | | 1 | 1 | 1 | | | | 1 | 1 | | | | EN | IUCN EN |
| Cetorhinidae | *Cetorhinus maximus* | Basking shark | (Gunnerus, 1765) | 1 | | | | | | | | | | | 1 | II | I, II | | EN | CMS I; IUCN EN |
| Echinorhinidae | *Echinorhinus brucus* | Bramble shark | (Bonnaterre, 1788) | 1 | 1 | 1 | | 1 | | | | | | | | | | | EN | IUCN EN |

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| Ginglymostomatidae | *Pseudoginglymostoma brevicaudatum* | Shorttail nurse shark | Günther, 1867 | 1 | 1 | 1 | 1 | | 1 | | | | | | | | | | C R | IUCN CR |
| Lamnidae | *Carcharodon carcharias* | Great white shark | (Linnaeus, 1758) | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | I I | I, II | | V U | CMS I |
| Lamnidae | *Isurus oxyrinchus* | Shortfin mako shark | Rafinesque, 1810 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | I I | II | | E N | IUCN EN |
| Lamnidae | *Isurus paucus* | Longfin mako shark | Guitart Manday, 1966 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | I I | II | | E N | IUCN EN |
| Oxynotidae | *Oxynotus centrina* | Angular rough shark | (Linnaeus, 1758) | | - | - | | | 1 | | | | | | - | | | | E N | IUCN EN |
| Pentanchidae | *Holohalaelurus favus* | Honeycomb catshark | Human, 2006 | 1 | 1 | | | | | | | | | | | | | | E N | IUCN EN |
| Pentanchidae | *Holohalaelurus punctatus* | African spotted catshark | (Gilchrist, 1914) | 1 | 1 | | | | 1 | | | | | | | | | | E N | IUCN EN |
| Rhincodontidae | *Rhincodon typus* [c] | Whale shark | Smith, 1828 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | I I | I, II | x | E N | CMS I; IOTC; IUCN EN |
| Scyliorhinidae | *Haploblepharus edwardsii* | Puffadder shyshark | (Schinz, 1822) | 1 | | | | | | | | | | | | | | | E N | IUCN EN |
| Sphyrnidae | *Sphyrna lewini* | Scalloped hammerhead shark | (Griffith & Smith, 1834) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | I I | II | | C R | IUCN CR |
| Sphyrnidae | *Sphyrna mokarran* | Great hammerhead shark | (Rüppell, 1837) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | I I | II | | C R | IUCN CR |
| Stegostomatidae | *Stegostoma tigrinum* | Zebra shark | (Herman, 1783) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | | | | E N | IUCN EN |

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| Triakidae | *Mustelus manazo* | Starspotted smoothhound | Bleeker, 1855 | | - | 1 | 1 | | - | | | 1 | | | | | | | E N | IUCN EN |
| Triakidae | *Mustelus mustelus* | Common smoothhound | (Linnaeus, 1758) | 1 | | | | | | | | | | | | | | | E N | IUCN EN |

[a] IOTC Resolution 12/09 (http://www.iotc.org/cmm/resolution-1209-conservation-thresher-sharks-family-alopiidae-caught-association-fisheries-iotc) "Fishing Vessels flying the flag of an IOTC Member or Cooperating Non-Contracting Party (CPCs) are prohibited from retaining on board, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae";

[b] IOTC Resolution 13/06 (http://www.iotc.org/cmm/resolution-1306-scientific-and-management-framework-conservation-sharks-species-caught) "CPCs shall prohibit, as an interim pilot measure, all fishing vessels flying their flag and on the IOTC Record of Authorised Vessels, or authorised to fish for tuna or tuna-like species managed by the IOTC on the high seas to retain onboard, tranship, land or store any part or whole carcass of oceanic whitetip sharks";

[c] IOTC Resolution 13/05 (http://www.iotc.org/cmm/resolution-1305-conservation-whale-sharks-rhincodon-typus) CPC's "shall prohibit their flagged vessels from intentionally setting a purse seine net around a whale shark in the IOTC area of competence, if it is sighted prior to the commencement of the set" and that "in the event that a whale shark is unintentionally encircled in the purse seine net, the master of the vessel shall: a) take all reasonable steps to ensure its safe release";

[d] IOTC Resolution 19/03 (https://iotc.org/cmm/resolution-1903-conservation-mobulid-rays-caught-association-fisheries-iotc-area-competence) CPC's "shall prohibit all vessels from intentionally setting any gear type for targeted fishing of mobulid rays in the IOTC Area of Competence, if the animal is sighted prior to commencement of the set" and "shall prohibit all vessels retaining onboard, transhipping, landing, storing, any part or whole carcass of mobulid rays caught in the IOTC Area of Competence" and "shall require all their fishing vessels, other than those carrying out subsistence fishery, to promptly release alive and unharmed, to the extent practicable, mobulid rays as soon as they are seen in the net, on the hook, or on the deck, and do it in a manner that will result in the least possible harm to the individuals captured".

**Annex 2**: Shark and ray species in the Western Indian Ocean for which harvesting regulations and/or trade controls should be imposed, based on their listing on the International Union for Conservation of Nature Red List of Threatened Species as Vulnerable (IUCN VU) or Near

Threatened (IUCN NT), on the Convention on the Conservation of Migratory Species of Wild Animals Appendix II (CMS II), or on the Convention on International Trade in Endangered Species of Wild Flora and Fauna Appendix II (CITES II). Also shown are current IUCN Red List status (IUCN) for each species (VU = Vulnerable, NT = Near Threatened, LC = Least Concern, DD = Data Deficient, NE = Not Evaluated) and countries in which the species is confirmed (1) or reported but not confirmed (-) (ZA = South Africa, MZ = Mozambique, TZ = Tanzania, KE = Kenya, SO = Somalia, MG = Madagascar, MU = Mauritius, RE = La Réunion, SC = Seychelles, KM = Comoros, YT = Mayotte, ABNJ = Areas Beyond National Jurisdiction).

| **Family** | **Species** | **Common name** | **Taxonomic reference** | **ZA** | **MZ** | **TZ** | **KE** | **SO** | **MG** | **MU** | **RE** | **SC** | **KM** | **YT** | **ABNJ** | **CITES** | **CMS** | **IUCN** | **Criteria for harvest or trade regulation** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Rays*** | | | | | | | | | | | | | | | | | | | |
| Aetobatidae | *Aetobatus ocellatus* | Indian eagle ray | (Kuhl, 1823) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | VU | IUCN VU |
| Anacanthobatidae | *Anacanthobatis marmorata* | Spotted legskate | (Von Bonde & Swart, 1923) | 1 | 1 | | | | | | | | | | - | | | NT | IUCN NT |
| Dasyatidae | *Bathytoshia lata* | Brown stingray | (Garman, 1880) | 1 | 1 | 1 | 1 | | | | 1 | | 1 | | | | | VU | IUCN VU |
| Dasyatidae | *Dasyatis chrysonota* | Blue stingray | (Smith, 1828) | 1 | - | | | | 1 | | - | | - | | | | | NT | IUCN NT |
| Dasyatidae | *Himantura leoparda* | Leopard whipray | Manjaji-Matsumoto & Last, 2008 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | VU | IUCN VU |
| Dasyatidae | *Maculabatis ambigua* | Baraka's whipray | Last, Bogorodsky, & Alpermann, 2016 | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | NT | IUCN NT |
| Dasyatidae | *Pastinachus ater* | Broad cowtail ray | (Macleay, 1883) | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 | - | 1 | | | | VU | IUCN VU |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dasyatidae | *Pateobatis fai* | Pink whipray | (Jordan & Seale, 1906) | 1 | 1 | 1 | | | 1 | | | | | 1 | | | | VU | IUCN VU |
| Dasyatidae | *Pateobatis jenkinsii* | Jenkins whipray | (Annandale, 1909) | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | VU | IUCN VU |
| Dasyatidae | *Taeniurops meyeni* | Blotched stingray | (Müller & Henle, 1841) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | | | VU | IUCN VU |
| Dasyatidae | *Urogymnus asperrimus* | Porcupine ray | (Bloch & Schneider, 1801) | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 | | 1 | | | | VU | IUCN VU |
| Dasyatidae | *Urogymnus granulatus* | Mangrove whipray | (Macleay, 1883) | | | | 1 | | | | | 1 | | 1 | | | | VU | IUCN VU |
| Gymnuridae | *Gymnura poecilura* | Longtail butterfly ray | (Shaw, 1804) | | - | - | 1 | 1 | - | | | | | | | | | VU | IUCN VU |
| Narkidae | *Heteronarce garmani* | Natal electric ray | Regan, 1921 | 1 | 1 | | | | 1 | | | | | | | | | NT | IUCN NT |
| Rajidae | *Dipturus campbelli* | Blackspot skate | (Wallace, 1967) | 1 | 1 | | | | | | | | | | | | | NT | IUCN NT |
| Rajidae | *Dipturus crosnieri* | Madagascar skate | (Serét, 1989) | | | | | | 1 | | | | | | - | | | VU | IUCN VU |
| Rajidae | *Leucoraja wallacei* | Yellowspotted skate | (Hulley, 1970) | 1 | 1 | | | | | | | | | | - | | | VU | IUCN VU |
| Rajidae | *Raja clavata* | Thornback skate | Linnaeus, 1758 | 1 | | | | | 1 | 1 | 1 | | | | | | | NT | IUCN NT |
| Rajidae | *Raja straeleni* | Biscuit skate | Poll, 1951 | 1 | 1 | | | | - | - | | | | | | | | NT | IUCN NT |
| Rhinobatidae | *Acroteriobatus annulatus* | Lesser guitarfish | Smith, 1841 | 1 | | | | | | | | | | | | II | | VU | CITES II; IUCN VU |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rhinobatidae | *Acroteriobatus andysabini* | Malagasy blue-spotted guitarfish | Weigmann, Ebert, & Séret, 2021 | | | | | | 1 | | | | | | | II | | NE | CITES II |
| Rhinobatidae | *Acroteriobatus ocellatus* | Speckled guitarfish | Norman, 1926 | 1 | 1 | | | | | | | | | | | II | | DD | CITES II |
| Rhinobatidae | *Acroteriobatus zanzibarensis* | Zanzibar guitarfish | Norman, 1926 | | | 1 | 1 | - | | | | | | | | II | | NT | CITES II; IUCN NT |
| Rhinobatidae | *Rhinobatos austini* | Austin's guitarfish | Ebert & Gon, 2017 | 1 | 1 | 1 | | | 1 | | | | | | | II | | DD | CITES II |
| Rhinobatidae | *Rhinobatos holcorhynchus* | Slender guitarfish | Norman, 1922 | 1 | 1 | 1 | 1 | | 1 | | | | | | | II | | DD | CITES II |
| Rhinobatidae | *Rhinobatos nudidorsalis* | Bareback Guitarfish | Last, Compagno, & Nakaya, 2004 | | | | | | | | | | | | 1 | II | | DD | CITES II |

| **Family** | **Species** | **Common name** | **Taxonomic reference** | **ZA** | **MZ** | **TZ** | **KE** | **SO** | **MG** | **MU** | **RE** | **SC** | **KM** | **YT** | **ABNJ** | **CITES** | **CMS** | **IUCN** | **Criteria for harvest or trade regulation** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Sharks*** | | | | | | | | | | | | | | | | | | | |
| Carcharhinidae | *Carcharhinus albimarginatus* | Silvertip shark | (Rüppell, 1837) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Carcharhinus altimus* | Bignose shark | (Springer, 1950) | 1 | 1 | 1 | - | - | 1 | | | | | - | | II | | NT | CITES II; IUCN NT |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carcharhinidae | *Carcharhinus amblyrhynchoides* | Graceful shark | Whitley 1934 | | | | | 1 | | | | - | | | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Carcharhinus amboinensis* | Pigeye shark | (Müller & Henle, 1839) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Carcharhinus brachyurus* | Copper shark | (Günther, 1870) | 1 | - | | | | 1 | | | 1 | | | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Carcharhinus brevipinna* | Spinner shark | (Valenciennes, 1839) | 1 | 1 | | | | 1 | 1 | 1 | 1 | | | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Carcharhinus falciformis* | Silky shark | (Müller & Henle, 1839) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | II | II | VU | CITES II; CMS II; IUCN VU |
| Carcharhinidae | *Carcharhinus galapagensis* | Galapagos shark | (Snodgrass & Heller, 1905) | | 1 | | | | 1 | | | 1 | | | 1 | II | | LC | CITES II |
| Carcharhinidae | *Carcharhinus humani* | Human's whaler shark | White & Weigmann, 2014 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | II | | DD | CITES II |
| Carcharhinidae | *Carcharhinus leucas* | Bull shark | (Valenciennes, 1839) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Carcharhinus limbatus* | Blacktip shark | (Valenciennes, 1839) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Carcharhinus macloti* | Hardnose shark | (Müller & Henle, 1839) | | | 1 | 1 | 1 | | | | | | | | II | | NT | CITES II; IUCN NT |
| Carcharhinidae | *Carcharhinus melanopterus* | Blacktip reef shark | (Quoy & Gaimard, 1824) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | II | | VU | CITES II; IUCN VU |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carcharhinidae | *Carcharhinus sorrah* | Spottail shark | (Valenciennes, 1839) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | II | | NT | CITES II; IUCN NT |
| Carcharhinidae | *Loxodon macrorhinus* | Sliteye shark | (Müller & Henle, 1839) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | II | | NT | CITES II; IUCN NT |
| Carcharhinidae | *Prionace glauca* | Blue shark | (Linnaeus, 1758) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | II | II | NT | CITES II; CMS II; IUCN NT |
| Carcharhinidae | *Rhizoprionodon acutus* | Milk shark | (Rüppell, 1837) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | | | II | | VU | CITES II; IUCN VU |
| Carcharhinidae | *Scoliodon laticaudus* | Spadenose shark | Müller & Henle, 1838 | | - | 1 | 1 | 1 | 1 | | | | | | | II | | NT | CITES II; IUCN NT |
| Carcharhinidae | *Triaenodon obesus* | Whitetip reef shark | (Rüppell, 1837) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | II | | VU | CITES II; IUCN VU |
| Centrophoridae | *Centrophorus moluccensis* | Smallfin gulper shark | Bleeker, 1860 | 1 | 1 | 1 | | | 1 | | | 1 | | 1 | - | | | VU | IUCN VU |
| Centrophoridae | *Deania calceus* | Birdbeak dogfish | (Lowe, 1839) | 1 | - | | | | - | | | | | | 1 | | | NT | IUCN NT |
| Centrophoridae | *Deania profundorum* | Arrowhead dogfish | (Smith & Radcliffe, 1912) | 1 | - | | | | - | | - | | | | 1 | | | NT | IUCN NT |
| Centrophoridae | *Deania quadrispinosa* | Longsnout dogfish | (McCulloch, 1915) | 1 | 1 | | | | 1 | | - | | | | | | | VU | IUCN VU |
| Dalatiidae | *Dalatias licha* | Kitefin shark | (Bonnaterre, 1788) | 1 | 1 | 1 | | | 1 | | | | | | 1 | | | VU | IUCN VU |
| Galeocerdonidae | *Galeocerdo cuvier* | Tiger shark | (Péron & Lesueur, in | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | NT | IUCN NT |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lesueur, 1822) | | | | | | | | | | | | | | | | |
| Ginglymostomatidae | *Nebrius ferrugineus* | Tawny nurse shark | (Lesson, 1831) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | VU | IUCN VU |
| Hemigaleidae | *Hemigaleus microstoma* | Sickelfin weasel shark | Bleeker 1852 | | | 1 | | | | | | | | | | | | VU | IUCN VU |
| Hemigaleidae | *Hemipristis elongata* | Snaggletooth shark | (Klunzinger, 1871) | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 | | | | | | VU | IUCN VU |
| Hemigaleidae | *Paragaleus leucolomatus* | Whitetip weasel shark | Compagno & Smale, 1985 | 1 | 1 | - | - | - | 1 | | | | | | | | | VU | IUCN VU |
| Hexanchidae | *Heptranchias perlo* | Sharpnose sevengill shark | (Bonnaterre, 1788) | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - | | | NT | IUCN NT |
| Hexanchidae | *Hexanchus griseus* | Bluntnose sixgill shark | (Bonnaterre, 1788) | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | NT | IUCN NT |
| Hexanchidae | *Hexanchus nakamurai* | Bigeyed sixgill shark | Teng, 1962 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | NT | IUCN NT |
| Hexanchidae | *Notorynchus cepedianus* | Sevengill shark | (Peron, 1807) | 1 | | | | | | | | | | | | | | VU | IUCN VU |
| Odontaspididae | *Odontaspis ferox* | Smalltooth sand tiger shark | (Risso, 1810) | 1 | - | 1 | | | 1 | | | 1 | 1 | | | | | VU | IUCN VU |
| Pentanchidae | *Bythaelurus hispidus* | Bristly catshark | (Alcock, 1891) | | | | 1 | 1 | | | | | | | | | | NT | IUCN NT |
| Hexanchidae | *Hexanchus nakamurai* | Bigeyed sixgill shark | Teng, 1962 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | NT | IUCN NT |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hexanchidae | *Notorynchus cepedianus* | Sevengill shark | (Peron, 1807) | 1 | | | | | | | | | | | | | | VU | IUCN VU |
| Odontaspididae | *Odontaspis ferox* | Smalltooth sand tiger shark | (Risso, 1810) | 1 | - | 1 | | | 1 | | | 1 | 1 | | | | | VU | IUCN VU |
| Pentanchidae | *Bythaelurus hispidus* | Bristly catshark | (Alcock, 1891) | | | | 1 | 1 | | | | | | | | | | NT | IUCN NT |
| Pentanchidae | *Halaelurus boesemani* | Speckled catshark | Springer & D'Aubrey, 1972 | | | | 1 | 1 | | | | | | | | | | VU | IUCN VU |
| Pentanchidae | *Halaelurus natalensis* | Tiger catshark | (Regan, 1904) | 1 | 1 | | | | | | | | | | | | | VU | IUCN VU |
| Pentanchidae | *Haploblepharus fuscus* | Brown shyshark | Smith, 1950 | 1 | | | | | | | | | | | | | | VU | IUCN VU |
| Pentanchidae | *Haploblepharus kistnasamyi* | Natal shyshark | Human & Compagno, 2006 | 1 | | | | | | | | | | | | | | VU | IUCN VU |
| Scyliorhinidae | *Cephaloscyllium sufflans* | Balloon shark | (Regan, 1921) | 1 | 1 | - | - | - | 1 | | | | 1 | | - | | | NT | IUCN NT |
| Scyliorhinidae | *Scyliorhinus capensis* | Yellowspotted catshark | (Smith, 1838) | 1 | | | | | | | | | | | | | | NT | IUCN NT |
| Somniosidae | *Centroscymnus coelolepis* | Portuguese dogfish | Barbosa du Bocage & de Brito Capello, 1864 | 1 | 1 | | | | 1 | | | 1 | | | 1 | | | NT | IUCN NT |
| Somniosidae | *Centroscymnus owstoni* | Roughskin dogfish | Gaman, 1906 | - | - | | | | 1 | | 1 | 1 | | 1 | 1 | | | VU | IUCN VU |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Somniosidae | *Centroselachus crepidater* | Longnose velvet dogfish | (Barbosa du Bocage & de Brito Capello, 1864) | - | - | | | | 1 | | 1 | 1 | | 1 | 1 | | | NT | IUCN NT |
| Sphyrnidae | *Sphyrna zygaena* | Smooth hammerhead shark | (Linnaeus, 1758) | 1 | 1 | - | | 1 | 1 | 1 | 1 | 1 | 1 | | - | II | II | VU | CITES II; CMS II; IUCN VU |
| Squalidae | *Squalus acutipinnis* | Southern African spiny dogfish | Regan, 1906 | 1 | - | | | | | 1 | - | | | | | | | NT | IUCN NT |
| Squatinidae | *Squatina africana* | African angelshark | Regan, 1908 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | | | | | NT | IUCN NT |
| Triakidae | *Mustelus mosis* | Arabian smoothhound | Hemprich & Ehrenberg, 1899 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | | | | | | | NT | IUCN NT |
| Triakidae | *Scylliogaleus quecketti* | Flapnose houndshark | Boulenger, 1902 | 1 | | | | | | | | | | | | | | VU | IUCN VU |

### 2.3.4. Africa's Coastal and Marine Cultural Heritage: Repository, Archive and Treasure Chest

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**Abstract**

The ocean is a space with its own agency, frame and logic. Humans long conceptualized and rendered it socially meaningful. This paper and presentation reflect on Africa's coastal and marine cultural heritage as a diverse proposition. It is argued that CCH is a repository, archive and treasure chest – offering knowledge of the dynamic CCH of Indigenous Peoples and Local Populations (IPLCs), the historical factors shaping present iterations of cultural heritage and the future that such a repository holds for the rethinking and reshaping of ocean management and ocean literacy. The paper offers preliminary insights into these issues, which will be developed into more robust and substantive argument at a later date. True to form, the discussion draws on literary references and insights to explain and discuss the contour and dynamism of African coastal and marine cultural heritage.

Keywords: Intangible Cultural Heritage, IPLCs, Western Indian Ocean, Southern Africa

**Introduction**

The feminist, activist and visionary Kenyan woman, Wangari Maathai says that 'culture is coded wisdom'. As readers of literature, one can find such coded wisdoms in the work of various African authors, I need not mention them all – but the work of Ben Okri and Molara Wood come to mind. Although I never met Wangari Maathai, or Ben Okri, I met Molara Wood in 2023. I was blessed because I had ample time to converse with her and to listen to her steady voice and to take in the wisdom she has acquired over a lifetime of travel between the Africa and Europe. What I learned from Molara is priceless and the knowledge cleaves beautifully to what follows in this discussion, which concerns the value of cultural heritage in ocean management and the place of IPLC knowledge in Ocean Literacy (OL), globally and in the Western Indian Ocean (WIO) region.

The discussion is in three parts: (1) a consideration of the Africa's coastal and marine cultural heritage (as it is understood by Indigenous Peoples and Local Communities (IPLCs), to be a repository of knowledge for future generations (2) a consideration of this repository (or keeping place) as an archive, a collection of ideas, beliefs and symbols that, as the philosopher Michel Foucault (1979) would say, is worth 'excavating' and (3) these cultural heritages as a treasure chest still be found and explored. The paper and discussion consist of an overview of research conducted, including the locations and methodology. This is

followed by a description and discussion of the findings. The third and final part of the paper considers the three points noted above, namely, a discussion on Africa's coastal and marine heritage in relation to the role of this heritage as a repository, archive and treasure chest.

**The Research and Findings**

The research project seeks to investigate the diverse human cultural relations with the sea and coast. A funded research project taking place across five southern and East African countries (South Africa, Namibia, Tanzania, Mozambique and Kenya), the research utilizes anthropological research methods to discern and document the rich coastal intangible cultural heritage (ICH) of southern and East Africa. The project is primarily funded by the South African National Research Foundation and Department of Science and Innovation (DSI). Additional funders are the Indian Ocean Rim Association (IORA) and previously, the UKRI GCRF One Ocean Hub project. As the Principal Investigator (PI), I am tasked with the leadership and guidance of 5 Postdoctoral fellows and 9 PhD candidates, as well as two MA students and several research assistants. The team conducts research on cognate issues in ocean cultures and heritage. In this regard, there are postdoctoral fellows researching ICH in coastal culinary heritage, health and wellbeing in coastal contexts, Small Scale Fishers (SSF) and the cultural concept of time, customary law in the Areas Beyond National Jurisdiction (ABNJ) and the PhDs are working on topics such as the value of culture in social-ecological systems, port security and culture in South Africa and SSF and coastal human relations in Namibia. The team is multidisciplinary and multinational, as well as multilingual. Regarding transdisciplinary research, the team includes audio-visual researchers and artists, all of whom contribute according to their specialization on the subject of coastal cultural heritage. For example, in 2023, the artist Sarah Walmsley produced a resin figure, called the 'water being' to align with the scholarly discussions held on the subject of human relations with water in the Waterways Conference. At the Waterways Conference, the team also exhibited the photography collection in an exhibition entitled 'Human Oceans'.

The outputs of the project reflect the self-reflexive methodology of the project and the research. Self-reflexivity refers to the process of critical thinking regarding the place, process and politics of research in still unequal societies. The researcher is involved in a hermeneutical process whereby, s/he thinks carefully about how she is represented in the research field, how her presence might impact on the objectivity of the findings and whether the research process produces particular subjectivities that may compromise the authenticity and validity of data gathered. In brief, some twenty years ago, anthropologists worldwide (but especially in the global North), engaged in a process of critical reflection that considered the place and purpose of anthropology in the world, as well as its historical ties to processes of colonization. The result of the reflection was that anthropologists are now encouraged not only to prioritize the emic voice or the insider voice in any community, but she is also required to remain viscerally aware of the complexities of the research process as well as her role in shaping both process and outcome. An excellent overview of the process of self-

reflexivity and the politics of ethnography, can be found in Clifford and Marcus' (1988), *the Politics and Poetics of Ethnography*.

The research focuses on primary data collection. To date, more than 500 semi-structured interviews have been conducted in South Africa and more than 100 interviews have been conducted in Namibia and Kenya respectively. The most recent field research yielded 35 detailed (more than one hour) interviews in Seychelles (Mahe, La Digue and Silhouette islands).

The research clearly shows that across these different spaces, humans have a rich relationship with the ocean and coast and that these relationships manifest in diverse ways, either for example, via knowledge of marine species, or in the cultural and spiritual beliefs held about water and the sea specifically.

Because the research involves human subjects, full ethical clearance from the Human Ethics Committee at the teams' main university (Nelson Mandela University) was required and obtained. The research also focuses on adult (18 years and older) individuals.

Key research questions included, 'What does the sea mean to you?'. Subsequent questions were structured around the use of the ocean and coast for ritual and cultural purposes, and the impact of coastal development (offshore or real estate development) on practices and beliefs of a cultural nature. The research was conducted mainly in coastal communities in the locations noted. In Lamu, Kenya, fieldwork (2022 and 2023) was done in two delta communities: Kipungani and Matondoni. In Seychelles, fieldwork (2023) was done in Mahe, Silhouette Island and La Digue Islands. In South Africa, fieldwork (2020 – 2023) was done in many coastal areas, from Port Nolloth in the Northern Cape Province to Cintsa in the Eastern Cape Province. The gender composition of the sample was almost 50/50 in all the sites.

The primary findings yielded rich interviews and observations of cultural life at the coast in the countries noted. The secondary data and research showed that multilingualism is key to a deeper understanding of the nuances of cultural heritage at the coast, as well as the diverse ways in which humans have historically and contemporarily engaged with the ocean. As noted elsewhere (Boswell 2022), the data shows that Africans have a rich biocultural heritage and transmaterial relationship with the ocean and coast and that for these reasons, one cannot perceive human relations with the coast in merely economic terms. It is also for this reason that the research team continues to interrogate (See Boswell and Thornton 2021) national strategies and concept of the ocean as signifying of the blue 'economy'. Third, both primary and secondary data reveal the holistic and integrated nature of coastal cultural heritage. The coast is itself a physical and phenomenological space that allows for the creation of cultural meaning. It is these places, with coconut and mango trees, beaches and mountains, that shape the processes of cultural production. In this regard, coastal dispossession and/or climate change impacts which compromise locals' use of these spaces, may have devastating impacts on the environment and human cultural use of these spaces. A significant finding thus far (summarized here for appropriate brevity), is that coastal

cultural heritage research reveals the existence of alternative world-views and forms of 'worlding' (Pnina-Cabral 2014). By this I mean that doing anthropological research in the coastal context is showing that IPLCs have radically different views of nature and of reality to what is accepted and understood in either the global North or, in social contexts where the views of global North 'reality' are accepted.

Here I must turn back to Molara Wood and Ben Okri. Both authors use the idea and language of magical-realism to narrate human experience in extraordinarily difficult circumstances. Both authors tell of how humans do not live in the current, visible plain of existence with which 'we' are all familiar. Via Wood and Okri, one comes to appreciate the in-betweenness, frailty and contingency of human existence. There is a notion and feeling that one is potentially, as the literary author, VS Naipaul put it once, always vulnerable, since one is always in the process of 'arriving' somewhere that is unfamiliar. The latter refers to the disjuncture (social, political, cultural) that Africans and 'Others' feel when arriving in the global North, whether it is to actual places or social practices, that are 'alien' to the 'immigrant'. Applying these insights to the work on coastal cultural heritage (and thereby nuance thinking on the issues of critical heritage studies [Winter 2013], phenomenology in anthropology [Merleau-Ponty] and the inexorable challenge of inequality and suffering [Lambek and Bourdieu]), it becomes apparent that even in the domain of ocean management, one finds that there are IPLCs who are *continuously arriving at (and experiencing the disjunction of) the destination of official ocean management* processes. It is in this regard that I also offer the following observations, which may help to move all further along the path of sustainable, intuitive and holistic ocean management, especially in the WIO and in Africa.

## The Heritage of Africa: Repository, Archive and Treasure Chest

Scholars in the global North often discuss heritage as a cultural legacy that passes from one generation to the next. It is thought to be uncomplicated, culturally bounded and important to the expression of national identity. But as the work in Africa has shown, heritage can be situated in multiple locales, it is messy, complicated and it crosses borders and ideologies. In 2021, the African cultural heritage expert, Georges Abungu asserted 'we need empathetic, *listening voices*' in Africa. By this, Abungu was stating that listening to sense and hear is critical in Africa. The voices speaking precede us as bounded, individual beings. This is because the landscape speaks, the ritual practices speak, the bodies and the culinary heritages speak – but as Spivak (1988) once said, if one is not able to hear, it means that such speaking will fall on deaf ears.

It is in this regard that Africa is repository, archive and treasure chest. It is a repository because it is continuously and dynamically being added to by IPLCs in the coastal context. Climate change impacts what people can eat, how and when they can eat it, what they can catch and in which season. Rising sea levels impact where children can play, whether women can plant and harvest seaweed. MPAs, planned and executed by national governments can

impact cultural access to the ocean and coast (c.f., the case study on the Tsitsikamma MPA, shared by Thornton and Pillay 2022). The human dimensions and implications of coastal cultural heritage are vast. But it is not only the present and continued replenishment of the repository that matters. Coastal cultural heritage is also an archive, since it tells us of historical cultural relations and the raison d'être of cultural practices and beliefs in existence today. In Lamu Kenya for example, an interview with a boat captain revealed the following, potentially contradictory advice, the captain said, that 'no-one should become a captain unless he knows how to sink'. It was later explained that a skilled captain must know the way in which to sink or retain his ship. There must be a 'letting go' when engaging the ocean, for it is unpredictable and approaching it with less than required circumspection may compromise a journey on the open ocean. Thus, there is both belief (the ocean is more powerful than us humans and more unpredictable) and there is logical practice (one must prepare for all eventualities).

Finally, the coastal cultural heritage is an invariable treasure chest. This means that it is a source of incredible information about the extraordinary creativity and resilience of the human species, as well as information regarding the diversity of humanity itself. There is no unified, easily objectifiable, bounded human being in the world. Instead there are situationally defined human beings, shaped by cultural world views or perspectives as the Brazilian anthropologist, Vivieros de Castro (1998) would say. These human beings perceive their contingent existence, they understand the holistic nature of humanity's existence with nature. They are, like the author Ernest Hemingway wrote in his book, *The Old Man and the Sea,* part of an oceanic universe that is difficult to split.

In this regard, official, authorized discourses of ocean management, including well thought through 'roadmaps' for strategic development of the oceans in Africa and the world, need to consider the perspective of IPLCs and the ways in which official discourses of ocean management may overshadow or potentially exclude coastal cultural heritage and the people that make these heritages. As I said elsewhere, we must be continuously open to crafting and including 'parallel frames, philosophies and understandings so that such knowledge forms, arising from the African continent can be understood on its own terms' (Bosswell, SAIMI Keynote 25 May 2023).

**Conclusion**

As an IOR diaspora person, I understand the in-betweenness, multiplicity of existence and contingency of life among IPLCs. My own heritage crosses many cultural boundaries, and these heritages predispose me to a particular form of empathetic listening and cultural flexibility. I perceive, and am open to multiple cultural registers, which can be read in bodies, dispositions and expressions, as well as language. Considering ocean management, the Ocean Decade for Africa and the place of Ocean Literacy (OL) in this matrix of development and change, it can be said that learning happens on the border of authorized discourses of the ocean and IPLC perception and experience of the same. What is required is for more space to be made on this border, so that IPLCs can arrive at it without the anxiety

and sense of exclusion that may be experienced in the formal ocean management space. Next is the necessary lexicon to share IPLC knowledge of the ocean and coast, as well as their cultural heritages of the ocean. This can be achieved in various ways, which will be documented in due course. But for now, it can be said that the team is working on transdisciplinary and multidisciplinary outputs, in the form of film, photography, narrative encounters and experiences. These outputs allow for multiply situated (non-scholarly, and non-institutional) frames of the ocean space. The approach is producing new narratives of the ocean, ways in which to perceive the wind and the waves, as well the relationships between humans and marine life. Finally, and to return to the earlier comment on the excavation of knowledge – proceeding to make space on the border for alternative conceptions of the ocean, especially ICH conceptions of the ocean will have the effect of improving equality in the ocean management domain. Equality is always present when one creates opportunities for others to feel comfortable in sharing their knowledge and the value of their knowledge in addressing serious issues such as climate change, ocean development and ocean literacy.

### 2.3.5. Source-to-Sea Management in The Western Indian Ocean: Policy, Governance and Technical Considerations For Regional Implementation

Authors: Joseph M Maina, Ernest F Asamoah, Vera Horigue, Japhet Kashaighili, Dinis Juizo and Jared Bosire

**Summary**

In the dynamic interphase between land, freshwater, coasts, and oceans, the main challenges of our time - biodiversity decline, pollution, and climate change - manifest. The interconnected nature of these systems has generated a need for a holistic approach to their management, termed Source-to-sea (S2S). The S2S approach integrates natural resource management and economic development across land, water, deltas, estuaries, coasts, nearshores, and ocean ecosystems, which have an impact on ecosystem functioning and ecosystem services. In this approach, source-to-sea programs are designed, planned, implemented, evaluated, and monitored in a systematic manner. The approach supports several other policies, such as Sustainable Development Goals (e.g., life on land, in water, and under water), climate change, and biodiversity conservation, making it crucial to long-term sustainability. While progress has been made on some of its components, such as environmental flows on land, the S2S approach to environmental management has yet to be implemented in the WIO region. Here we propose an adaptive management framework for source-to-sea, in which the current situation is explored, policies are formulated for implementation, and monitoring and evaluation take place. We also discuss the policy, governance and technical considerations associated with the source-to-sea approach.

**Background and rationale**

The Western Indian Ocean is the largest and most diverse marine and coastal region on the African continent. The coastal and marine ecosystems of the WIO not only have very high biodiversity but are important for livelihoods and national economies. However, nutrient loads from unmanaged agricultural runoff and inadequate wastewater treatment continue to cause eutrophication and spread of dead zones in our coastal and marine waters. Hydrologic alterations impact critical coastal and marine ecosystems, leading to a reduction in ecosystem goods and services that support the livelihoods of coastal communities, as well as national economies. Similarly, salinity intrusion causes economic loss from farming. Remedying the issue of threats originating in one system and affecting others requires management actions to minimise cross-system impacts. S2S provides a framework to respond to these interconnected environmental challenges with more systematic solutions and to maintain cross-system ecosystem processes, such as nutrient subsidies or habitat for species occupying multiple systems and can result in co-benefits or trade-offs. However, source-to-sea management is still at its infancy in most countries in the WIO region, where it is focused primarily on some of the related components such as integrated coastal zone management, environmental flow, and marine spatial planning. As part of the S2S framework, it is important to unify the various land-sea management efforts, including the Integrated Water Resource Management initiatives, as it provides a more holistic perspective, to identify gaps, and build capacity for its application in the region.

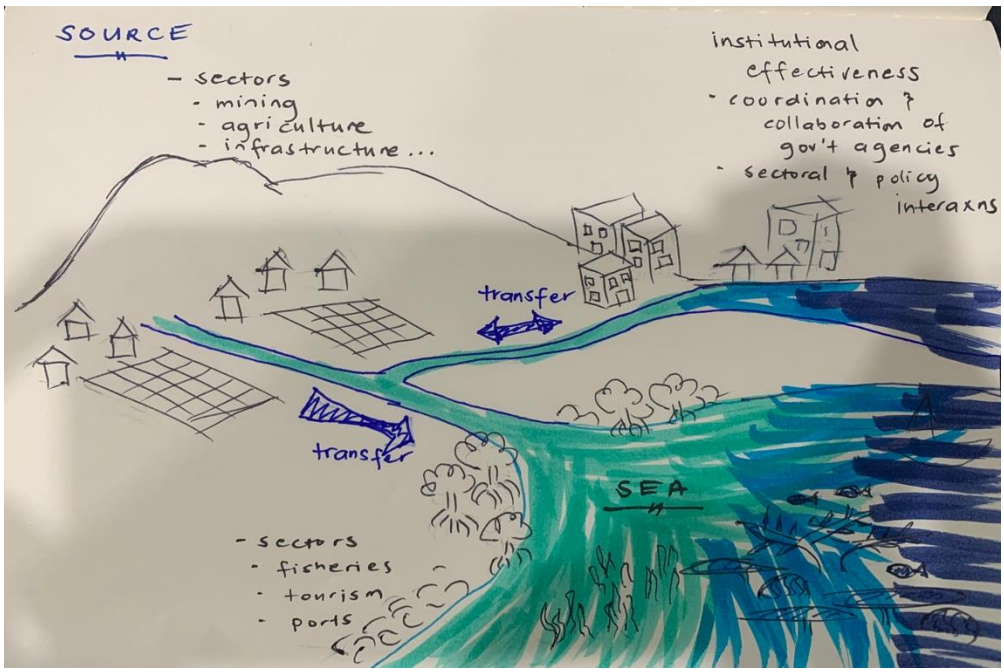


**Figure 1. A schematic illustration of the material transfer from sources across different geographies, institutional, governance and socioecological contexts.**

**Bringing S2S into policy frameworks**

The source-to-sea approach to environmental management aligns with several initiatives in the WIO, including marine spatial planning, development of Blue Economy, biodiversity

conservation, among others. For example, several targets in the Kunming Montreal Global Biodiversity framework (GBF) can be achieved through Source to sea approach. These include Target 2 on the restoration of degraded ecosystems, where implementing this policy requires an understanding of the suitable areas to undertake ecosystem restoration. Target 3 of GBF require the expansion of protected areas in integrated landscapes and, with sustainable development as one of the considerations. As part of source-to-sea planning, land-sea planning can help to achieve this goal by minimizing economic trade-offs and enhancing ecosystem goods and services. In GBF Target 10, the aim is to ensure sustainable agriculture, aquaculture, fisheries, and forestry, as well as sustainable biodiversity management. As part of this, biodiversity-friendly practices, such as sustainable intensification, agroecology and other innovative approaches, should be incorporated substantially into agriculture, aquaculture, fisheries, and forestry. Source-to-sea also supports SDG 11 on sustainable urban development in a land-sea context and SDG 6 on transboundary catchment management.

As part of an effort towards the development of a source to sea approach in the WIO region, our aim is to develop the framework for its implementation on catchments and on coastal ocean. The framework will encompass linked initiatives such as environmental flows, marine spatial planning, and the integrated coastal zone management. Moreover, governance and policy context of the source to sea will also be examined, and the analytical framework for the understanding different geographical segments of a system and their interlinkages and impacts developed.

**Unlocking our understanding of S2S linkages**

S2S management has emerged as a promising management approach to sustaining the health of land, water, coastal and marine systems. S2S challenges vary widely across geographies, land uses, climates, and socioeconomic conditions but can be categorised into six priority flows: water, sediment, pollutants, materials, biota, and ecosystem services (**Figure 1,2**).

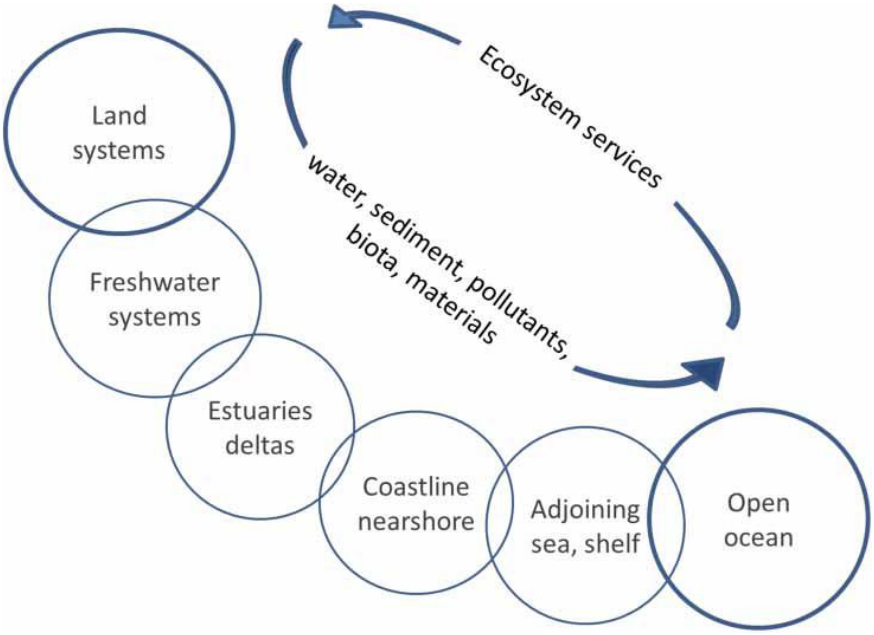


**Figure 2. Key flows connecting geographies from source to sea: water, sediment, pollutants, biota, materials, and ecosystem services flows (Granit et al. 2017).**

Adaptive management strategies that incorporate "learn-from-doing" are important for implementing a S2S strategy, as they support managers and planners to overcome the inherent uncertainties surrounding climate change and its effects (ref). The adaptive management approach can assist decision-makers in blending elements of source-to-sea approaches into their national environments to achieve positive management outcomes. The approach can be implemented in the following steps (Figure 3).

**Improve understanding of S2S linkages.** Establish context while enhancing communication and consultation, effects-based assessment, compare policy objectives, systematic planning and assessment. Implementing S2S begins with a situational analysis, aimed at improving the understanding. This is often achieved by assessing how land development (land cover and use) cause dissolved inorganic oxygen and sediment to seep into catchment bounding and implementing an integrated modelling framework (hydrological, hydrodynamics, ecosystem model and field sampling), to identify areas to spatially targeting areas to implement interventions.

**Policy planning.** Update strategies, project plans, and forecasts. With a new and improved understanding of the dynamics of S2S, new information can be compared with waters, land and sea policy objectives and policy frameworks for helping to improve the management of the S2S continuum can be developed.

**Implementation:** Design and implement on-ground actions, sewage treatment, plant upgrade etc.

**Monitoring.** Establish frameworks to monitor ecosystem health, track finances, and implement audits and research.

**Evaluation:** design report cards, audit reports, annual health reports, review workshops, and science advisory panels.

By learning from key insights and lessons from applied S2S interventions, we can start building a robust knowledge base to support the community of practitioners working to manage and sustain the health of our land, water, coastal, and marine systems.

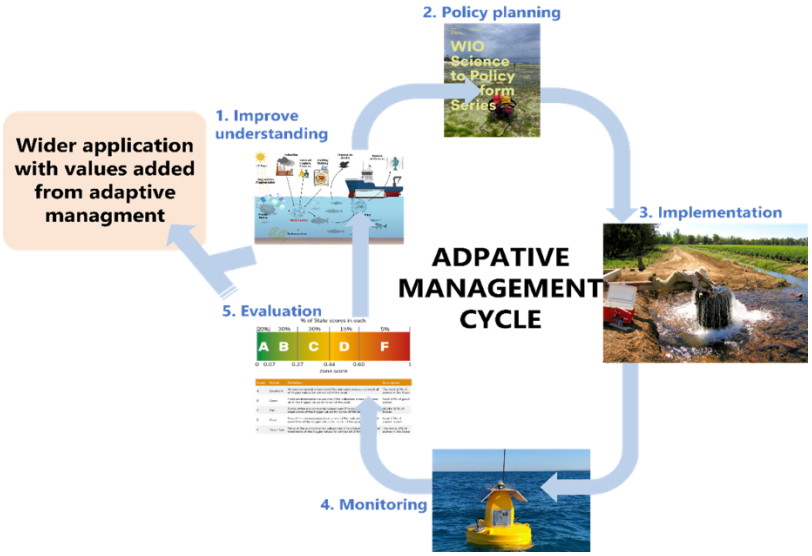


**Figure 3. Guiding practice of adaptive planning and management of source to sea systems**

## Governance and technical challenges

The source-to-sea adaptive planning and management framework aims to integrate management initiatives in the WIO, which can prevent sectoral approaches that have led to different government agencies and departments working in 'silos.' The framework also adopts an intersectoral approach to environmental governance, which can improve institutional effectiveness of WIO governments by considering the different activities across land and oceans, as well as the laws and policies implemented to manage these activities, and the relationships of different agencies and their policies (see Song et al., 2018). This is important, because some policies implemented on land can have antagonistic effects on coastal policies and indirectly affect ecosystems. For example, policies that encourages increased agricultural production can contribute to an influx of sediment and pollutants to coastal areas, and affect coastal ecosystems that are being conserved and also supporting fisheries and tourism. Governance and management of transboundary catchments and impacts, estuaries and deltas, and coastal ecosystems across the WIO, can be implemented through S2S approach. The governance aspects of the source-to-sea framework still considers the entire system as a whole but recognises that the increasing governance complexity particularly when there are two or more countries involved.

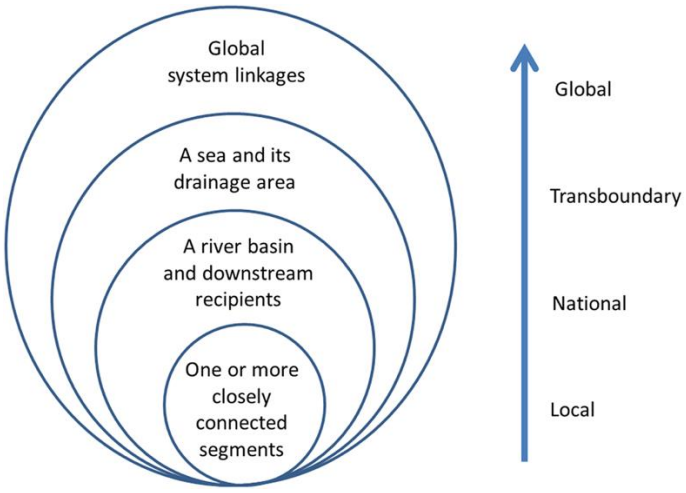


**Figure 4. Source-to-sea implementation across governance and management structures (Granit et al. 2017). A comprehensive understanding of the governance arrangement in source-to-sea systems is necessary for formulating effective actions.**

**Policy Recommendations**

1. **INVEST** in building institutional capacity across scales. Support and develop research on integrating e-flows, decision support frameworks including spatial planning, and biophysical ecology to understand its implications for achieving conservation, social, and economic objectives. Capacity building is critical for the adoption and implementation of the source to sea approach. This includes both knowledge, technological and financial capacities.
2. **DEVELOP** protocols and mechanisms among different decision-making entities across scales, which encourage dialogue and integrative planning. Develop frameworks for monitoring and evaluation of programmes.
3. **COLLABORATE:** Our waters – fresh, coastal, marine, and everything in between – move across political and disciplinary borders. A holistic approach is necessary to overcome institutional and legislative silos and to coordinate across sectors and national borders, which is a cornerstone of transboundary water management.
4. **EVALUATE**: Analyse the intersectoral relationships that influences governance of source-to-sea systems, which include:
    i) characterisation of the different sectors and stakeholders involved and the policies used to regulate the different sectors;
    ii) assessment of the intersectoral claims and values across the source-to-sea system;
    iii) examination of the power relations to determine which sectors are winners and losers;
    iv) analyse how global, regional, and national policies are influencing the use of the system.

5. **ESTABLISHMENT:**

(i) Based on the social, economic, environmental and governance research, develop the institutional arrangements to support coordinated, collaborative, and integrated approaches to source-to-sea management.

(ii) Create a source-to-sea program for the WIO that focuses on maintaining and enhancing ecosystem goods and services in the WIO through integrated approaches to managing land, water, forests, biodiversity, and coastal resources that contribute to poverty reduction, sustainable livelihoods, and climate resilience. Through strategic planning, capacity building, and actions to sustain livelihoods and preserve ecosystem services, S2S program can promote climate resilient approaches to integrated land, water, forest and coastal management in WIO based on Source to Sea principles.

**References**

Song, A., Bower, S., Onyango, P., Cooke, S., Akintola, S., Baer, J., Gurung, T., Hettiarachchi, M., Islam, M.M., Mhlanga, W., Nunan, F., Salmi, P., Singh, V., Tezzo, X., Funge-Smith, S., Nayak, P., Chuenpagdee, R., 2018. Intersectorality in the governance of inland fisheries. Ecology and Society 23. https://doi.org/10.5751/ES-10076-230217

## 2.3.6. Overview of the Western Indian Ocean Information Management System (WIO IMS)

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**Background and Rationale:**

The Western Indian Ocean (WIO) region, united by a commitment to sustainable blue economy practices and recognizing the critical role of ecological, social, and economic data, initiated the Knowledge Management Strategy and Clearing House Mechanism in 2006 following Nairobi Convention COP 4/8. The Decision COP 10/5.3 highlighted the importance of a regional Information Management Strategy (IMS) to tackle common challenges in ocean governance. In response to the increasing need for strong marine and coastal governance, the 10th Conference of the Parties to the Nairobi Convention in November 2021 marked a crucial juncture.

The collaboration between the Nairobi Convention Secretariat and the German Society for International Cooperation (GIZ) resulted in the establishment of the Western Indian Ocean

Governance Initiative (WIOGI). Commissioned by the Federal Ministry for Economic Cooperation and Development (BMZ), WIOGI was tasked with developing an Information Management System (IMS) specifically tailored to address the distinctive needs and challenges of the WIO region.

**IMS Development Process**

The development of the IMS has been characterized by a collaborative and inclusive ethos with active participation and engagement. The process was guided by a Multi-Stakeholder Working group (MSWG) including representatives from Nairobi Convention countries, NGOs, academia, and various stakeholders. The process unfolded through dynamic participation in technical webinars focused on ocean accounting and data-sharing frameworks. These webinars provided a platform for collective insights.

The strategy's iterative evolution, embodied in its first and second drafts organized into clusters Oceanography and Geomorphology, Biological, and Socio-economic was a testament to co-creation. This co-creation was facilitated by vibrant interactions among stakeholders in technical dialogues and a dedicated writeshop workshop, where the MSWG actively contributed to the writing of the strategy. The final draft, a culmination of this interactive process, is slated for adoption at the 11th Conference of Parties in the second quarter 2024 and underlines the commitment to inclusivity and stakeholder-led prioritization in shaping the strategy.

**Linkage to Regional Ocean Governance Strategy and Global Processes:**

The Information Management Strategy (IMS) assumes a central role in the dynamic ocean governance landscape and strategically aligns with the Regional Ocean Governance Strategy (ROGS). As the IMS unfolds in response to the evolving field of ocean sciences, it places a deliberate emphasis on the seamless integration of information into models and ocean accounts. Through the development of scenarios and models, the IMS establishes a direct and synergistic link between scientific insights and policy development and advocates for a balanced and informed approach to anthropogenic use of the ocean. The spatial approaches endorsed by the IMS resonate harmoniously with the imperative for sectoral economic considerations articulated in the ROGS. Together, the IMS and ROGS create a cohesive framework that not only addresses current challenges in marine and coastal governance but also anticipates and navigates the complexities of the future oceanic landscape. This collaborative approach ensures that the region's strategies align coherently with global goals for responsible and sustainable ocean management.

**IMS Content:**

The IMS content is meticulously structured, encompassing an introduction outlining the vision, objectives, and guiding principles. Core components delve into governance, standards and regulations, the WIO data and information platform, capacity development, and strategy implementation milestones. Guiding principles underscore adherence to standards, copyright and licensing, and the utilization of trusted repositories. Emphasis on

regional data collection standards, regulations, data sharing agreements, and metadata quality management is a testament to the strategy's commitment to transparency and trust-building.

**WIO Data and Information Platform:**

At the heart of the IMS is the WIO data and information platform hosted by the Nairobi Convention Secretariat. This centralized repository ensures FAIR (Findable, Accessible, Interoperable, Reusable) handling of content, aligned with TRUST principles. The platform not only facilitates accessibility but also guarantees the reliability and seamless integration of data into diverse applications.

**Capacity Development:**

Recognizing the pivotal role of capacity development, the IMS targets human and institutional capabilities, with a specific focus on political capacity through summaries and awareness programs tailored for decision-makers. By enhancing the understanding of the IMS among key stakeholders, the strategy aims to secure sustained support and engagement.

**Interconnectedness and Sustainability:**

The IMS recognizes the intricate interconnectedness of economic, social, and Earth systems, aligning with the broader goals of the ROGS. By fostering transparency, adherence to standards, and the FAIR principles, the IMS contributes to a comprehensive and integrated approach to ocean governance. This approach ensures a harmonious relationship between economic activities, societal well-being, and environmental sustainability, fostering responsible management of the ocean's resources for the benefit of current and future generations.

**Recommendations:**

1. **Technical Infrastructure and Security:**
   Addressing the critical challenge of technical security, the IMS proposes the establishment of a secure, centralized database infrastructure. This infrastructure addresses the invisibility of existing records, which often occurs when data is informally stored on personal devices, risking data loss due to technical issues, illegitimate usage, or cyber-attacks. The technical framework must be versatile enough to accommodate data storage at both national and regional levels, promoting data exchange and ensuring the reliability of datasets.
2. **Governance and Oversight:**
   The IMS recommends the establishment of a Regional Steering Committee as the apex governing body responsible for data and information sharing. This committee assumes the crucial role of overseeing the development and implementation of standardized practices at local and national levels. By ensuring strict governance

measures, the committee contributes to the promotion of transparency and accountability in the management of the region's valuable marine resources.

3. **Data Access and Licensing:**
   Acknowledging the varying sensitivity of datasets, the IMS suggests implementing user authentication mechanisms on the WIO data platform. This approach allows for different access rights based on user roles, managing the accessibility of open and restricted datasets. The IMS recognizes the importance of data sovereignty and ownership, respecting the rights of states, communities, and individuals over their data.
4. **Capacity Development:**
   The IMS underscores the significance of human, institutional, and political capacities for the successful implementation of the strategy. Capacity development initiatives aim to harmonize processes, tool usage, and knowledge essential for comprehensively managing IMS components. The goal is to empower stakeholders with the skills necessary to navigate the intricacies of the IMS, ensuring its sustainable and effective implementation.

**Lessons Learned and Future Emphasis:**

The journey of developing the Information Management Strategy (IMS) illuminates key insights essential for shaping its future trajectory. Lessons drawn from this process underscore the pivotal roles of political will, a clear mandate, and sustained capacities in orchestrating regional processes effectively. Emphasizing the need for continuous efforts and a long-term approach, these reflections serve as a guiding compass for the ongoing commitment required for the successful evolution and implementation of the strategy.

This comprehensive narrative provides a nuanced understanding of the WIO IMS, emphasizing its participatory development process and strategic integration with the Regional Ocean Governance Strategy (ROGS). Beyond its function as a data management system, the IMS aspires to transcend, envisioning itself as a trusted repository of information. Through this vision, it seeks to foster transparency

**Key words:** Nairobi Convention, Information Management System, WIO region, …

**Multi-Stakeholder Working Group Members**

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| | | |
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| Dr Arshad Rawat | Director - Oceanography / Marine Geosciences Unit Prime Minister's Office Department for Continental Shelf and Maritime Zones Administration and Exploration | Mauritius |
| Dr. Abdikarim Hersi | Climate change, environmental governance, Food security and livelihood and fisheries sector development. | Somalia |
| Dr Abdulqadir Omar Ziyad | Marine Science Department | Somalia |
| Mr. Masumbuko Semba | Oceanographer and Data Scientist The Nelson Mandela African Institution of Science and Technology (NM-AIST) | Tanzania |
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| Julien Barde, PhD | IT Research Engineer at IRD and Expert in Data and Fisheries Science | France |
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| Ms Sofia Chambe | Geomatic Studies | Mozambique |
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| Edmond Kuto | Wetlands International/ Geographic Information System | Kenya |
| Emmanuel Mpina | TNC/ The Nature Conservancy (US International organization)/ Marine Spatial Planning | Tanzania |
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| John Ngatia | IOC-UNESCO/ Programme Assistant | Kenya |

### 2.3.7. Towards a regional MSP vision and roadmap for the Northern Mozambique Channel

Authors: Samantha Petersen (WWF), David Obura (CORDIO East Africa), Dresy Lovasoa (WWF), Harifidy Ralison (Independent Expert), Kareen Andriantsiferana (WWF)

This paper addresses three of the proposed sub-themes for the upcoming Science to Policy meeting i.e. i) Implementation of the Kunming-Montreal Biodiversity Framework in the WIO; ii) Opportunities for implementation of the High Seas Treaty (BBNJ) in the WIO; and iii) Approaches to collaborative regional ocean governance for a sustainable Blue Economy. It builds on previous decisions taken by the 8th and 9th Conference of Parties at the Nairobi Convention through Decision CP8/6(b) and Decision CP9/7(b) on the Northern Mozambique Channel (NMC) integrated ocean management approach. These decisions identified the need for trans-boundary protection and highlighted the NMC as a good example of integrated ocean management approach.

## 1. Background and rationale

The Northern Mozambique Channel (NMC)[37] contains a large proportion (35%) of the entire Indian Ocean's coral reefs (ca. 11,000 km2 in the Channel), ca. 5% of the world's mangrove forests[38] (ca. 7,300 km2 in the Channel) and seagrass beds. Studies reveal that coral reefs in the Western Indian Ocean form a relatively well connected network, with reefs at Mafia-Latham Island (Tanzania), Angoche-Nacala and Pemba-Mucufi (Mozambique), Anjouan and Ngazidja (Comoros), and Glorieuses Islands being the most significant for connectivity. An estimated 450 species of coral are found here, many of which are highly robust and better able to withstand the impacts of climate change[39]. Highlighting the importance of the area for the regeneration of future coral reefs across the region once the planet's climate has stabilised.

Owing to its high productivity, the NMC region is one of the most important breeding and foraging areas for key indicator and flagship marine species and functions as a corridor for migratory species, such as sea turtles, sharks, marine mammals and tunas. Surveys of the eastern and central parts of the channel have shown several regions of prime importance for foraging megafauna, while recent work on the Mozambique coastline has revealed high concentrations of whale sharks and manta rays in the south, and humpback whales in the northern part of the channel. The NMC is a prime habitat of the coelacanth; perhaps because the old and steep coastlines (going back 180 million years). The combination of flagship species and oceanographic dynamics of the NMC are among the key features that make the channel unique globally.

The economic value of a healthy ocean can be quantified based on the outputs of its provisioning services (for example, the value of sustainably caught fish), the services it supports (such as tourism services), and adjacent benefits (such as carbon sequestration). Using this methodology, the total economic value of the Western Indian Ocean has been valued at more than US$333.8 billion.[40] Much of this value is concentrated in the NMC.

The rich fisheries in the Channel[41], particularly obvious in the northern part, including major prawn fisheries and a regional tuna stock, are exploited not only by domestic fishing industries but also by foreign fishing fleets. However, this is not always to the benefit of the countries of the region. The NMC is a key feeding area for tropical tuna and a major spawning area for skipjack tuna thanks to warm waters and strong mesoscale activity that

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[37] Ghermandi et al 2019. Marine ecosystem services in the NMC: A geospatial and socio-economic analysis for policy support. *Ecosystem Services, Volume 35*, 1-12.

[38] https://www.wetlands.org/publication/mangroves-latest-data-2021-mozambique-madagascar-kenya-tanzania/

[39] https://gcrmn.net/wp-content/uploads/2022/05/Chapter-5.-Status-and-trends-of-coral-reefs-of-the-Western-Indian-Ocean-region.pdf

[40] Obura, D. et al. 2017. Reviving the Western Indian Ocean Economy: Actions for a Sustainable Future. WWF International, Gland, Switzerland. 64 pp.

[41] Chassot et al. 2019. The key role of the NMC for Indian Ocean tropical tuna fisheries Emmanuel . Rev Fish Biol Fisheries 29:613–638

results in the enrichment of surface waters and efficient energy transfers enabled by short food chains. Furthermore, near shore fish stocks support centuries old artisanal fishing industries and significantly contribute to the livelihoods and food security of the region's population.

The sedimentary plains occupying parts of the seafloor of the Mozambique Channel have long been recognized as having potential to store trapped hydrocarbons, with exploration for oil and gas starting in the 1950s. The entire Mozambique Channel coastline has been divided into exploration blocks, including areas currently having protected status, wildlife migration corridors, areas demarcated for tourism development and areas that support fish or prawn breeding and nurseries, mangroves, coral reefs, sea grass beds, lagoons etc[42]. These discoveries could be 'game changers' for the region's economies and puts the region on the threshold of a resource driven 'bonanza' period, which will require comprehensive preparations to ensure both sustainable economic benefits and environmental protection.

The Mozambique Channel also forms an important trade route from southern Africa and the South Atlantic to and from the Indian Ocean. The Channel is a strategic trade route for the Southern Africa Development Community (SADC), carrying more than half of the region's merchandise exports and imports. 30% of global tanker traffic passes through the Channel, carrying significant risk of oil spills and environmental damage. Furthermore, the waters off Mozambique are becoming a major new security hotspot in the Indian Ocean[43]. The insurgency in Mozambique threatens security in the Mozambique Channel. There are also growing attacks on maritime infrastructure. In August 2020, insurgents seized a key port in northern Mozambique from government forces. Maritime drug smuggling is a key source of funds for insurgents.

## 2. Linkage of the NMC to regional and global processes

The potential of the NMC as a transboundary site for regional conservation was first identified by experts during a regional workshop organized through the Indian Ocean Commission (IOC) in November 2009, in Antananarivo, Madagascar[44]. Such transboundary networking of management areas would build on individual sites already in place and under multiple different management entities and authorities. In 2012, an assessment by the UNESCO World Heritage Centre Marine Programme identified the NMC as the highest priority region meeting the design criteria for a World Heritage Site, comprising multiple sites of potential outstanding Universal Value. Also in 2012, the NMC was described as

[42] WWF 2018. The threat of mining and oil and gas to our marine heritage.

[43] Brewster. 2021. The Mozambique Channel is the next security hotspot. https://www.sadf.eu/wp-content/uploads/2021/05/iop_brewster_mozambique.pdf

[44] Obura et al 2015. The Northern Mozambique Channel. Setting the foundations for a regional approach to marine governance. A Background Document. WWF International and CORDIO East Africa.

meeting the criteria for Ecologically or Biologically Significant Areas (EBSAs) under the Convention on Biological Diversity[45] [46].

Historically, economic sectors have viewed the ocean as an infinite resource for exploitation. But as the global economy has expanded, multiple uses, often with limited sectorial control, have not only come into conflict with one another, but substantial human impacts are seen across the oceans and to their deepest depths. In December 2022, the Kunming-Montreal GBF was agreed by 196 nations, including all those of the NMC, to 'take urgent action to halt and reverse biodiversity loss'. This agreement includes targets for all areas to be under inclusive spatial planning and/or effective management processes by 2030, and to effectively protect and conserve 30% of areas by 2030. And in June 2023, the United Nations treaty to manage biodiversity beyond national jurisdictions was agreed, laying out a pathway for governance of the high seas to enable increased protection of marine living resources as a global commons. There are, therefore, growing calls for marine spatial planning and integrated ocean management to reconcile conflicting uses and preserve natural assets.

## 3. Marine Spatial Planning (MSP): A tool for an integrated ocean governance in the NMC

Marine spatial planning is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that have been specified through a political process (UNESCO[47]). It is a method of collective governance that involves mapping oceanic usage areas to identify appropriate zones for activities and so reduce the potential for future conflicts between incompatible uses. In the case of the NMC, marine spatial planning would see the governments of the NMC countries convene relevant civil society organisations and the private sector to collectively identify areas for human activities such as commercial fishing, mariculture, oil and gas projects, and tourism and renewable energy, while identifying areas worthy of increased levels of protection to ensure a sustainable blue economy is underpinned by a foundation of healthy ocean ecosystems.

At the fifteenth Session of the African Ministerial Conference on the Environment (AMCEN) in 2015, African ministers of environment agreed to develop a governance strategy, in accordance with the United Nations Convention on the Law of the Sea and regional seas conventions, on oceans and seas in Africa for the effective management of the region's shared maritime resources. This led to the development of the Africa Integrated Maritime Strategy 2050 (AIMS 2050) and Agenda 2063. Progressing MSP in the region is in line with major outcomes of the Strategic Action Programme Policy Harmonization and Institutional Reforms (SAPPHIRE) and Western Indian Ocean Strategic Action Programme

[45] https://www.cbd.int/marine/ebsa/booklet-03-sio-en.pdf

[46] CBD 2016. Ecologically or Biologically Significant Marine Areas (EBSAs). Special places in the world's oceans. Vol 3: Southern Indian Ocean. 128pp

[47] https://www.ioc.unesco.org/en/marine-spatial-planning

(WIO-SAP) Projects which recognizes that a regional MSP strategy is vital to harmonize the different marine and coastal management and spatial planning initiatives in the countries of the WIO region. During 2020-2021, a regional MSP strategy was developed with input from the MSP Technical Working Group (TWG) and wider stakeholders[48]. In keeping with global best-practice, the strategy adopted an ecosystem-based approach to MSP.

The Swedish Agency for Water Management (SwAM) has been working with the Nairobi Convention Secretariat and the MSP TWG to develop the Symphony tool[49] which maps human pressures and ecological impacts for MSP in the Western Indian Ocean. There are numerous other initiatives related to the development of regional databases (such as MASPAWIO[50]) and knowledge sharing platforms in the WIO that will be able to support MSP activities in the region.

While there has been large progress towards policy development and institutional structures available for MSP in the WIO, the countries of the WIO are still very much in different stages of MSP uptake and policy and legislative development. A study commissioned by WWF in 2022 in Madagascar and Tanzania highlighted the following key constraints to effective implementation of spatial management in the region[51]:

- Limited financial resources available to design, implement and monitor national and regional plans
- The lack of coordination between government maritime agencies, stemming from a lack of a common vision on the use of the maritime space

Furthermore, coastal communities in the NMC region rely heavily on marine resources for their livelihoods. Different interests of the users of the marine space can lead to conflicts and ultimately threaten the welfare and prosperity of these communities[52]. This highlights the importance of MSP to reduce conflicts between users and in particular improve the welfare of coastal communities. In additional to providing strengthened protection and management of the offshore areas of the NMC region, it is recommended that that coastal MSP efforts should support existing LMMA networks and governance mechanisms such as Community managed areas and MPAs, these strategies could be further integrated and synergised with the development of MSP.

## 4. **Recommendations**

48 UNEP-Nairobi Convention (2022). A Strategic Framework for Marine Spatial Planning in the Western Indian Ocean. UNEP-Nairobi Convention, WIOMSA, Nelson Mandela University, and Macquarie University.

49 https://www.havochvatten.se/en/eu-and-international/international-cooperation/swam-ocean---improving-lives-through-sustainable-use-of-the-ocean/wio-symphony---a-tool-for-ecosystem-based-marine-spatial-planning.html

50 http://maspawio.net/

51 WWF Consultancy. Snow et al. 2022. Scoping for the design of a methodological tool for enhancing the sustainability and suitability of national MSP in NMC countries. Situational report for Tanzania. NMU, South Africa.

52 Ghermandi et al. (2019). Marine ecosystem services in the Northern Mozambique Channel: A geospatial and socio-economic analysis for policy support. Elsevier, Ecosystem Services, Volume 35, 1-12.

Given the exceptional biodiversity value and the increasing scale of the risks, the NMC region deserves special attention. Significant gaps in the protection of key biodiversity hotspots leave the NMC region vulnerable. It also provides an ideal testing ground for multi-country cooperation in applying Integrated Ocean Management MSP and facilitating transboundary management and protection. It is therefore recommended that a transnational MSP process is undertaken in the NMC region in line with the FFEM funded NoCaMo project.

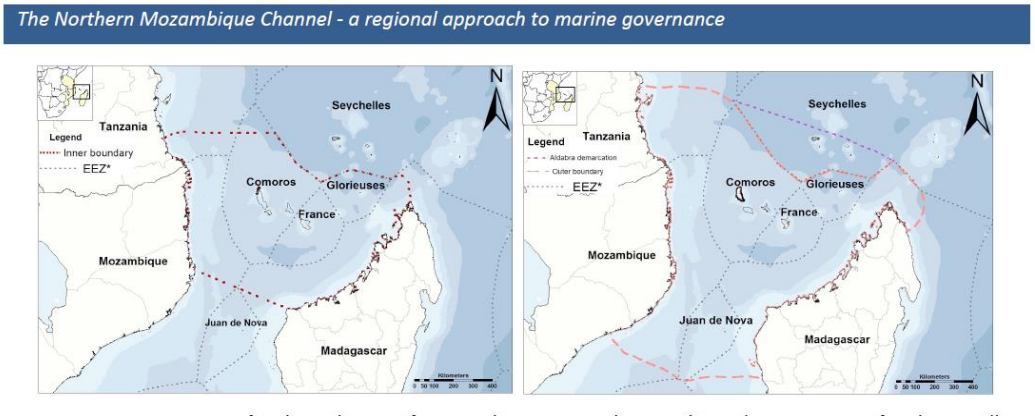
The following are recommended:

### 4.1. NMC countries to develop a shared MSP vision

The working vision proposed for the NMC interprets the WIOSAP and the WIO MSP Framework vision to make it explicit to the NMC. A draft vision, for further development by the countries and partners, is 'A sustainable future where healthy ecosystems support, and are supported by, thriving local communities and a vibrant economy' and a draft goal 'An inclusive and holistic MSP process that produces a regional marine spatial plan to support the sustainable management of ocean and coastal ecosystems for all.'

### 4.2. Develop a roadmap for the delivery of increased transboundary protection of the NMC

The geographic boundaries of a regional initiative for the NMC should be determined by the countries primarily, but also with consideration for the principal stakeholders and partners from civil society and the private sector. Two basic options (smallest and largest) have been suggested in previous documentation[53]. These are driven by the biophysical properties of the region, as well as certain administrative boundaries (see below). It is proposed that the boundaries are determined based on the issues the countries want to solve collectively.

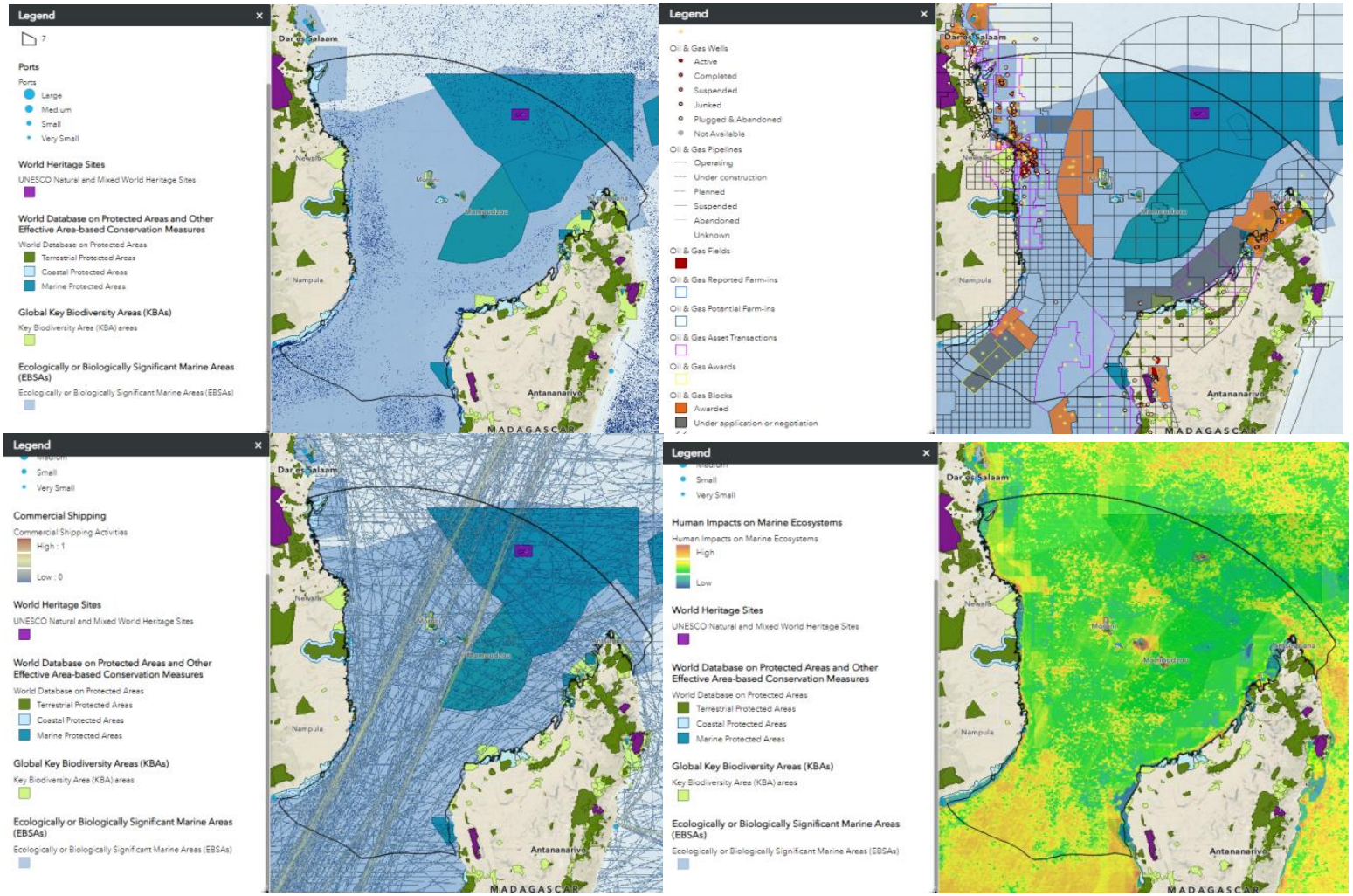



**Building on the WIO MSP Framework and the NMC process to date, the following is proposed:**

[53] Obura et al 2015. The Northern Mozambique Channel. Setting the foundations for a regional approach to marine governance. WWF and CORDIO.

| | |
|---|---|
| **Year 1** | 1. Launch a stakeholder engagement process that brings the NMC governments, private sector and civil society, including communities and scientists together. |
| | 2. Articulate clear institutions arrangements for collaboration and coordination across government and non-government institutions. |
| | 3. Agree on objectives, principles and establish guidelines for MSP that recognises the interconnections between sectors and countries and provides a clear method for developing a MSP. |
| | 4. Define or identify the legal framework for the MSP |
| | 5. Confirm the appropriate data platform, collate data and identify data gaps. |
| **Year 2** | 6. Undertake spatial analysis and assessment following the agreed method and based on best available information. Define zones, set targets for activities/uses, and define a management plan as relevant, following the agreed method. This should include identification of areas worthy of increased ocean protection, e.g., MPAs, LMMAs and OECMs. |
| | 7. Establish a cross sectoral governance mechanism |
| | 8. Harmonize legal instruments for blue economy (with a focus on oil and gas, energy and fisheries) |
| **Year 3** | 9. Assess costs and benefits and continue to consult with stakeholders, to finalise the Marine Spatial Plan and ensure strong buy-in. |
| | 10. In parallel and where feasible, improve the mapping of biophysical environment and human activities within the region (this will be an on-going activity). |
| | 11. Collectively, consider improved management of sectoral activities, for example improved EIA legislation and industry best practice guidelines |
| **Year** | 12. Take the required steps to move identified areas through to proclamation and implementation |
| **4-**5 | 13. Develop and set up monitoring programme as relevant |

**Appendix:** Maps depicting various features of the NMC region from top right to bottom left: a) location of MPAs, EBSAs and world heritage sites, b) Presence of oil and gas exploration and extraction, c) Location of major shipping routes and d) Cumulative human impacts (Source WWF SIGHT)


Legend
Ports
Large
Medium
Small
Very Small
World Heritage Sites
UNESCO Natural and Mixed World Heritage Sites
World Database on Protected Areas and Other Effective Area-based Conservation Measures
Terrestrial Protected Areas
Coastal Protected Areas
Marine Protected Areas
Global Key Biodiversity Areas (KBAs)
Key Biodiversity Area (KBA) areas
Ecologically or Biologically Significant Marine Areas (EBSAs)
Oil & Gas Wells
Active
Completed
Suspended
Junked
Plugged & Abandoned
Not Available
Oil & Gas Pipelines
Operating
Under construction
Planned
Suspended
Abandoned
Unknown
Oil & Gas Fields
Oil & Gas Reported Farm-ins
Oil & Gas Potential Farm-ins
Oil & Gas Asset Transactions
Oil & Gas Awards
Oil & Gas Blocks
Awarded
Under application or negotiation
Commercial Shipping
Commercial Shipping Activities
High : 1
Low : 0
Human Impacts on Marine Ecosystems
High
Low
Dar es Salaam
Nampula
Antananarivo
MADAGASCAR

### 2.3.8. A Toolkit for Sustainable Port Development in a Blue Economy

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#### 1. Background & Rationale

The port industry faces a growing challenge to address societal and environmental considerations while still having to provide adequate capacity and cost-effective economic services to traders (Lu et al. 2016; Alamoush et al. 2021). With increasing societal and regulatory pressures, port authorities around the world are compelled to pursue greater sustainability to safeguard their 'license to operate' (Lam and Van der Voorde, 2012; Roh et al., 2016). In response to these global challenges the concept of 'Green Ports' emerged, primarily focusing on balancing environmental challenges and economic demand and striving for sustainability through increasing both economic and environmental competitiveness (Bergqvist and Monios 2019; Lam and Notteboom 2014). The concept of 'Sustainable Port Development' builds on that of 'Green Ports' by also considering social sustainability, advocating a balance across economic growth, environmental protection, and social progress (Hiranandani 2014; Taljaard et al. 2021), working towards the 5$^{th}$ generation ports (Kaliszewski 2018).

The Western Indian Ocean (WIO) region is no exception, as it is experiencing an unprecedented pace of large-scale developments, including ports. Indeed, economic growth and development are inevitable if countries of the region want to address social challenges such as poverty and inequality. Several initiatives towards the greening of port are emerging, such as Kenya and Tanzania's Green Port policies, as well as initiatives undertaken by the Maputo Port Development Company and the port authorities of Madagascar, South Africa and the Seychelles (UNEP et al. in prep.). The Port Management Association East and Southern Africa together with the Maritime Technology Cooperation Centre-Africa also are in consultation with ports in the region to embrace greening through improved energy efficiency (UNEP et al. in prep).

While the broader region still has an opportunity to define sustainable trajectories for infrastructure investments, the potential remains for such activities to significantly impact on the integrity of critical habitats and natural resources on which future well-being and growth also may depend on. In the WIO region coastal communities are especially reliant on such resources for their lives and livelihoods (UNEP et al. 2015). Therefore, considering

the rich diversity of coastal and marine ecosystems in the WIO region, and its potential to contribute to socio-economic benefits, the concept of sustainable Blue Economy growth holds great promise for the area. Towards such sustaible growth in the coastal and marine environment of the WIO region, this project set out to develop a Toolkit for sustainable port development in a Blue Economy.

## 2. Linkage to Global and Regional Processes

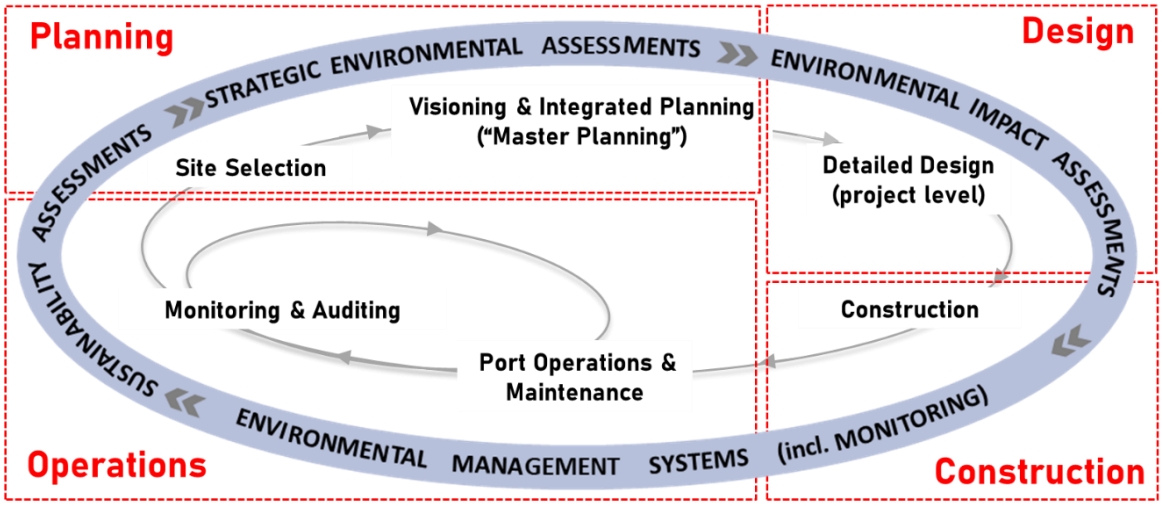
According to the World Bank (2017), sustainable Blue Economy is the 'sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem'. It strives "to promote economic growth, social inclusion, and the preservation or improvement of livelihoods while at the same time ensuring environmental sustainability of the oceans and coastal areas". Aligned with this description, the Africa Blue Economy Strategy (AU 2019) views the Blue Economy as 'an inclusive and sustainable economy that becomes a significant contributor to continental transformation and growth, through advancing knowledge on marine and aquatic biotechnology, environmental sustainability, the growth of an Africa-wide shipping industry, the development of sea, river and lake transport, the management of fishing activities in these aquatic spaces, and the exploitation and beneficiation of deep sea mineral and other resources'.

This project is complimentary to the Strategic Framework for Coastal and Marine Water Quality Management in the Western Indian Ocean Region of the Nairobi Convention (Taljaard et al. 2022) and seeks to facilitate sustainable port development in the WIO on request of the Conference of Parties. It is part of and supports the Implementation of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities (WIOSAP) Project. It is informed by the appreciation that ports intersect with critical coastal and marine resources, and it is aligned with the WIO region's vision to grow a sustainable Blue Economy (https://www.unep.org/resources/report/building-blue-economy-wio-region).

## 3. Advances: Toolkit for Sustainable Port Development in Blue Economy

The Toolkit comprises a selection of practical management and operational tools aimed at port operators and managers in the WIO region aimed at practical assistance to advance sustainable port planning and operations aligned with international best practice (UNEP et al. in prep).

Key to sustainable ports is acknowledging the multi-use benefits derived from natural capital in ports and their surrounds and bridging the traditional disconnect between natural environmental issues and port planning and development. To assist in practically bridging this disconnect, Taljaard et al. (2021) posed an Integrated Port Management (IPM) framework conceptually positioning and aligning environmental processes within the traditional port development cycle. To allow port operators to easily contextualise the tools, these have been organised in accordance with key stages in the IPM framework as posed by




Taljaard et al.

(2019), that is planning, design, construction and operations (Figure 1).

**Figure 1: The Integrated Port Management Framework, conceptualizing alignment between the traditional port planning and development cycle and key environmental assessment and management processes, as well as highlighting its four key stages (Adapted from: Taljaard et al. 2021)**

The tools included in the toolkit were largely distilled from international best practice applicable and workable in ports of the WIO region. These were reviewed and refined by regional marine scientists and port managers through a series of in-person workshops. Table 1 summarises the various tools contained in the Toolkit within each of the four main stages.

**Table 1: Structure and content of the Toolkit for Sustainable Port Development**

| SECTION | TOOLS |
|---|---|
| **A: Planning** | A.1 Guidance on Strategic Environmental Assessment |
| | A.2 Site selection and Master Planning |
| | A.3 Planning for Climate Change |
| | A.4 Scenario Analysis Tool for Planning |

| SECTION | TOOLS |
|---|---|
| **B: Design** | B.1 Guidance on Environmental Impact Assessment |
| | B.2 Concept of Nature-based Solutions |
| | B.3 Design for Biodiversity Offsets |
| | B.4 Building-with-Nature Design Approach |
| | B.5 Ecological Enhancement Options |
| **C: Construction** | C.1 Construction Environmental Management Plans |
| | C.2 Dredge Management (also relevant in Operations) |
| | C.3 Considerations for Port Decommissioning |
| **D: Operations** | D.1 Guidance on Environmental Management Systems |
| | D.2 Circular Economy in Ports |
| | D.3 Examples: Sustainable Port Development Actions |
| | D.4 Securing External Finance for Port Development Projects |
| | D.5 Sustainable Use of Materials and Land |
| | D.6 Energy Efficiency Management |
| | D.7 Management of Carbon Footprint |
| | D.8 Management of Water Consumption |
| | D.9 Waste Management |
| | D.10 Ballast Water Management |
| | D.11 Guidance on Sustainable Hull Cleaning |
| | D.12 Towards Improving Port Environmental Quality |
| | D.13 Ecosystem Restoration |
| | D.14 Marine Litter Clean up Technologies |
| | D.15 Oil Spill Contingency Planning |
| | D.16 Environmental Monitoring and Evaluation |
| | D.17 Environmental Information Systems |
| | D.18 Effective Capacity Development |

| SECTION | TOOLS |
|---|---|
| | D.19 Introduction to Natural Capital Accounting |
| | D.20 Sustainability Performance Index (linked to SDGs) |

It may not be practically possible for ports in the WIO region to implement all the tools in this Toolkit at once, due to human and financial resource limitations. However, by committing to a focussed, on-going process towards aligning environmental matters early in port planning and development, and in the operational and maintenance phases as is contextualised in the IPM Framework, port operators can incrementally achieve environmental sustainability, implementing key priorities specific to their port environments, supported by the tools in this Toolkit. Ideally, the IPM Framework, as well as the guidance and best practice as proposed in the Toolkit should be adopted and embedded in national policies pertaining to sustainable port management, as appropriate.

Given the growing challenge to address societal and environmental considerations, working towards 5$^{th}$ generation ports (Kaliszewski 2018) the inclusion of dedicated institutional arrangements to address environmental sustainability in the port governance configuration has become critical. Such institutional structures should be considered as 'equal partners' with other port institutional structures (or departments) overseeing, for example strategic port planning and development, and ports operations if ports are serious about environmental responsibility, socially accountability and economically viability and in achieving true sustainable port development (Taljaard et al., 2019).

## 4. Recommendations

Towards advancing the effective operationalisation of Sustainable Port Development in the WIO region, the following policy recommendations are proposed for consideration by the Contracting Parties:

- Contracting Parties adopt the Integrated Port Management Framework (IPM) towards sustainable port development in the WIO region, including the Toolkit for sustainable port development in a Blue Economy
- Contracting parties consider adopting and embedding the IPM Framework, and the Toolkit for sustainable port development in a Blue Economy in national policies pertaining to sustainable port management, as appropriate.
- Contracting Parties formally establish a Regional Network or a Community of Practice on Geo-spatial Technologies to coordinate and facilitate the development of standard methods for the generation of geo-spatial data on coastal habitats comprising both data scientists and ecologists, the latter being key to assisting with ground truthing and interpretation of geo-spatial data (also identified as a need by other initiatives in the WIO region reliant on accurate coastal habitat data).

The following technical recommendation is proposed for consideration by the Contracting Parties in support of the effective operationalisation of Sustainable Port Development in the WIO region:

- The Nairobi Convention Secretariat work with partners to support capacity development programmes in support of the effective operationalisation of Sustainable Port Development in the WIO region.

Ultimately, the achievement of sustainable port development in the WIO region will rely on countries embracing and adopting the proposed implementation into national policy and best practice, as appropriate. It will also require corporate commitment from port management authorities, as well as political commitment, to assist in securing dedicated financial resources and the skilled personnel required in the execution of identified sustainable port development initiatives.

The science-based outputs generated from this project are to be shared with national governments to support and guide them in the development of national policies for sustainable port development. Further, the outputs will be shared with port developers and operators in the region to support and guide them with the implementation of sustainable port development options. This should be achieved through the Science-to-Policy Platform supported by the Nairobi Convention.

**Acknowledgements**

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### 2.3.9. SDG 14.4: Bridging the divide between intent and implementation.

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**Background**

SDG 14.4 states that by 2020 countries should:

*'…effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.'*

This paper primarily focuses on the illegal, unreported, and unregulated (IUU) fishing component of SDG 14.4. IUU fishing is described by the FAO as: '*…one of the greatest threats to marine ecosystems and undermines national and regional efforts to achieve sustainable fisheries*.'[54].

Although the term IUU is often used as a shorthand for illegal fishing only, this paper will look beyond just *illegal* element and focus equally on *reporting* and *regulation*, each arguably as important as the other and covering most core elements of fisheries management. A lack of adequate reporting on a fishery has been likened to the folly of driving at night with the headlights off[55], while it has been argued that unregulated fishing should be considered a case of governance failure[56]. Considering all its various elements the level of IUU is, in effect, a reflection on the success of fisheries management itself. When there is weak reporting, or regulations are poorly designed or enforced, as well as illegal fishing taking place, management is clearly failing to achieve its objectives.

**Linkage to Regional & Global Processes**

IUU fishing is a relatively well-studied phenomenon in industrial fisheries, and the FAO have developed an IUU IPOA defining the responsibilities held by flag state, port states and coastal states as they relate to industrial fisheries[57]. But the same cannot be said for small-scale fisheries (SSF). Roberts et al. (2022) observed that '*many of the strategies being employed to halt IUU fishing and support sustainable fisheries management in the WIO focus on industrial offshore fishing, largely overlooking artisanal/small-scale fisheries*.'. There is currently no regional, or indeed global, international plans of action (IPOA) specifically for SSF IUU, although a proposal for the latter was made in an FAO document as far back as 2000[58].

[54] FAO, 2021
[55] WIOMSA, 2022
[56] Tsamenyi et al., 2015
[57] FAO, 2001
[58] Drammeh, 2000

Neither are there any national SSF IUU plans of action (NPOAs) in the WIO. However, potential elements of such an instrument are captured in elements of NPOAs established in the context of implementing Voluntary Guidelines for Securing sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (e.g., the Tanzania NPOA-SSF[59]).

**IUU Fishing in the Small-scale Fisheries of the WIO**

The recommendations that are the purpose of this paper have been generated from the application of the WIOMSA SSF IUU Index in Kenya, Madagascar, Mozambique, and Tanzania[60]. A follow-up workshop was held in Zanzibar in May 2023[61]. The IUU Index sought to gather perceptions from various fisheries professionals, mainly fisheries officers, on the management of up to four fisheries (octopus, small-pelagic, reef and shrimp) in each of the four countries. Perceptions were captured, in a questionnaire, across a set of 20 indicators on the attributes of the management of a fishery, and 19 indicators of IUU fishing. Each indicator was scored 1-5 based on the knowledge of the questionnaire respondents. The selection of indicators was informed by the literature (e.g., FAO, 1995; Halls et al., 2002; Anderson et al., 2015; FAO, 2015; MSC, 2018).

**Fishery Management Attributes - IUU Vulnerability**

These variables are reported in two principal categories: fisheries co-management and, trade and economics, although only data for the former are presented here.

Fisheries Attributes

Annex 1.1 presents data on the interpolated median scores given by respondents on fishery co-management attributes for each of the four participating countries. For a better understanding of what each level of the metric relates to the reader is referred to the WIOMSA report. Note that higher scores for any particular co-management attribute, equating to orange/red in the graduated traffic-light graphical used here, reflects a greater likelihood to contribute to overall vulnerability to IUU fishing. (NB: Madagascar did not distinguish small-pelagics as a separate fishery).

It is apparent that some fisheries performed better than others. In Mozambique, for example, small-pelagic and shrimp fishery attributes indicated higher degrees of IUU vulnerability than for reef or octopus fisheries. This is particularly the case for *de jure* and *de facto* control of access to a fishery. These two variables speak to the extent to which local management institutions can control access to the fishing grounds for which they are responsible, either through the application of official legislation (*de jure*) or through customary or normative traditions (*de facto*).

The higher median scores (increasing vulnerability to IUU) in Mozambique, for example, particularly for the small pelagic and shrimp fisheries, reflect an apparent lack of control of

[59] URT, 2021
[60] Perceptions of IUU Fishing in the Small-scale Fisheries of the Western Indian Ocean (WIOMSA, 2022)
[61] WIOMSA, 2023

access that has implications for the likely effectiveness of any local management interventions.

### Illegal Fishing

Illegal fishing, as it pertains to SSF, is '…*conducted by* ***national*** *or foreign* ***vessels in waters under the jurisdiction of a State****, without the permission of that State, or* ***in contravention of its laws and regulations*** '[62]

Annex 1.2 presents the results related to the seven indicators selected for this dimension of IUU (each of the 3 terms is termed a *dimension* in the Index) and a score of 5 represents the highest level of illegal fishing activity. Overall, the majority of the indicators returned medium to high scores. Scores were relatively high for *unlicensed fishers* (suggesting high numbers of unlicenced fishers) and the *probability of prosecution* (suggesting there was a low probability of prosecution and thereby a lower level of deterrence) across most fisheries in most countries while, on the contrary, contravention of *seasonal closures* was generally low.

But it was also clear that in most countries, and in most fisheries, there was far from universal consensus[63] - see Annex 2 - amongst respondents on the extent of illegal fishing (or in fact any dimension of IUU). There is more work required to understand the implications of this observation. Are the fisheries officers' perceptions based on a correct understanding of the reality existing in these fisheries? And, equally important, is their understanding of the actual legislated regulations up-to-date (i.e., what activity might, or might not be, illegal)?

### Unreported Fishing

Unreported fishing, again in the context of SSF, is defined as *'…fishing activities which have* ***not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations…****'* (FAO, 2001).

In SSF it is typically the responsibility of national fisheries agencies to collect data, usually through landing site sampling programmes, requiring only the cooperation of fishers rather than their active contribution of data. For example, the FAO's *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries* (Article 11.1, FAO, 2015) observes that:

*'States should establish systems of collecting fisheries data, including bioecological, social, cultural and economic data relevant for decision-making on sustainable management of small-scale fisheries*.'.

The degree that SSF are *unreported* is an indication of the ability (or lack of) of management agencies to generate the information necessary to track the performance of their regulations and policies.

[62] FAO, 2001

[63] Van der Eijk's (2001) measure of Agreement 'A' (R library *agrmt;* Ruedin, 2013)

Annex 1.3 presents the median scores for the full set of seven reporting indicators - a score of 5 represents the highest level of reporting effectiveness. In the majority of countries, fisheries and indicators, the median scores were relatively low, suggesting a low degree of reporting effectiveness, albeit with variations between the indicators. For example, data on licences appears more commonly available compared to data on catch, species life-history and the marine environment, data that should be key to effective management decision-making.

**Unregulated Fishing**

Unregulated fishing takes place '*in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.'* (FAO, 2001).

In terms of SSF, a state's responsibilities would derive, in the first place, from obligations defined in the relevant national fisheries policy and subsequently from its obligations from being a party to, or signatory of, international agreements or initiatives such as the United Nations Convention on the Law of the Sea (UNCLOS), UN SDG14, the Code of Conduct for Responsible Fisheries (FAO, 1995) etc.

Annex 1.4 presents the median scores for the nine regulatory indicators. A score of 5 represents the highest level of regulatory effectiveness (and comprehensiveness) and a score of zero indicates no regulations in place. The two indicators of area closures (long-term or seasonal) were reported as being uniformly positive across all fisheries in Kenya, and reef fisheries were overall the best performer across the other three countries. Controls on gear does not register as an important tool in the regulatory toolkit of any fisheries in the four countries sampled for the Index.

Overall, stock assessment did not appear to follow best practice or be routinely undertaken in most fisheries, but the best performance was reported for the shrimp and small-pelagic fisheries in Mozambique. Mozambique also reported relatively strong use of fisheries data in general to inform management across all four fisheries. Evidence-based decision making was reported as important in Tanzania reef fisheries but was overall weakly applied in Madagascar. The regulatory performance reported for the octopus' fisheries in Madagascar appears somewhat anomalous, in particular stock status, given the number of interventions by local communities in partnership with NGOs, and the number of scientific papers produced on the fishery in recent years. From the perspective of the ecosystem approach to fisheries, the generally modest scores for by-catch and habitat status are likely to be of concern to respective fisheries managers.

**Recommendations**

**> On the detailed results from the SSF IUU Index**

The SSF IUU Index was designed with a set of indicators selected to gauge the perceived extent of IUU fishing. A lot of information is carried in the data generated for this Index and the devil really is in the detail - **so the first and most important recommendation** is that fisheries managers review the WIOMSA SFF IUU Index report in detail and by each indicator in turn. This should stimulate discussions amongst policy-makers and managers whether, and if so what aspects of their fisheries management programmes would benefit from improvement.

A possible approach to such a review would be a facilitated, seminar-style, meeting with participants equipped with the relevant extracts of policy and regulation documents, management reports etc. Are there important gaps in the profile of fisheries management activities that come to light and that can be addressed? Is it more a case that there are difficulties in implementation, or is there an incomplete (or mis-) understanding amongst local fisheries personnel about the policy and fisheries management environment (and even its implementation)?

**A second recommendation therefore might arise out of this and that is to improve communication of the detail of fisheries management programmes** targeting fisheries officers (and other local stakeholders). This communication would be designed to explain the actual facts of the policy and management environment (e.g., consultation, sampling, access control, gear controls, stock assessment etc.).

As part of this review and communication initiative, local fisheries officers will be in position to update the ministry responsible for fisheries management on the nuances of local management activities, for example, those aspects that are not covered by formal legislation (e.g., traditional/ customary controls on access) as well as describe the difficulties they may face in implementation.

> Reducing Illegal Fishing

The study that has informed this paper focused on gathering the perceptions of fisheries professionals, primarily local fisheries officers, but it is **recommended that a direct survey of fishers** themselves also be undertaken to further understand the distribution, incidence, and prevalence of illegal fishing and to complement the findings from the original study. The challenges that such a study pose are evident, but techniques such as the Ballot-Box Method (BBM) and the Randomised Response Techniques (RRT) (or even just direct questioning) have proven to generate valuable and accurate insights into illegal behaviour across a range of sectors including fisheries, wildlife poaching as well as in other arenas where a risk of social desirability bias are thought likely to affect the results[64].

There are a number of criteria that might influence the design of such a study, but with financial resources typically scarce, one important criterion would be to focus on areas where marine resources generate the highest values (revenue, contribution to food security

[64] e.g., Razafimanahaka et al. 2012; Bova et al. 2018; Arias et al. 2020

etc.) and therefore where loss of biomass and biodiversity would have the most negative social impact. Considerations on the *motivations* of illegal activity in SSFs is also needed and therefore the study could usefully look at compliance issues, for example, considering the CRAVED concept, as well as the opportunity vs actor-based approaches[65].

**A second recommendation relates to surveillance.** Although high-tech solutions are routinely suggested to improve surveillance of small-scale fisheries, these are rarely suitable for the particular circumstances found in such fisheries. The nature of small-scale fishing operations tends not to be suitable for surveillance using satellite-based systems, not to mention the typically low benefit-cost ratio associated with such initiatives. Although improving compliance is always likely to be the best option, affordable, low-tech surveillance approaches tailored to the SSF context are available (e.g., drones, RADAR, phone-signal tracking), with investment focused again on important areas and with the necessary assets in place to follow-up on detection of potentially illegal activities.

### Increasing the Effectiveness of Reporting Systems

Evidence from the SSF IUU Index suggests that there are opportunities for improvement. For catch-effort data, for example, specific local challenges to data collection were widely reported, both via the Index and during the follow-up workshop in Zanzibar, as well as problems with the subsequent management of data etc.

The **recommendation here is to ensure that the reporting system is designed to provide the information that is necessary for management and to ensure that the reporting system is adapted to local conditions.** The Index review seminars proposed above will provide a forum for locally-based DFOs to inform central authorities of the challenges they face in the reporting of fisheries under their immediate responsibility.

More specifically, it appears that across the WIO as a whole there are major shortfalls appear related to the provision of life-history and environmental data. **The second recommendation therefore is that a coordinated approach** across the WIO is taken to address this. This is warranted not least by the sub-regional or regional genetic connectivity across many species (e.g., small-pelagics, octopus, some reef species), but also because it makes sense to adopt what are more or less globally-agreed protocols in such challenging management environments. One option, no doubt out of many, is for a set of guidelines to be developed by a regional expert committee covering the WIO's major fisheries, which can be complemented by existing guidelines of statistical issues (e.g., Cadima et al., 2005; FAO, 2017).

### Improving Outcomes from Regulations

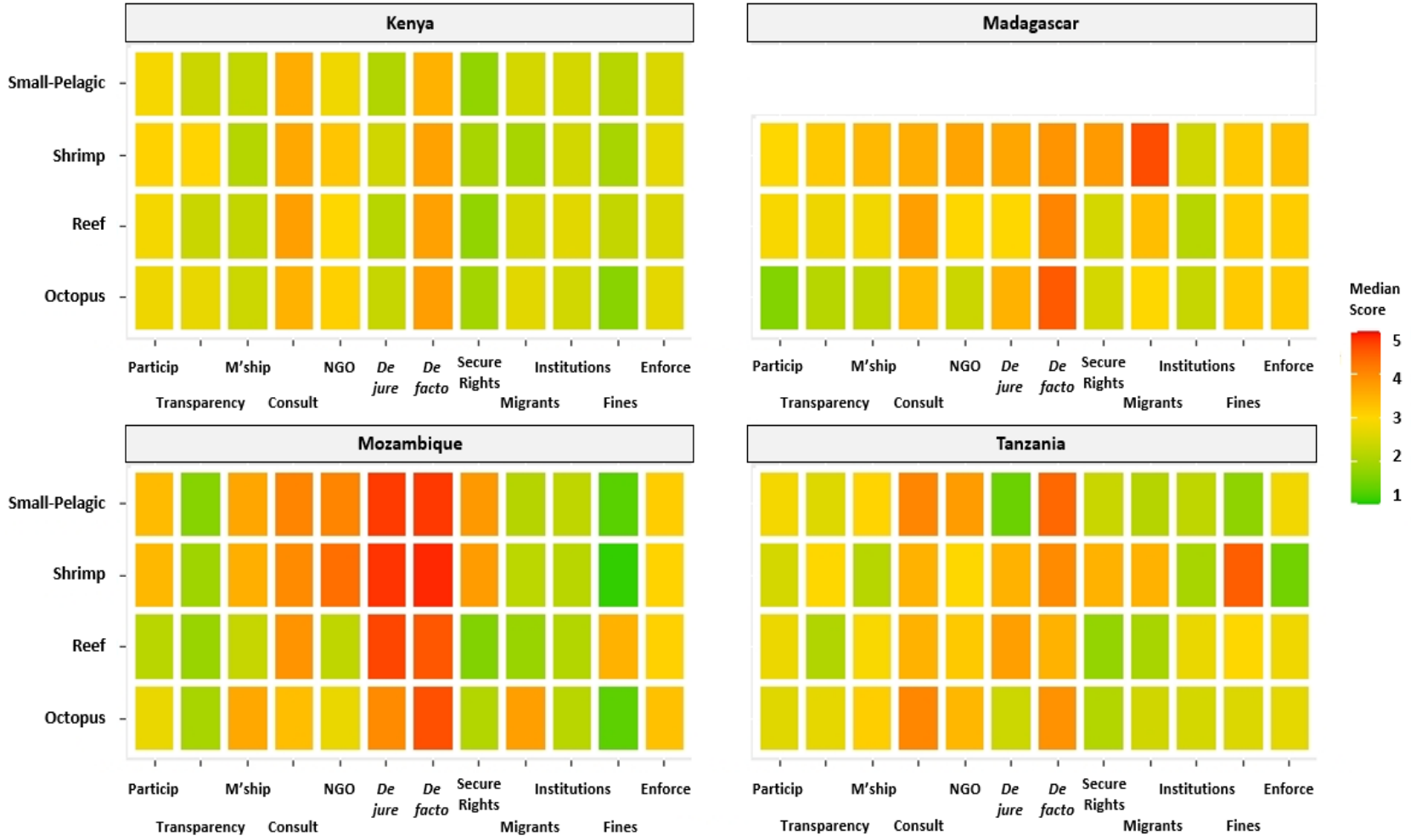
[65] Moreto & Lemieux, 2015 ; Petrossian, 2015

Again, the proposed review seminars would offer an opportunity to look at each indicator listed under this dimension to determine what aspects of the regulations and the decision-making that informs them need to be improved and what aspects should be better communicated.

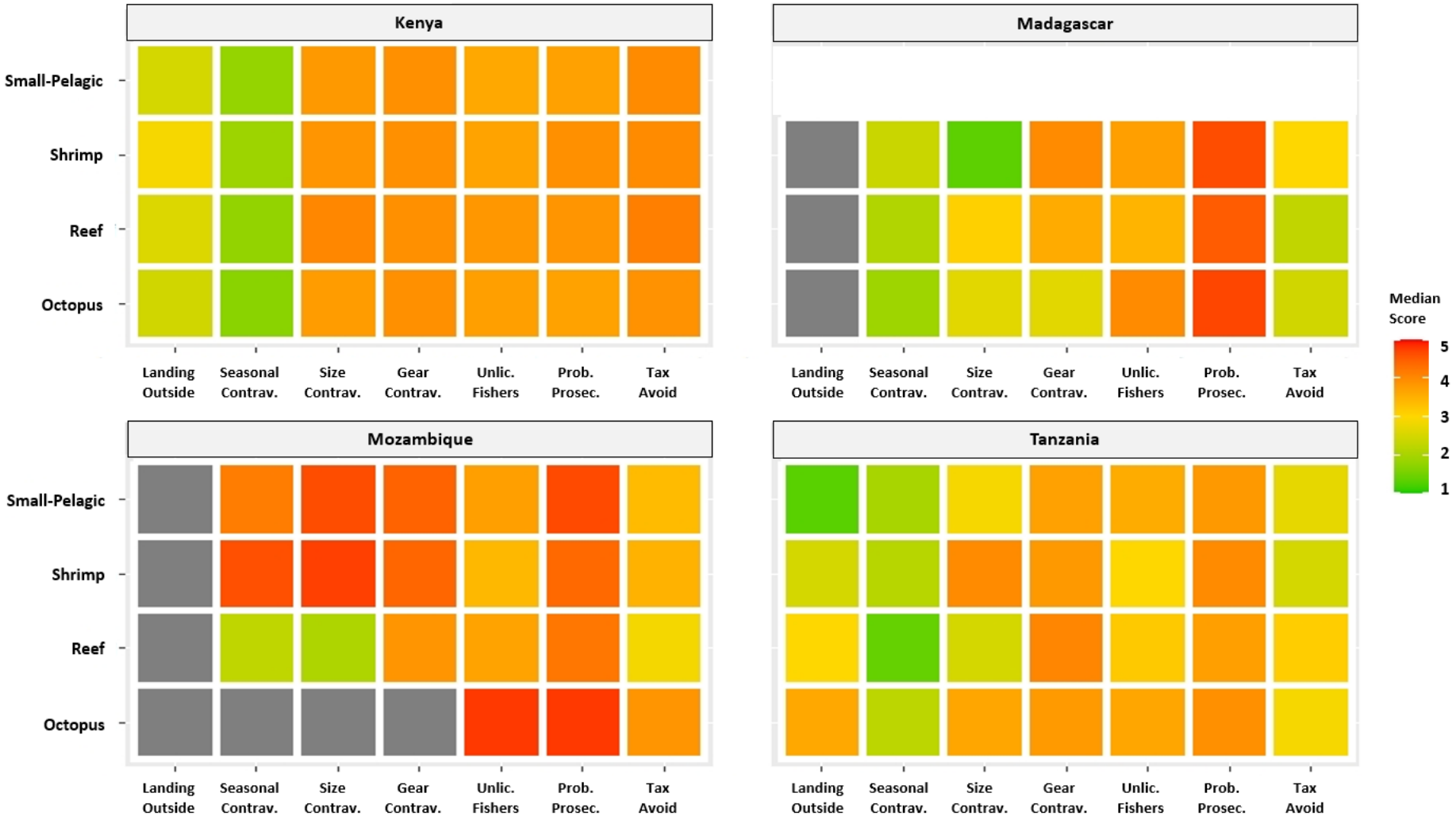
**But a specific recommendation can be made here and that relates to stock/resource assessment** where area-based management tools (ABMTs) are employed. Whilst ABMTs are widely used in the region and across many fisheries, given the shortfalls in reporting described earlier, and the limited application of stock assessments and wider evidence-based decision-making to inform regulations, their actual contribution to sustainable use of resources may not be fully understood and their potential wasted. Echoing the sentiments of many researchers, Garcia et al. (2022) observed that the '*effectiveness* [of ABMTs] *will depend on the appropriateness of the location; the quality of resource assessments and management advice, the suitability of measures taken inside it; and the rigour of their enforcement.*'. Stock assessments should, therefore, be a *sine qua non* for all conservation initiatives (which often involve donor partners and/or NGOs and to who this recommendation is also addressed) using appropriate tools for the data-poor contexts that characterise many situations in the WIO. This would be coordinated with the design of reporting systems to ensure the necessary data in available, either through routine sampling or from a programme of sampling.

## Annex 1: Figures of Interpolated Means by Fishery Attribute & IUU Dimension

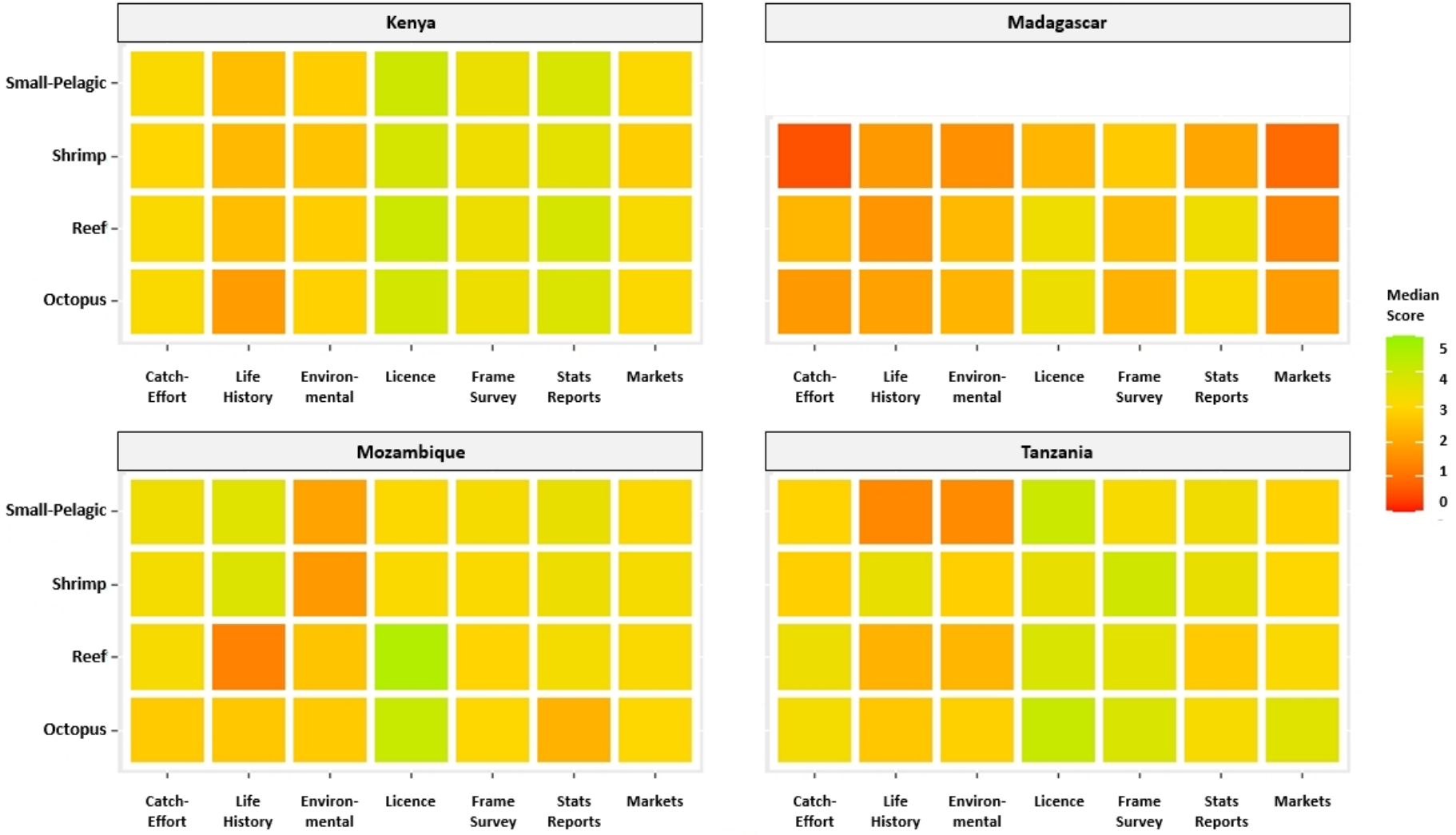
**ANNEX 1.1 - INTERPOLATED MEDIAN SCORES OF FISHERY CO-MANAGEMENT ATTRIBUTES, BY FISHERY AND COUNTRY**



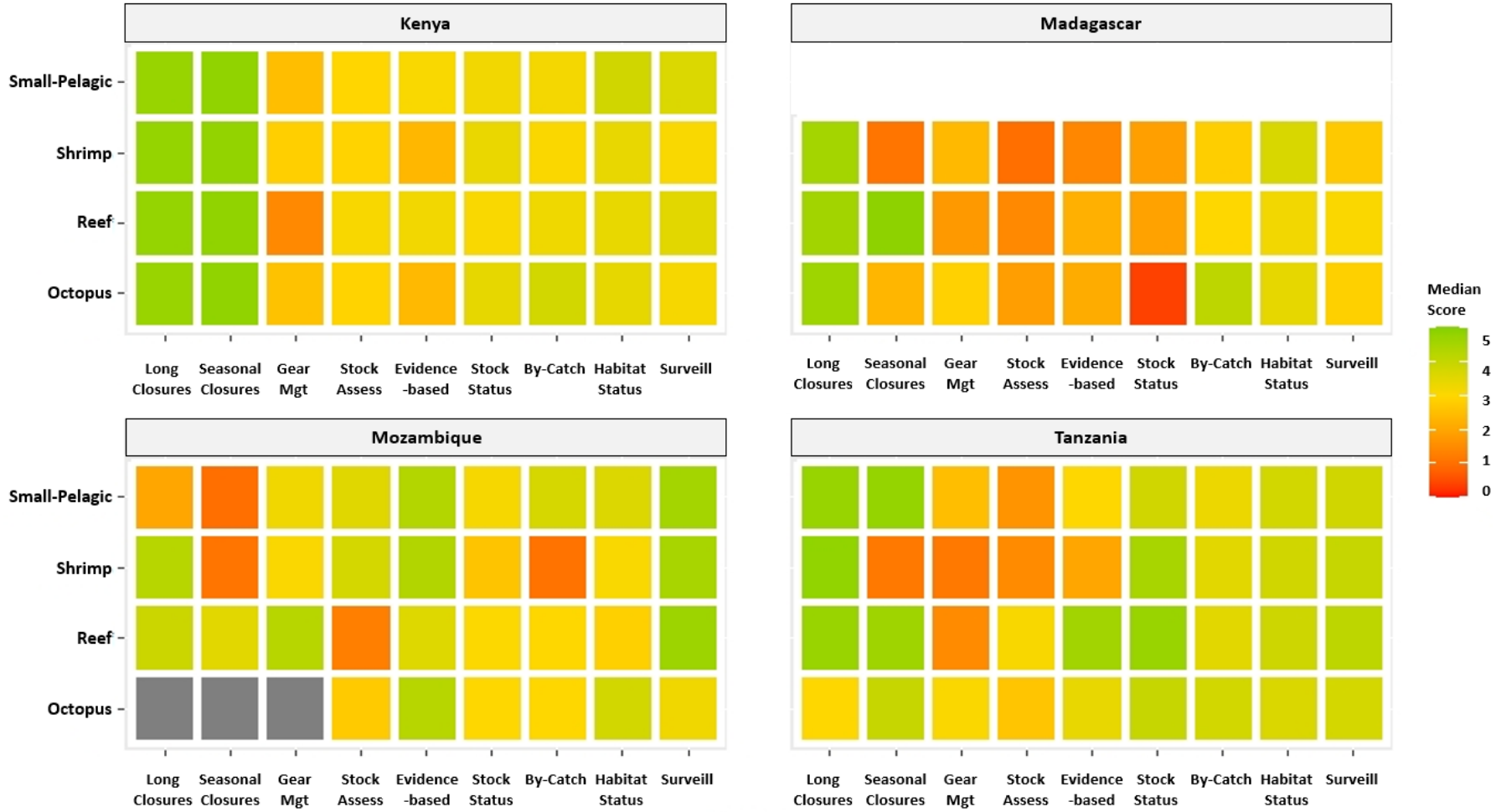
**ANNEX 1.2 - INTERPOLATED MEDIAN SCORES FOR ILLEGAL FISHING, BY FISHERY AND COUNTRY.**



**ANNEX 1.3 - INTERPOLATED MEDIAN SCORES FOR REPORTING EFFECTIVENESS, BY FISHERY AND COUNTRY.**



**ANNEX 1.4 - INTERPOLATED MEDIAN SCORES FOR REGULATORY EFFECTIVENESS, BY FISHERY AND COUNTRY.**



**Annex 2: Level of Agreement amongst national respondents on the prevalence of illegal fishing**

| Country | Agreement (Van der Eijk's *A**) amongst respondents | | | |
|---|---|---|---|---|
| | **Octopus** | **Small Pelagics** | **Shrimp** | **Mixed Reef** |
| **Kenya** | 0.08 | 0.14 | 0.12 | 0.14 |
| **Madagascar** | 0.08 | n/a | -0.03 | -0.01 |
| **Mozambique** | 0.39 | 0.20 | 0.23 | 0.06 |
| **Tanzania** | 0.28 | 0.06 | 0.26 | 0.21 |

*The measure '*A*' ranges from -1 to +1, where -1 indicates a polarisation of responses to either end of the scale (e.g., 50% chose a score of 1 and 50% a score of 5). An *agreement* of 1 indicates full agreement amongst respondents for one particular score (e.g., 100% of respondents selected a score of 3, or 5 etc.). A measure of 0 indicates that each category/score was selected by an equal number of respondents, a perfect dispersion (e.g., each scale score of 1-5 was selected by 20% of respondents).

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### 2.3.10. Rising Climate Risk and Loss and Damage to Coastal Small-Scale Fisheries Livelihoods

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**Draft under consideration for potential publication in a journal article*

## Executive Summary

Subsistence-oriented communities in tropical coastal areas face the greatest threat from climate change, with consequences manifesting through diminishing returns from small-scale fishing and farming ventures. The complementary climate, sustainable development, and biodiversity conservation policies target reducing climate risks, but effective policy outcomes depend on a thorough understanding of system-wide climate risk, community adaptation potential and gaps, and possible economic losses. Using four countries in the Western Indian Ocean (WIO) region as a case, we quantify climate risk to subsistence-oriented coastal communities. On average, economic losses of ecosystem services are predicted to increase with increasing climate risk, with annual losses of up to 23% and 32% of total economic value (TEV) (USD 516,828,468/year) under SSP2-4.5 and SSP5-8.5 scenarios by 2050, respectively. A comprehensive assessment of climate risks and ecosystem services can inform policy actions aimed at adapting, mitigating, and compensating for the loss and damage caused by climate change.

## Introduction

Climate change is causing damage to tropical coastal agroecological systems (AES) and compromising their ability to sustain resource-dependent livelihoods and cultures (Adger et al., 2013; Cinner et al., 2022). Mitigation efforts are hindered by uncertainty about the scope and magnitude of future climate risks among the most vulnerable low- and lower middle-income nations; how communities will cope with the negative impacts of climate change on sectors supporting subsistence economies; and adaptation occurring in practice and its efficacy in moderating risks (Brown, 2018; Cinner et al., 2022; Conway et al., 2019). Despite the attempts to mitigate (to reduce adverse impacts) and adapt (to cope with adverse impacts) to climate change, the efforts have not reached the scale necessary to offset the adverse impacts of climate change under current emissions scenarios (Masson-Delmotte et al., 2021). Moreover, climate risk and impact assessments and hazard mitigation plans commonly focus on physical exposure, are often sectoral, routinely omit the community socioeconomics, and overlook scale considerations (Conway et al., 2019). Here we develop and apply a framework for quantifying systemwide climate risks to ecosystem goods and services and subsistence-oriented livelihoods in coastal agroecological systems. Moreover, we contextualize the climate risk framework with small scale fishing and coastal subsistence farming and estimate the adaptation gap and potential losses arising from climate change to guide efforts to mitigate these impacts and paying compensation (to compensate for remaining losses)

## Research Overview

We estimated residual risk as a function of the potential impact, socioecological sensitivity, and adaptive capacity metrics. Sensitivity and adaptive capacity were based on socioeconomic surveys of 1460 households in 29 villages across four countries using a socioecological vulnerability assessment framework (Cinner et al., 2016, 2013, 2012; Thiault et al., 2021). Finally, we calculated L&D to the natural assets using estimates of the

value of tangible ecosystem services that would be lost as a function of projected climate impact (more details are provided in the Methods) (Fig. 2). Here, L&D refers to the potential losses of goods and services derived from natural assets in coastal agroecological systems that may result from the interactions of climate-related hazards, exposure, and vulnerability. In our analyses of L&D, we focus on the economic value of tangible ecosystem services, and exclude assessments of social, cultural, governance, and other intangible impacts (Manuel and Derrickson, 2017).

## Results

### Climate risk for subsistence-oriented communities in the WIO

Overall, there is substantial variability in climate risk across villages and climate scenarios, with risk scores averaging 0.37 (SD = 0.18) and 0.28 (SD = 0.14) for the SSP5-8.5 and SSP2-4.5 respectively (Fig. 1). The highest risk score was found in Tanzania (0.72) for Mjini Kiuyu under SSP5-8.5. The lowest risk score (0.006) is for Kiwayu in Kenya under SSP2-4.5, which increases marginally under scenario SSP5-8.5. There is notable variation in climate risk estimates by village based on their sensitivity and adaptive capacity (Fig. 1a). For example, several villages in Tanzania are at relatively high climate risk, due to low adaptive capacity and high sensitivity, accompanied by relatively high impact to the agroecological systems considered here. Droughts as measured using cumulative dry days and drought frequency indices are expected to become increasingly widespread, exacerbating damage to or destruction of subsistence crops, particularly in Northern Kenya where they are set to intensify. Increasingly, droughts are recognized as one of the most dangerous climatic stresses to global socio-economic sustainability and ecosystem health because of their impacts on productivity and vegetation mortality, which may in turn cascade into other hazards, such as crop losses (Yin et al., 2023). Subsistence farming would thus no longer be an effective alternative occupation for small-scale fishers. Similarly, heatwaves, which tend to co-occur with droughts and are expected to intensify under future scenarios, suggesting a challenging future for coastal communities.

### Adaptation gap and the cost of loss and damage

Our analysis demonstrates increasing spatiotemporal climate risk and highlights a need for increased mitigation efforts targeted at reducing greenhouse gas emissions and promoting sustainable development. For some places, living with residual risk and diminishing ecosystem services could become a reality with further global warming of 2 degrees or more in the near future. The development of a strategy for managing residual risks can assist in improving climate outcomes at local and national levels. This may involve increasing funding for Ecosystem-based adaptation (EbA) and mitigation (EbMs), particularly in areas where losses relating to economic value of ecosystem services will be greatest. Using conventional economic frameworks, such as valuation methods and inflation adjustments, it is possible to assess the value of ecosystem services of natural assets. Moreover, scenarios of climate risk can be linked to economic exposures using loss functions that define the

cumulative impacts of hazards on the natural assets that generate economic flows. Consequently, damage to the integrity of natural assets and their corresponding economic flows can then be integrated, in principle, into risk models to quantify the potential changes in economic flows. Loss functions define how total economic value changes as a function of physical hazards or climate risk. Therefore, future TEV and L&D will be affected by assumptions made about the rate of change of TEV, inflation and climate change scenarios.

Accordingly, we estimate Total annual Economic Value (TEV) based on accumulated monetary values based on published data of ecosystem service value (USD/year), including coastal (flood) protection, tourism, climate mitigation, and fisheries or agriculture services. Ecosystem valuation data is available for coastal flood protection – an intangible ecosystem service, consequently, it was incorporated as part of the TEV. Results indicate ~174.4 million USD potential total annual losses of ecosystem services to coastal communities (Mean = 6.01, SD = 4.7 million USD/year) due to unmitigated risk under scenario SSP5-8.5. This represents 32% and 23% of the total present-day TEV respectively.

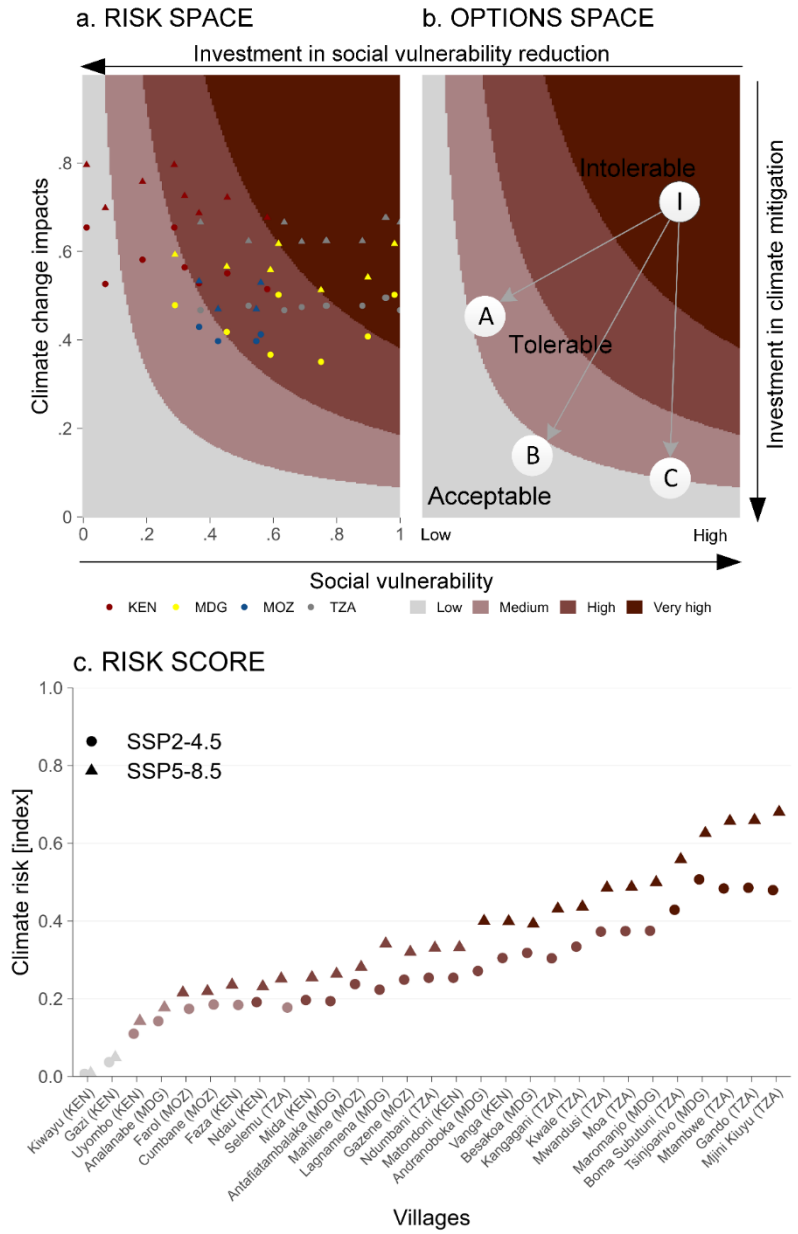


Fig. 1 Climate risk for coastal communities. (a) A risk cartesian space as defined by climate impact (y-axis) and vulnerability (x-axis) with four levels of climate risk represented by the color shades; (b) climate risk policy options for subsistence-oriented communities in tropical coastal agroecological systems, and. Intolerable risks are characterized by high impact and social vulnerability and require transformative measures for avoiding and managing increasingly intolerable risks. (c) relative climate risk scores across communities. *Note*: MOZ = Mozambique, KEN = Kenya, MDG = Madagascar, and TZA = Tanzania. Possible risk reduction policy outcomes (*I*) may differ depending on the level of both climate impacts and social vulnerability.

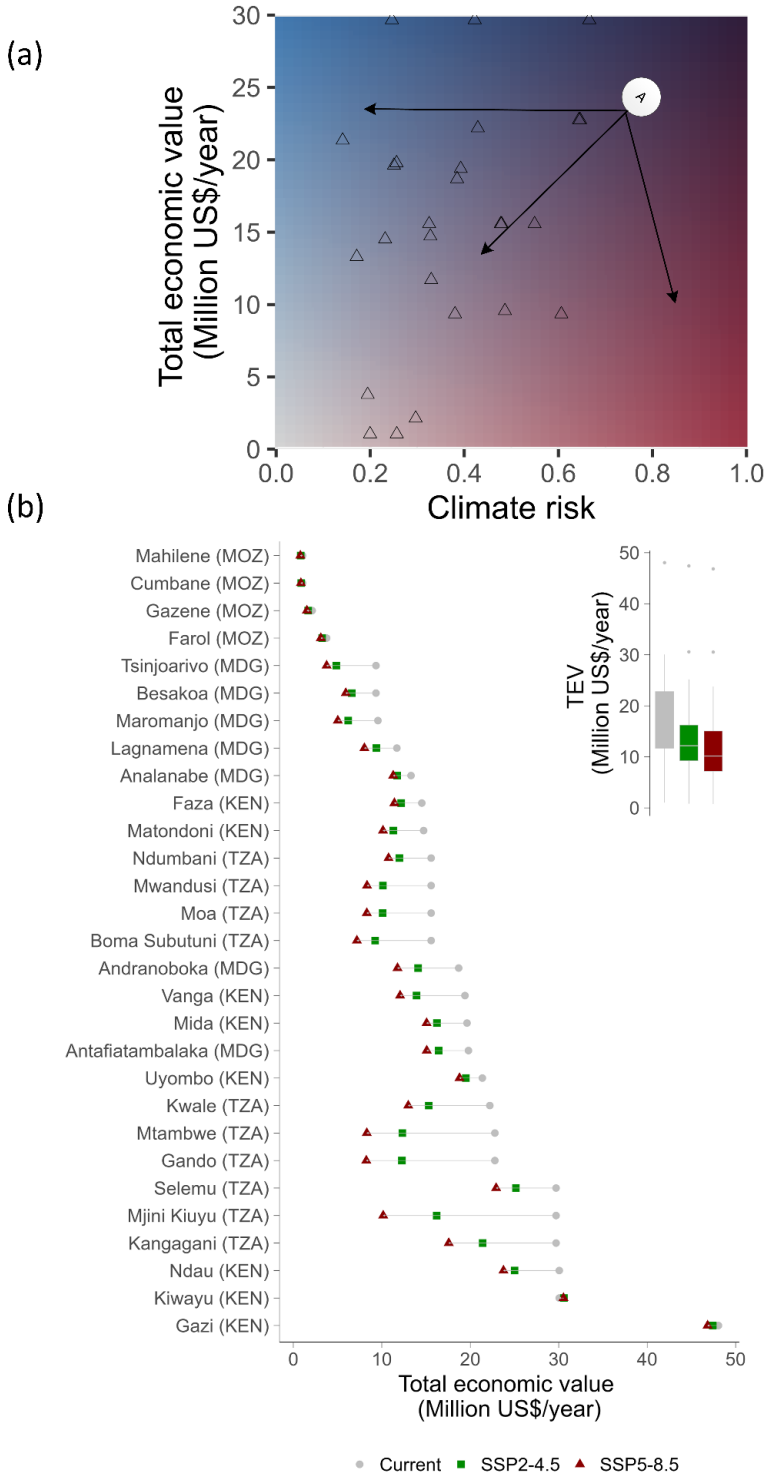


Fig. 2 Coastal villages risk potential economic losses under climate change. (a) Conceptual framework, (b) residual TEV losses, (c) relationship between current TEV and future climate risk.

We further examined the potential TEV losses by plotting predicted 2050 residual climate risk against the current TEV to illustrate the possible loss and damage scenario across the

residual risk gradient (Fig. 2a). TEV can be maintained, and loss can be avoided by mitigating climate risks and adopting restoration and ecosystem-based adaptation measures to maintain the integrity and preserve the economic value of the natural assets (Fig. 2a - Arrow A). In this ideal scenario, relative position of villages on loss space will shift to the left along the climate risk (x) axis, while maintaining their position along the TEV (y) axis. If the mitigation and adaptation actions at the local and international level are weak, potential residual risk decreases marginally accompanied with moderate TEV losses (middle arow) or increases above the predicted levels to lead to a collapse of ecosystems and services they provide with catastrophic losses (bottom arrow). Villages faced with higher climate risk by 2050 will likely incur higher annual economic losses, which mostly represents villages in Northern Mozambique and Kenya (Fig. 2b). The opposite is true for villages in Northern Mozambique and southern Kenya.

Considering the adaptation gaps and residual risks identified among the studied villages, managing agroecological risks in the WIO will require significant investment of financial resources, possibly facilitated through climate financing, biodiversity financing and damage and loss compensation. Despite developed nation's pledges to fund reparations under climate financing mechanisms, only half of the funds targeted for adaptation in Eastern Africa were disbursed in the past (Trisos et al., 2022). In addition to meeting commitments, the funding arrangements must assure that the most vulnerable and affected groups can access financial support (Dahiya and Okitasari, 2022). Yet, those responsible for planning and funding adaptation efforts may have a limited perspective on where support is necessary and how best to bolster climate resilience (Savvidou et al., 2021; Trisos et al., 2022).

**Policy recommendations**

1. Develop and implement a comprehensive regional climate information system to enhance capacity building and awareness efforts in order to effectively address climate risks.

Our preliminary results signal that the time is coming when some communities will have to undertake significant adaptation. Therefore, it is critical that coastal communities and stakeholders understand the risks they are exposed to.

2. Prioritize poverty alleviation strategies, aligned with Sustainable Development Goals (SDGs), within coastal communities to mitigate the compounded impacts of poverty and climate change.

Our findings also show that *significant* abatement and/or adaptation must occur across most communities. Most households of communities experiencing intolerable risk are either unemployed or spend enormous time conducting main economic activity, which receives low income from their catch sold. Correcting for and improving this almost assuredly depends on developing more effective actions, including livelihood diversification and poverty alleviation plans.

3. Provide/Increase funding for Ecosystem-based adaptation (EbA) and mitigation (EbMs), particularly in areas where losses relating to economic value of ecosystem services will be greatest.

A comprehensive strategy is needed for increasing ecosystem-based mitigation, including nature-based solutions. There is evidence that these options lead to livelihood improvement and carbon co-benefits. Doing all these will take time and more resources. This certainly raises the question of "what level of both (adaptation and mitigation) is required". Prioritising either adaptation or mitigation actions can reduce risk to an acceptable level, and focusing on both can indicate more resilient communities.

4. Governments in the region should strengthening natural resource institutions within the ICZM

As there are clearly barriers to implementing the approaches in low-income nations, communities might consider strengthening natural resource institutions within the ICZM. Establishing follow-up strategies could prevent maladaptation, which might have arisen because of the inaction of previously formulated policy.

5. Countries should conduct climate risk assessment, including CCVA, to understand possible futures and develop adaptation pathways under different plausible scenarios

Steps should be taken now to invest in capacity building to manage rigorous and systematic monitoring and LMMAs, especially within communities correctly considered low risk. This leaves at least one unanswered question? What can communities do when several "residual" risks arise? Findings show notable ecosystem service losses are expected even with adaptation, particularly useful for donors needing multisector aid.

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### 2.3.11. Leading the Coordination of a Regional OA Monitoring Network to Inform Implementation of Marine, Climate and Sustainable Development Goals

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2. *Dr. Rueben Makomere- Faculty of Law University of Tasmania*
3. *WIOMSA*

**Introduction: What are the policy limitations or science gaps that hinder the attainment of the global targets?**

Africa's marine resources hold the potential for achieving socio-economic development goals and bolstering health and resilience of marine ecosystems and coastal communities. The Continent's marine resources and ecosystem services play a role in alleviating poverty and promoting development in the face of transformative changes, including post-COVID economic recovery[i] and rapid demographic shifts.[ii]

However, achieving regional developmental goals, delivering a sustainable blue economy, and feeding a growing population will require ever more increasing reliance on WIO's marine resources that are threatened by climate change and ocean acidification (OA).

OA represents a unique and pressing challenge for the WIO region. It involves a series of chemical reactions occurring in the ocean, primarily driven by the increased absorption of $CO_2$, resulting in more acidic seawater.[iii] These chemical changes, such as reduced pH and diminished concentrations of carbonate minerals used by some marine species (e.g., coral reefs and shellfish) to create shells and skeletons, combine with other climate-related ocean impacts like ocean warming and declining oxygen levels to heighten the overall stress faced by marine species and ecosystems, diminishing their resilience against these and other stressors.[iv]

These changes are likely to intensify as this century progresses and have the potential to significantly alter marine ecosystems and associated ecosystem services for decades to come. The cumulative effects of OA and other associated stressors, WIO marine ecosystems and resources are vulnerable to the cumulative impacts of OA and climate change. This has impacts on the region's development goals, sustainable blue economy, and food security.

Landmark policy initiatives, such as the UN Decade of Ocean Science for Sustainable Development (Ocean Decade), the Kunming-Montreal Global Biodiversity Framework (GBF), and the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement, reflect the growing recognition of the importance of these issues.[v]

International and regional governance frameworks call for—or would benefit from—an enhanced focus on OA monitoring and research (**Table 1**). Across policy frameworks, there are several localized management actions that can be employed to combat OA and support vulnerable marine ecosystems and resources. However, the effectiveness of management strategies depends on knowledge of local factors and conditions, alongside an awareness around the costs or benefits of certain activities.

**Table 1. Example of relevant governance arrangements that call for—or would benefit from-- OA monitoring and research in WIO**

| | Global | Regional |
|---|---|---|
| **Marine Management Goals & Targets** | United Nations Law of the Sea (UNCLOS)<br><br>Boundaries Beyond National Jurisdiction Agreement (BBNJ Treaty<br><br>Kunming-Montreal Global Biodiversity Framework | Nairobi Convention & Decision CP 10/7 to Establish Regional Action Plan to address Ocean Acidification<br><br>Protocol for the Protection of the Marine and Coastal Environment of the Western Indian Ocean from Land-Based Sources and Activities<br><br>Convention for the Protection, Management, and Development of the Marine and Coastal Development in the East African Region |
| **Climate Adaptation Goals & Targets** | United Nations Framework Convention on Climate Change<br><br>Paris Agreement | African Union Climate Change and Resilient Development Strategy and Action Plan<br><br>East African Community Climate Change Policy<br><br>East African Community Climate Change Master Plan 2011-2031<br><br>Southern African Development Cooperation Climate Strategy |
| **Sustainable Development Goals & Targets** | UN – SDG Goals including goal 14.3 "to minimize and address OA"<br><br>SDG 1 – No Poverty<br>SDG 2 – Zero Hunger<br>SDG 13 – Climate Action<br>SDG 17 – Partnership for the Goals | Africa Agenda 2063<br><br>Africa Blue Economy Strategy<br><br>East African Community (EAC) Development Strategy 2050<br><br>Southern African Development Community (SADC) Vision 2050 |

## II. Do we understand or are we prepared for the implementation of these instruments at the national, or regional level?

To gain a better understanding of, prepare for, and address the dual ecological and developmental challenge posed by climate-ocean change and OA, it is imperative to enhance regional capabilities and coordination of scientific monitoring, research, and impact assessments. This information should serve as a foundational element of existing and emerging policy responses to the challenge.

While the Intergovernmental Panel on Climate Change (IPCC) can offer insights into global trends, there remains significant gaps in information concerning national or local trends as well as the localized impacts of OA. This information gap creates impediments to achieving equitable and holistic responses to OA at the domestic level. In addition, regional information gaps also obscure valuable insights, perspectives, and knowledge from the region that could inform effective response.

The Western Indian Ocean Marine Science Association (WIOMSA) are critical players in increasing regional scientific knowledge, prioritizing discrete projects at local scales, and are well aligned to provide decision makers and communities with research and monitoring information on current and emerging marine socio-ecological threats and potential responses.

In 2018, the Western Indian Ocean Acidification (WIO) OA Monitoring project was established by WIOMSA in conjunction with regional institutions and experts. The monitoring project resulted in the WIO OA report in 2022, which examines the state of OA and makes recommendations for future research and information priorities across 6 countries: Kenya, Tanzania, Mozambique, South Africa, Mauritius, and Seychelles.

This research initiative provides a baseline that can foster the development of a more comprehensive and integrated strategy for ocean acidification monitoring, research, and impact assessment across the WIO region. The research also identifies priority knowledge gaps that must be addressed to enhance management response to rising acidity.

Some of these include:

- Expanded coverage on monitoring assets in the region.
- Capacity for robust laboratory equipment.
- Increased funding for research assistants conducting ex-situ and in-situ experiments.
- Expanded research to incorporate multiple stressors of warming, OA and deoxygenation.
- Increased biological research on the impacts of OA to key fisheries, shellfish and coral.

- Monitoring OA conditions in coastal waters to identify hot spots or refugia (worse or better conditions).
- Research to evaluate the potential of mangrove and seagrass to remediate the effects of OA on nearby coral reef or near shellfish.
- Develop regional vulnerability assessments that prioritize OA research of species and ecosystems that have socio-economic significance or dependence.

## III. Is there anything that needs to be done at the regional level to enhance attainment of targets at the national and global levels? Leveraging existing obligations to situate and enhance support for OA monitoring and research.

In 2021, the Conference of Parties to the Nairobi Convention requested the secretariat to develop, "A regional action plan to both monitor and enhance national climate change intervention strategies to minimize the impacts of ocean acidification." (*Decision CP 10/7*) The decision has established an opportunity for integrating ongoing OA monitoring and research work into the broader governance of the Convention.

With this approach, OA monitoring, research, and impact assessment need not be viewed as isolated, stand-alone activities, but as integral components of larger resource management. There are political and practical opportunities of such a regional OA program established under the Nairobi Convention, including a deeper relationship to policy, management strategies and communications about OA.

A regional OA program should be part of the WIO's approach to integrated ocean management in the context of climate change. This integration is critical for managing climate-ocean change and advancing the development of a sustainable blue economy. Moving forward with a coordinated and well-funded regional OA monitoring network and research agenda in the WIO, would provide a value model for the Continent.

## IV. Recommendations: What could be the WIO region's contribution to the global debate on the subject?

**Operationalize a Regional OA Program**:

Implement a regional OA program, as advocated by the Nairobi Convention, and integrate into the WIO's approach to resource management. The development of a robust regional OA program should integrate monitoring, research, and impact assessment to directly inform mitigation, adaptation, and priorities of national governments across relevant policies. These

efforts should focus on enhancing marine socio-ecological adaptation and resilience to OA and other perturbations at local, national, and regional scales.

**Integrate OA Information Across Relevant Policy Goals**:

There exists a diverse suite of existing policy arrangements whose implementation would benefit from increasing OA information in the WIO. Parties to the Nairobi Convention should include OA within their technical and financial support mechanisms for critical policy priorities, including those related to sustainable blue economy, climate action, and sustainable development. This ensures that OA information becomes an integral component of these broader policy objectives. Existing marine management, climate change, and sustainable development policies provide a crucial foundation for utilizing OA information.

**Call for Increased Climate Adaptation Funding to Support OA Knowledge and Response:**

Regional proposals should be put forward to funding entities like the Green Climate Fund, Global Environment Facility, or Development Banks, making the case that well-funded and intentionally coordinated regional OA monitoring and research agenda is an imperative and a necessary use of climate-adaptation financing at scale.

Climate financial mechanisms have existing marine and coastal project portfolios that increased OA information could further support and enhance. Examples include projects focused on developing the blue economy, coastal adaptation, sustainable aquaculture, and ecosystem restoration.

**Institutionalize and Enhance Science-Governance Collaboration**:

Establish and enhance research and advisory frameworks that bridge the gap between scientific knowledge and governance. This facilitates the identification and utilization of the most influential marine, climate and developmental policy frameworks that can benefit from and mainstream the existing and emerging scientific information. This fosters a more profound connection to policy responses aimed at addressing current and emerging socio-ecological challenges in the region.

## 2.4. Opportunities for implementation of the High Seas Treaty (BBNJ) in the WIO, and, operationalization of the international legally-binding instruments on plastics.

This section includes papers that discuss and attempt to make recommendations of a technical and/or policy nature in the context of national, regional and global dimensions addressing opportunities for implementation of the High Seas Treaty (BBNJ) in the WIO, and, operationalization of the international legally-binding instruments on plastics.

### 2.4.1. Application of the Urban Monitoring Framework in Linking Data to Policy and Action

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**Background and Rationale**

Lack of good quality, relevant, accessible, and timely data on cities is a key element impeding progress in not only monitoring and reporting on global agendas frameworks such as the 2030 Agenda for Sustainable Development and the New Urban Agenda (NUA), but also in formulating policies and designing programs that respond to urban dynamics and challenges of communities living near marine and freshwater ecosystems. Coastal regions are home to a large and growing population and face higher environmental vulnerabilities than other regions. These vulnerabilities are generally associated with increasing population densities and intensified human activities on land and water. As a result, many urban decision-makers for coastal cities around the world operate in an environment of uncertainty, often allocating resources to immediate and convenient needs rather than investing in data informed transformative actions such as those associated with SWOT analysis and data trends projection.

Coastal cities require monitoring systems to support their vision and long-term plans for sustainable development. This requires periodic assessments on their state of development and evaluation of policy outcomes and impact of specific plans and actions. Through generation of reliable, timely, disaggregated, and accessible urban data, these systems can help cities to track their progress towards sustainability and to transition from subjective decision making to evidence-based decision making.

To help address the challenges related to access and use of urban data worldwide, UN-Habitat has, over the past two decades, developed tools and methodologies for urban data collection and analysis. This has been achieved through partnerships with countries, cities

around the world, as well as with other development agencies and institutions. One of the key tools developed by UN-Habitat is the Global Urban Monitoring Framework (UMF)[66] an inclusive city diagnosis framework which was endorsed for global implementation by the United Nations Statistics Commission (UNSC) in March 2022.

The UMF is a monitoring framework which not only allows countries and cities to collect data on their performance against about 77 indicators across 5 urban domains and 4 city objectives, but also acts as a practical framework for the formulation, implementation and monitoring of policies and practices on sustainable development and increased urban prosperity. Since its endorsement by the UNSC, the UMF has gained popularity and is currently being implemented by over 30 cities.

As part of global implementation of the framework, the UN-Habitat in collaboration with the Western Indian Ocean Marine Science Association (WIOMSA) supported the implementation of the UMF for Mombasa and Dar Es Salaam cities between June 2022 and May 2023[67]. For being among the first detailed UMF implementations, these case studies provide strong insights into the value of urban data for coastal cities and the provide recommendations for bridging the gaps between data/knowledge and policy, and policy and action.

**The City Diagnosis Process**

The UMF implementation process for Mombasa and Dar es Salaam involved stakeholders' engagement and extensive data processing. At the project inception workshop, key project stakeholders were mapped, and introduced to the framework and its implementation process. These stakeholders included city authorities and their development partners, the national statistical offices, civil society group, and youth groups among others. Further, against the UMF domains, urban performance indicators were identified, and data collected.

The data collection involved mixed processes based on each indicators' metadata. Secondary data was collected from censuses, survey, and global datasets from reliable data platforms. As many data sources lack urban statistics that are disaggregated by geography, a household survey was conducted in Mombasa to generate data that is analysable at smaller administrative units. A complimentary facilities' mapping survey was carried out to map location of public facilities to assess their levels of accessibility by the city populations. These surveys were carried out by trained youth groups and using open-source mobile data collection applications. Mapping and spatial analysis of the collected data were carried out to generate spatially disaggregated statistics. Some indicators required information from key

[66] https://unhabitat.org/the-global-urban-monitoring-framework
[67] https://data.unhabitat.org/pages/urban-monitoring-framework

informants, and this was achieved based on interviews with informants guided by the UMF interview guides and checklists.

Each indicator's data points were benchmarked against global city performances and a standardized performance score allocated. This allowed aggregation and averaging of performance to identify gaps in performance at the indicator, domain, city objective, and index levels. Validation of data and findings involved stakeholders' workshop where key stakeholders reviewed the data, findings, trends, and their implications. The data, findings, and recommendation were compiled into a report, and data integrated with UN-Habitat's Global Indicators' Database.

**Key Findings and Recommendations**

The implementation revealed that the two cities have significant gaps to overall sustainability. Better performances were observed in the domain of governance while weak performances were noted in the domains of economy and environment.

For Mombasa, analysis showed that the factor contributing to the reduced performance of the economy domain are related to unemployment, especially for the youth, and limited access to tertiary education. The weak performance on the environment domain is related to limited availability and access to green spaces, protected areas, open public spaces. This is coupled with unsustainable land consumption/urbanization. On the other hand, the society domain performed only marginally better than the economy and the environment domains with factors contributing to its reduced performance being related to health and hygiene, including poor performance on mortality rates, life expectancy at birth, and access to handwashing facilities. Additional indicators straining the performance of the society domain are on neighbourhood safety and poor access to basic facilities and services, notably the health and education facilities.

For Dar es Salaam, the culture, economy, and environment domains had the weakest performance. Most of the weak areas on the performance of Dar es Salaam overlap with those of Mombasa, the key ones including unemployment, poor access to higher education and internet, and gaps in solid waste management.

Based on the similarities in the two cases, the implementations recommended the following:

1) **Urban data management:** The studies relied on data from different sources, most of which were challenging to acquire. As such, the research recommends the development of urban databases to ease the processes of data acquisition and utilization by the city during decision making.

2) **Focus on the city beyond administrative demarcations:** Data from the project revealed that the impacts of urbanization are felt beyond city administrative boundaries, the key one being loss of biodiversity because of expansion of built-up areas. Accordingly, this project recommends analysis of city units based on the functional city boundaries, and this can be guided by the application of the Degree of Urbanization (DEGURBA)[68] approach for defining cities. With DEGURBA, cities can generate urban data that is comparable and that considers the urban-rural transitions.

3) **Investment on the enhancement of the economy:** The project recommends investment on employment, improved environment for small and medium businesses, higher education, opportunities for the youth which is also connected to neighbourhood safety and reduction of crime. This can be pursued along the cities' strategic goals, including in relation to the blue economy opportunities.

4) **Investment on the enhancement of the environment:** The project recommends a focus on the improvement of the cities' green areas and open spaces for recreation, conservation, and culture. Spatial data shows that the cities are sprawling, and there is an urgent need to plan for compact development especially on the outskirts of the city. This will in turn have positive impact on access to services such a water and sanitation, education, and health.

5) **Spatially targeted interventions:** Both cities exhibited huge spatial inequalities on most domains and for indicators where spatially disaggregated data could be accessed. It is therefore recommended that future interventions on the city development be prioritized by geography, settlements patterns, and demand for services.

**The Data-Policy-Action Gap**

The implementation of the UMF for Mombasa and Dar es Salaam also reviewed the development framework guiding planning and investment in the two cities. It was noted that the cities have comprehensive long-term plans such as the Dar es Salaam City Master Plan (2016-2023) and the Mombasa County Integrated Development Plan. While these plans identify general priorities areas for the cities to invest in, there is limited evidence of uptake of scientific research into the cities' long-term planning. The effect of this is actions by cities that may not connect, or only remotely connect, with the most pressing needs of the cities.

From the data perspective, among the lessons learnt by the two implementations is that cities require to increase their efforts in generating, computing, and hosting city level datasets. This includes expanding their scope of priority datasets to cover some overlooked areas such

[68] https://ec.europa.eu/eurostat/web/degree-of-urbanisation/background

as culture. The cases also revealed the importance of data disaggregation as a tool to identify vulnerability by geography, social classes, gender, age, and disability. This can be realized even more conveniently through establishment of urban observatories, which brings together city stakeholders to collect, manage, analyze, and report on data based on the city demands.

It is noted that, sustainable development framework, Agenda 2030, sets targets to be realized by the year 2030, and without baseline data, cities will not be aware of the impact their efforts are yielding on the scales of urban sustainability, and are likely to neglect some key components of urban sustainability.

**The Scale up – WIO Region Recommendations for the Nairobi Convention**

Based on the UMF implementation for Mombasa and Dar es Salaam and a review of the similarities in the two cases, the project highlights the following recommendation as relevant for sustainable management and use of the marine and coastal environment.

- **Development of a strategy on urban data management** – The gaps in urban data availability has impact on the actions that are taken by city authorities, and this widens the gaps between data, knowledge, policy, and action. A preferred model for this intervention includes setting up a network of WIO urban observatories to operate at the local and regional levels. The UN-Habitat provides guidance on setting up and utilizing urban observatories (Link).
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- **City diagnosis** – They study notes that – while there are efforts to by cities in the WIO region to identity their challenges and opportunities – cities have not invested in comprehensive urban monitoring, such as urban monitoring based the UMF. Urban issues are largely connected, and comprehensive monitoring allows cities to map root causes of urban challenges and also rank them systematically for more impactful interventions. This study recommends support for cities in urban monitoring which can also be linked to performance reporting through the VLRs.

- **Vulnerability assessment at high spatial resolution** – Disaggregation of data by geography revealed high levels of inequalities among urban settlements, even within the same city. Vulnerability assessment that includes overlaying multiple data layers could provide granular data that shows relationships among settlement typologies, natural disasters, degree of urbanization, pollution to marine ecosystems, and economic activities among others.

### 2.4.2. Marine plastic pollution: Research needs to support the upcoming international legally binding instrument

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#### Background and rationale

Global plastic production is rapidly increasing hence positively correlating to plastic pollution in the environment. Approximately 79% of plastic material have been reported to be released into the natural environment, 9% undergo recycling and about 11% undergo incineration (Geyer *et al.*, 2017). Once in the environment plastic pollutants can be transported from land into rivers and eventually into marine environment (Jambeck *et al.*, 2015). Plastic pollutants are categorized into macroplastics that are large 25-1000mm in size, mesoplastics that are medium 5-25mm in size, microplastic that are small 1-5000µm in size and nanoplastics that are <1µm in size (Bråte *et al.*, 2017; GESAMP, 2019).

Marine plastic debris have been reported to have detrimental effects on organisms and the environment at large. There have been reports of plastic ingestion and entanglement of various marine organisms leading to distress and even mortalities. Ingested plastic material cause obstruction of the digestive tract as well as acting as vectors for persistent organic pollutants (POPs), heavy metals and microorganisms from the environment (Massos and Turner, 2017). Microplastics have the potential for cellular effect like altering fishes' behavior when they penetrate the brain tissues through blood circulation (Mattsson *et al.*, 2017). In humans, MPs have been found to cause oxidative stress, DNA damage, organ dysfunction, metabolic disorder, immune response, neurotoxicity, and reproductive and developmental toxicity (Li et al, 2023).

#### Linkage to regional and global processes

The Indian Ocean is bordered by mostly developing countries, some with high population densities and inefficiently solid waste management including plastic pollutants (Pattiaratch et al., 2021). Recognizing the danger that plastic pollution continues to pose in the environment, biodiversity and humans, many countries have attempted to put in place policies and regulations to curb plastic pollution throughout the plastic life cycle stages (upstream, midstream, and downstream components) with varying success. The ban on plastic single use carrier bags has been implemented in most of the countries in WIO region with some variabilities especially in the thickness of the plastic used. In Kenya, for instance, the Nairobi City Council Solid Waste Management Act (2015) provides a county-level framework for solid waste management and prohibits manufacture of plastic bags less than 30 microns thickness and smaller than 8x12 inches. This was followed by Plastic bag ban (2017) that banned single use plastic (SUP) bags from production, importation and distribution, while the Wildlife Conservation and Management Act, (2020) banned the use and littering of protected areas such as national parks, beaches, forests, world heritage sites, biosphere reserves, Ramsar sites, and conservation areas with single use plastics. In Tanzania Environmental Management (Prohibition of Plastic Carrier Bags) Regulations,

(2019) restricts the importation, exportation, manufacture, sale, supply, storage and use of plastic carrier bags within mainland Tanzania. Zanzibar banned the importation of single use plastics less than 30microns in 2006. In 2019 the government passed the solid waste management regulation that requires waste segregation and uses the Polluter Pays Principle in waste management. Similarly, Uganda implemented the Plastic Bag Ban (2009) that prohibits plastic bags less than 30 microns in the country. Similarly, in other African countries in the region attempts to curb environmental plastic waste has been made through ban on single use plastics. For instance, Malawi's Plastic Bag Ban, (2015) prohibits use, sale, production, exportation, and importation of plastic bags, less 60 microns. South Africa banned certain plastics through the Plastic Carrier Bags and Plastic Flat Bags, (2003) that prohibits manufacture, trade, and commercial distribution of domestically produced and imported plastic carrier bags and plastic flat bags. In Mauritius Plastic waste is addressed by 45% of the legal frameworks that are concerned with waste in general and marine litter including the Plastic Bag Ban, (2016). Although attempts to curb plastic pollutions have been made through various legal and regulatory frameworks in the region, environmental plastics continue to accumulate.

On the other hand, ban on plastics use in these countries does not apply to microbeads and other single-use plastic products apart from Mauritius. The government of Mauritius recently implemented the Environment Protection (Control of Single Use Plastic Products) Regulations, (2020) that banned all non-biodegradable single-use plastic products, thereby minimizing the existence of plastic products in the country.

Mid this year the East African countries came together to discuss the issue of environmental plastics. The law makers were unanimous in the agreement to tackle single-use plastics, transition to a circular economy, including increased use of material substitutes to ensure a healthy environment. A healthy environment for the East African community countries could translates to a better WIO. However, the WIO region is surrounded by more countries than the East African countries, and includes the Southern African coastal and landlocked countries and the SIDs that need to be looped in regional plastic waste regulations since many rivers entering the WIO come from the hinterland. Currently the intergovernmental negotiations on a legally binding instrument that seeks to end plastic pollution is on-going. At the end of these negotiations countries will be required to implement actions such as update national action plans reflecting country-driven approaches to contribute to the objectives of the instrument, promote national action plans to work towards the prevention, reduction and elimination of plastic pollution, and to support regional and international cooperation, as well as periodically assessing the progress of implementation of the instrument, and the effectiveness of the instrument in achieving its objectives, to provide scientific and socioeconomic assessments related to plastic pollution, (UNEA, 2022). Countries will need to domesticate the agreement and implement and monitor the success of the adoption as well as the impacts of its implementation in terms of plastic pollution. To effectively achieve this, countries need to develop standard monitoring protocols and assess the current status in terms of plastic pollution.

## The subject matter being addressed

Marine plastic pollution is a major issue due to the impacts it has on environmental health, human health and impacts on biodiversity. The Indian Ocean receives enormous levels of plastic waste from polluted rivers and adjacent coastal cities and settlements. Despite this, the ocean basin is under studied hence the distribution and impact of plastics and microplastics not well described and understood compared to the Pacific and Atlantic Ocean (Pattiaratch et al., 2021). Along the Kenya coast, plastics make up a larger percentage of marine macro and meso-litter in several Kenyan beaches (Okuku et al., 2020a, 2020b). Microplastics have been recorded in surface waters and in zooplanktons (Kosore et al., 2018), macroinvertebrates (Awour et al., 2020; Awuor et al, 2021) and in marine fishes, water and sediments (Kerubo et al., 2021a and 2021b; Kerubo et al, 2022). With increase in use of plastic products during COVID-19 pandemic, it would be expected that plastic pollution may have increased in the marine environment since solid waste management has been a challenge (Okuku et al., 2021). In other WIO countries such as Tanzania, data from beach cleaning indicate that 70% of anthropogenic litter on the beaches consist of plastics (Shilla, 2019). This high amount of plastics litter on beaches and other tourism sites was mainly attributed to tourism activity (Maione, 2019). In South Africa, studies on microplastics have reported on MPs concentrations in the water, sediments and fauna but only about 42% of studies report on polymer type due to lack of equipment to identify polymers (Mvovo, 2020). Attempts to model the transport and fate of marine plastics along the beaches in South Africa provides much lower values than global estimates (Ryan, 2021), pointing to the need for more data to enable development of better models.

In most WIO countries there is under reporting of the status of plastic pollution especially microplastics in the marine environment due to paucity of data as a consequence of limited studies especially on microplastic (Shilla, 2019; Mvovo, 2021). There is also lack of capacity and infrastructure that limits the studies and lack of standardized protocol for analysis and reporting. More data on marine plastic pollution is required through monitoring and evaluation of plastic pollution in the region in order to inform policies implementation and evaluation in the long-term.

The few studies done in the region show lack of a continuous monitoring and evaluation plan that would involve acquiring and presenting real time data on the status of macro and microplastics in the marine environment. There is also lack of data on plastic pollution in the offshore waters and deep-sea sediments in the WIO region. Since the ocean is the ultimate sink for plastic pollution, its continuous monitoring will serve as an indicator whether the various policies on plastic pollution implemented have been effective.

## Recommendations

There lacks a continuous scientific monitoring and evaluation plan that involves acquiring and presenting real time data on the status of marine macro and microplastic in the marine environment. Since the ocean is the ultimate sink for plastic pollution, its continuous

monitoring will serve as an indicator whether the various policies on marine pollution are effective or not

There is need to support capacity development (human and infrastructure) to facilitate the process of data collection for monitoring to assess and evaluate the status of policy implementation.

Encourage regional collaborations on plastic pollution research and development of standardized assessment protocols for plastics including microplastics.

In developing monitoring programs, the high seas and the sea bed should be included as most of the plastics end up there in the open ocean.

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