MARINE **SPATIAL PLANNING** and the Blue economy in Kenya

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Published in 2023 by the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization and the Secretariat Office of its Sub-Commission for Africa and the Adjacent Island States (IOCAFRICA).

For bibliographic purpose, this publication should be cited as follows: IOC-UNESCO. 2023. *Marine Spatial Planning and The Blue Economy in Kenya*. Paris. Nairobi, UNESCO. (IOC Technical Series, 177).

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Cover photo: © Dan Baciu/Shutterstock.com

Graphic design: Gordon Arara

(IOC/2023/TS/177)

This document was co-funded by the Government of Sweden and the European Maritime and Fisheries Fund of the European Union.

Dedicated to the memory of

The late **Hon Arafa Salim Baya** (HSC)

~ A gallant solider and champion for the coastal environment ~

Table of Contents

Foreword

Kenya has recently embarked on a journey to develop a National Marine Spatial Plan for the Exclusive Economic Zone (EEZ) and nearshore waters. The intention of this process is to provide strategic alignment of the Blue Economic sectors within the marine and ocean space to enable them to harness the highest benefits.

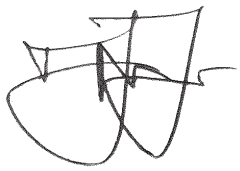
The sustainable use of the ocean and its biodiversity depends on appropriate planning and management of human uses. Marine Spatial Planning (MSP) has been advocated as a tool used for the distribution of human activities in marine areas. The allocation of marine spaces for different activities is important in the achievement of ecological, economic, and social objectives within this national planning framework.

This report captures the dialogue held between different sectoral players on environmental pressures along the Kenyan coast and highlights critical aspects that are important for consideration as Kenya develops its Marine Spatial Planning (MSP). The report also provides much needed information on how to foster coordinated actions and investments in the marine and coastal space and key considerations for such processes.

Aspects of conflict reduction in the search for equitable distribution of benefits are key considerations of this process as well as the elaboration of opportunities for new and innovative uses of the marine space in the development of aquaculture initiatives for Kenya.

Kenya is currently at the pre-planning stage of the MSP and this involves stakeholder mapping and engagement. Majority of the remaining steps are of a technical nature, but our belief is that stakeholders and major players will make the difference in this journey.

I applaud the Intergovernmental Oceanographic Commission (IOC-UNESCO) in partnership with the Kenya Marine and Fisheries Research in the mobilization experts who contributed critical lessons during the virtual workshop series. I remain hopeful that the lessons shared in this report will be useful in guiding the emerging Marine Spatial Planning process for Kenya.



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Preface

The blue economy is predicted to be an important driver for economic growth in the coming years. However, despite of its enormous potential for growth, the ocean space and the resources within it face significant pressures from a myriad of threats including overfishing, pollution, coastal development, ocean acidification and climate change. Goal 14 of the 2030 Agenda for Sustainable Development requires the protection of aquatic ecosystems by preventing these challenges. The Goal also focuses on the ocean's impact on human lives, to facilitate sustainable ocean-based economic, social and environmental benefits within the planetary boundaries of oceans and coasts.

Achieving a sustainable blue economy calls for a strategic and integrated approach to planning the ocean space. Subsequently, Marine Spatial Planning (MSP) has been widely recommended as a key instrument to integrate the sustainable development agenda in the ocean space and provide a breeding ground for new development paths towards a sustainable blue economy. Since 2006, the United Nations Educational Scientific and Cultural Organization (UNESCO), through its Intergovernmental Oceanographic Commission (IOC) has been proactive in promoting and supporting science-based, integrated, adaptive, strategic, and participatory MSP concepts among and between its member states, with the goal of improving cross-border and transboundary cooperation where it already exists and promoting MSP processes in areas where it is yet to be put in place.

UNESCO has supported Kenya in multiple initiatives aimed at providing strategic alignment of the country's Blue Economic sectors within the coastal and ocean space to enable the country to harness the highest possible benefits. This report is an important product of joint efforts with the Government of Kenya, aimed at providing a common platform for dialogue between different stakeholders, while simultaneously understanding key anthropogenic and environmental pressures along the Kenyan coast. The report also highlights critical aspects that are important for consideration as Kenya develops its Marine Spatial Plan.

The report underpins that stakeholder participation is critical in obtaining societal acceptance with inclusiveness of government regulations in management and conservation of the finite national marine resources. It further outlines the need to achieve socio-economic objectives and integrate cultural aspects of the coastal communities as well as the underwater cultural heritage. It also shows the need for scientific research in the MSP process in order to achieve a holistic approach that addresses social, cultural, economic, and environmental objectives and as such achieve sustainable development.

Whereas Kenya, and many other countries in Africa, have made some important steps towards initiating and adopting the Blue Economy approach, it is crucial to acknowledge that several obstacles lie ahead. Development, implementation and evaluation of marine spatial plans for a sustainable Blue Economy requires a diverse set of resources, including institutional governance frameworks, financial support as well as range of human skills and expertise.

UNESCO will continue to support Kenya in the development of its Blue Economy strategy as part of the implementation of the 2030 Agenda for Sustainable Development and its SDG 14.

Prof Hubert Gijzen
UNESCO Regional Director

Acronyms/Abbreviations for the report

ABNJ: Area Beyond National Jurisdiction
AIMS: African Integrated maritime Strategy
BE: Blue Economy
BMU: Beach Management Unit
CAP: Conservation Action Plan
CBD: Convention on Biological Diversity
CBO: Community Based Organization
CCA: Community Conservation Areas
CFA: Community Forest Associations
CIDP: County Integrated Development Plans
CLA: Community Land Act
CMA: Co-Management Area
CMAP: Co-management Area Plans
CITES: Convention on International Trade on Endangered Species
COP: Conference of Parties
CORDIO: Coastal Oceans Research and Development - Indian Ocean
CPUE: Catch per unit effort
CSO: Civil Society Organization
DPSIR: Drivers, Pressures, Status, Impacts and Responses
EACC: East African Coastal Current
EB-MSP: Ecosystem-based maritime spatial planning
EEZ: Exclusive Economic Zone
EIA: Environmental Impact Assessments
EMCA: Environmental Management and Co-ordination Act
EMP: Environmental Management Plan
ES: Ecosystem services
FAO: Food and Agricultural Organization
GDP: Gross Domestic Product
GEF: Global Environmental Facility
GHG: Greenhouse Gases
GIS: Geographic Information Systems
ICZM: Integrated Coastal Zone Management
IKI: International Climate Initiative
ICT: Information, Communication and Technology
IOC: Intergovernmental Oceanographic Commission
IOM: Integrated Ocean Management
IUCN: International Union for the Conservation of Nature
KEMFSED: Kenya Marine Fisheries and Socioeconomic Development Project
KEPSA: Kenya Private Sector Alliance
KeFS: Kenya Fisheries Service
KFS: Kenya Forest Service
KMA: Kenya Maritime Authority
KMFRI: Kenya Marine and Fisheries Research Institute
KNBS: Kenyan National Bureau of Statistics
KPA: Kenya Ports Authority
KTF: Kenya Tourism Federation
KTB: Kenya Tourism Board
KWS: Kenya Wildlife Service
LAPSSET: Lamu Port, South Sudan and Ethiopia Transport
LBSA: Land Based Sources and Activities

LMMA:.....Locally Marine Managed Areas
MCS: .....Monitoring, control and surveillance
MEA: .....Multilateral Environmental Agreement
MMA:.....Marine Managed Areas
MP:.....Micro plastics
MPA:.....Marine Protected Areas
MSC: .....Marine Stewardship Council
MSP:.....Marine Spatial Planning)
MSP TWG:.....Marine Spatial Planning Thematic Working Group
MTBC:.....Marine transboundary conservation
MTP:.....Medium Term Plan
$MtCO_2$:.....Metric Tons Carbon Dioxide
MUCH:.....Marine Underwater Cultural Heritage
NARC:.....National Rainbow Coalition
NDC: .....Nationally Determine Contributions
NEMA: .....National Environmental Management Authority
NGO:.....Non-Governmental Organization
NMK:.....National Museums of Kenya
NMHA: .....National Museums and Heritage Act
NLC: .....National Land Commission
OTGA:.....Ocean Teacher Global Academy
PES: .....Payment for Ecosystem Services
PFMP: .....Prawn Fisheries Management Plan
PPE:.....Personal Protective Equipment
PLUPA:.....Physical and Land Use Planning Act
RECS: .....Regional Economic Communities
SC: .....Somali Current
SAPPHIRE:.....Strategic Action Programme Policy Harmonisation and Institutional Reforms
SEA:.....Strategic Environmental Assessment
SECC: .....South Equatorial Counter Current
SEM:.....South East Monsoon
SDF-ABE: .....State Department for Fisheries, Aquaculture & the Blue Economy
SDG:.....Sustainable Development Goal
SwaM: .....Swedish Agency for Marine and Water Management
SWIO:.....South West Indian Ocean
TDA:.....Transboundary Diagnostic Analysis
TNC:.....The Nature Conservancy
UCH: .....Underwater Cultural Heritage
UNCLOS:.....United Nations Law of the Sea
UNEP: .....United Nations Environmental Programme
UNHCR:.....United Nations High Commissioner for Refugees
UNESCO: .....United Nations Educational, Scientific and Cultural Organization
VAJIKI: .....Vanga, Jimbo and Kiwegu
VBF:.....Vanga Blue Forest
WCS: .....Wildlife Conservation Society
WHO:.....World Health Organization
WIO:.....Western Indian Ocean
WMA:.....Watamu Marine Association
WCMA:.....Wildlife Conservation and Management Act
WIOMSA:.....Western Indian Ocean Marine Science Association
WIOSAP: .....Strategic Action Programme for the protection of the Western Indian Ocean (WIOSAP)
WWF:.....Wildlife Fund for Nature
WWF-Ke: .....Wildlife Fund for Nature - Kenya

Introduction

Photo credit: Isabel Urbina-Barreto, ReunionWorkTeam-in-77lavaflow-IUB-WIOMSA

Kenya is strategically placed within the Indian Ocean and its coastal and marine ecosystems are comprised of a rich and diverse marine life that supports the livelihoods of 2.7 million coastal communities and contributes to national economic development. The main economic activities that contribute to coastal and marine associated livelihoods are tourism, mining, shipping, port activities, agriculture, fishing and forestry.

The sustainable use of the ocean and its biodiversity depends on appropriate planning and management of human uses in these sectors. Kenya multitude of legal instruments addressing management of the marine environment, administered by at least 14 line ministries and their subsidiary bodies. Key legal instruments include: National Ocean and Fisheries Policy (2008), the Integrated Coastal Zone Management (ICZM) Policy (2015) and the ICZM National Action Plan (currently under review); the National Land Use Policy (2017); the National Environmental Policy (2013); The National Land Use Policy (2017); the National Wildlife Conservation and Management Policy (2017); the National Spatial Plan (2015-2045). Furthermore, County Governments in Kenya also have their constitutional mandates and jurisdictions over marine and coastal areas.

In recognition of the importance of the Ocean and its resources, the Government of Kenya developed the Blue economy Implementation Standing Committee (Gazette Notice No. 6275) with a mandate to co-ordinate and oversee the implemen-

tation of prioritized programs. One of the prioritized programmes that is captured in the Third Medium Term Plan (MTP III) of the Kenya Vision 2030 is Maritime Spatial Planning. Planning for the maritime space from the economic perspective is critical for investments in the Blue economy sector and this process would require a high level of management and coordinated planning to ensure that resource use conflicts between the different sectors are well managed. In Kenya, the intention of the Maritime Spatial Plan is to plan for all waters in Kenya inclusive of the lakes, rivers and the ocean as guided by the global MSP Roadmap.

The first plan under this ambitious programme is the Marine Spatial Plan which will provide for an operational framework to maintain the value of the marine biodiversity while at the same time allowing for sustainable use of the marine space for economic purposes. It is anticipated that the MSP will move beyond sectoral barriers and provide for an integrated spatial approach within the marine and coastal areas.

This report highlights the discussions held during the 4 day national technical – workshop held on 14th - 15th October 2020 to discuss environmental pressures, cumulative impacts and tools to support decision-making in Kenya for the marine spatial plan; and from 21st – 22nd October 2020 to discuss key elements for marine spatial planning in Kenya. The workshops were structured into discussions on environmental pressures and discussions on key elements for consideration as Kenya embarks on her MSP.

The overall aim of the dialogue was to exchange good practices and lessons learnt in tackling environmental challenges associated with the implementation of marine spatial planning in Africa. The workshops were conducted on a virtual platform and experts provided key insights into the Kenyan process. Support for the workshops came from Government of Kenya through the State Department for Fisheries, Aquaculture and The Blue economy as well as the Kenya Marine and Fisheries Research Institute. The event was co-financed by the Government of Sweden and the European Fund for Maritime Affairs and the Fisheries of the European Union in support of the Joint Roadmap to accelerate Marine Spatial Planning worldwide (MSP roadmap).

PART I:

THE ENVIRONMENTAL DRIVERS IN MARINE SPATIAL PLANNING

The Open Ocean & EEZ:

Stressors and management lessons

Dr. Joseph Nyingi Kamau

Kenya Marine and Fisheries Research Institute

Photo credit: © WIOMSA

Figure 1: Degraded coral reef and mangrove habitat.

The ocean environment

Understanding the ocean environment provides impetus towards the effective harnessing of the Blue economy. Unlike the Green Economy whose resource base is easily accessible and understood, much of the Blue economy marine resource base is not easily accessible and lies in the submerged depths of the ocean. The accessibility of these diverse marine resource is complex and requires much capital investment, hinged on advanced technologies and science. These underling complexities have placed Africa in a disadvantaged position viewed in the lens of a poor coastal community with a resource that appears near yet so far.

Environmental pressures

The coastline of Kenya extends from 1°30'S to 4°30'S latitude and is characterized by fringing coral reefs distributed at depths of between 16 and 40 meters. The coast has a narrow continental shelf, estimated at 19,120km^2, except where major rivers have pushed the shelf break further offshore. The shallow continental shelf encompasses coral, seagrass and mangrove critical habitats which supports the bulk of the artisanal fishery. The artisanal fishers are limited to inshore waters extending to the edge of the continental shelf. Overfishing and recreational activities have overtime exerted pressure on these critical habitats degrading their ecosystem functioning and ultimately impacting the fishery (Sanders et al., 1988; FAO, 2016).

Climate change is expected to further impact these nearshore ecosystems compromised by their shallow depths making them more susceptible to temperature variation. Figure 1 shows examples of degraded coral reef and mangrove habitat. Another challenging and highly dynamic climate impact stressor that the Kenya's industrial fishery will be facing as early as the decade 2020-30 is the impact of marine heatwaves (Kamau et al., 2021), threatening ecosystem health and affecting livelihoods. Of major concern are the poor coastal communities with low adaptive capacity (Barnes-Mauthe et al., 2013). It has however, been reported that changes in sea surface temperature (SST) are likely to result in a fundamental re-distribution of small pelagic fish species (Groeneveld, 2014). Fishbase has collated information and projected a possible re-distribution of species in the year 2100 (Groeneveld, 2014).

Geophysical features

The ocean floor of Lamu-Kiunga seascape lies on the Indian Ocean Basin within the African plate, which broke up from Gondwanaland, the super continent, about 180 million years ago (Cande

and Stegman, 2011; Obura et al., 2012). The ocean floor has remained relatively unchanged making it a refuge for various marine species.

The Malindi-Lamu-Kiunga ecoregion is highly influenced by the geophysical features located within the land-sea interaction and on the seabed. Kenya's major rivers, Tana and Sabaki, discharge into the ocean within the Malindi-Lamu-Kiunga ecoregion overtime contributing to the re-engineering of the geophysical features. A large portion of land has been reclaimed at Malindi Bay due to the accretion of River Sabaki sediments. River Tana discharges about 6.8 million tons of sediment annually (Kitheka et al., 2005) which, based on studies elsewhere (Nixon, 1981; Farias, 2003), are likely to act as a source of nutrients to the overlying water column. The fate and pathway of River Tana sediments is determined by physical processes entailing mixing of seawater with freshwater, currents dynamics, ocean bed topography and the physical state of the suspended sediments.

Figure 2 shows the topographic imagery of the North Kenya Bank indicating location of the River Tana sediments. Some of the sediments seem to be deposited at the deeper edges of the North Kenya Bank. Fishing grounds for the deep-water crab *Chaceon macphersoni*, which thrives on muddy habitats, have been located through observer data, along the deep edges of the North Kenya Bank. This further corroborates the acoustic observation on the fate of River Tana sediments.

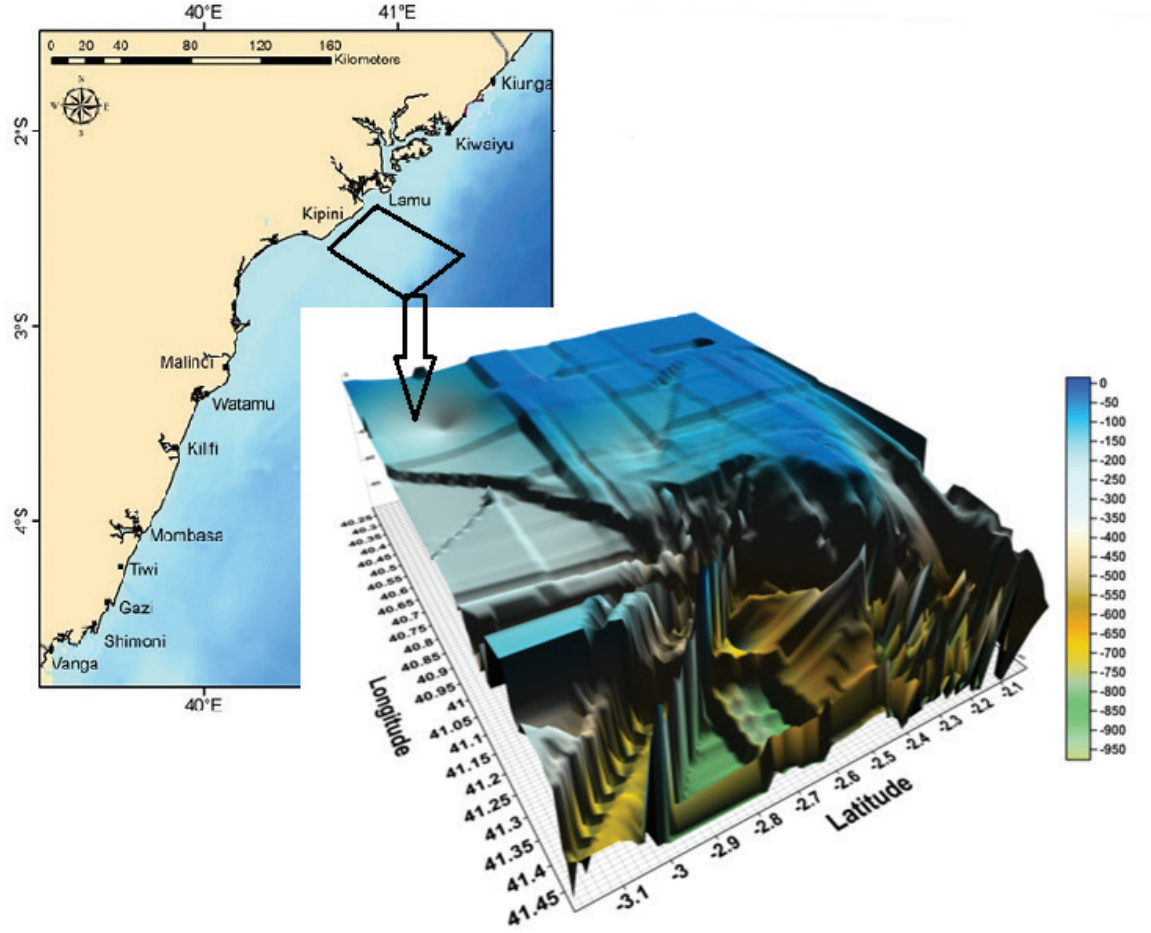

Figure 2: North Kenya Bank topographic imagery obtained from acoustic soundings (Source KMFRI 2017).

Figure 3 is the map of the Kenya coast showing location of unique bathymetric formation of the seabed. Deep highly productive canyons have been located at Kiwayu region by researchers of the Kenya Marine and Fisheries Research Institute through acoustic soundings during RV. Mtafiti research cruises. The canyons have depths of up to 500m and accommodate a large fish biomass at their crest. The north flowing East African Coastal Current (EACC) carries along with it the nutrient rich sediments from River Tana some of which get deposited in the deep canyons and may be contributing to the high fishery biomass above the canyons.

Figure 4 shows the EEZ of Kenya and the location of the seamounts. Within the EEZ, three seamounts labelled A, B & C have been located spreading along the length of the coastline. Seamounts A & B are located closer to the shore while C is further offshore. Seamounts rising into the ocean create obstacles that shape ocean currents and direct deep, nutrient-rich waters up the sloping sides of seamounts to the surface. These factors combine to make seamounts fertile habitats hosting a high marine biodiversity, including sponges, crabs, sea anemones, commercially important fish and deep-sea corals. Seamounts are volcanic in origin and may entail the presence of minerals as a result of hydrothermal activity.

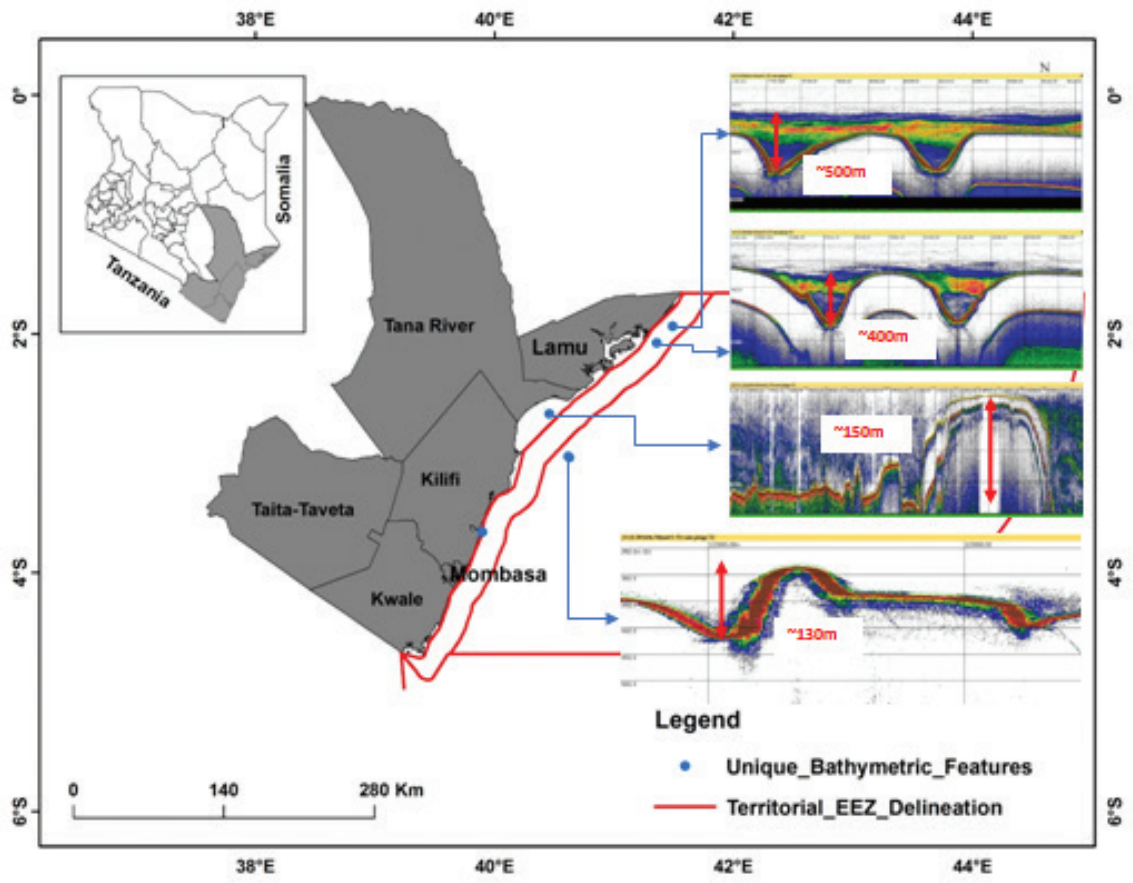

Figure 3: Unique bathymetric formations along the Lamu-Kiunga seabed area (Source KMFRI, 2017).

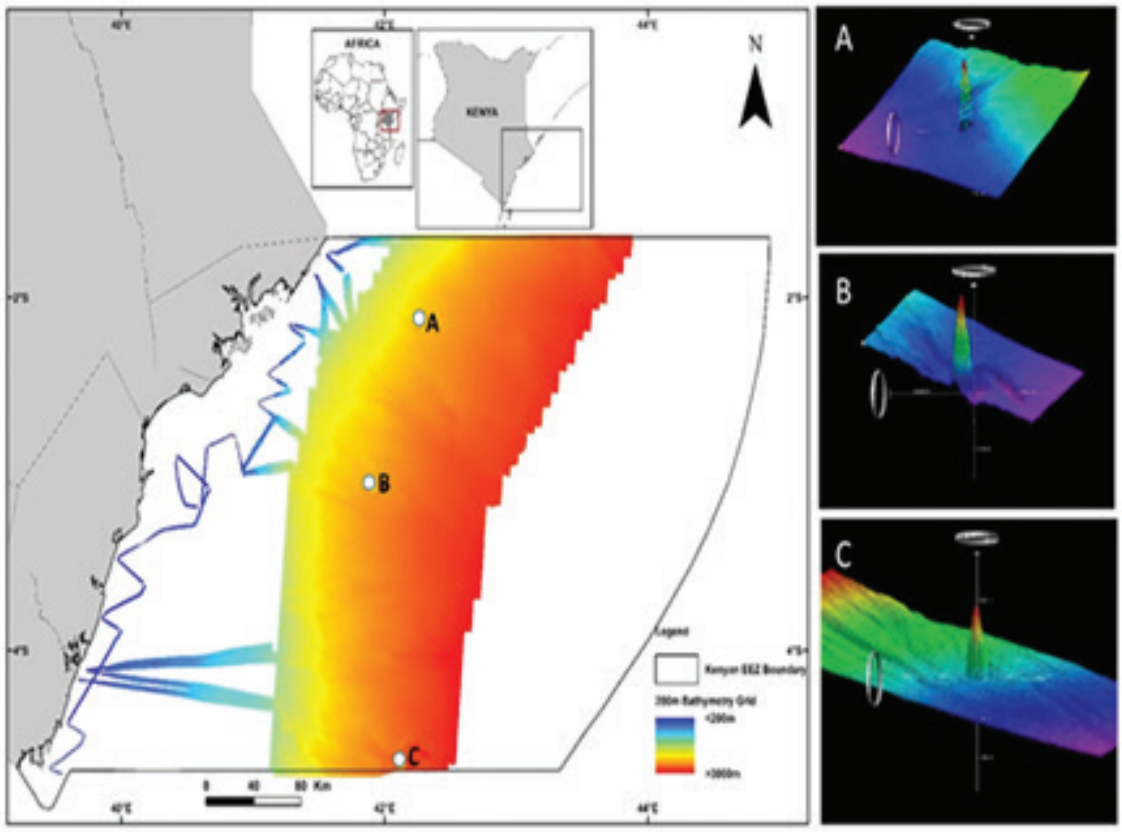

Figure 4: Seamount location along the Kenyan EEZ (Source KMFRI 2017).

Physical oceanographic processes

The East African marine waters have been documented as being nutrient poor, therefore the fishery in this region thrives mainly from the influence of upwelling systems (Kamau et al., 2021; Jacobs et al., 2020). Figure 5 shows orientation of the major ocean currents in the eastern coast of Africa and the wider Indian Ocean. The upper-ocean circulation of the East African coastal waters is bathed by the EACC, the Somali Current (SC) and the South Equatorial Counter Current (SECC). The formation of the SECC triggers a shelf break upwelling that brings deep nutrient rich waters to the surface hence enhancing productivity. This is the phenomenon that drives the fishery in this region during the North East Monsoon (NEM) season. The strength of the EACC relative to that of the SC determines where the SECC will be located. It has been postulated that the EACC will weaken as climate change continues unabated, pushing the formation of the SECC further South effectively affecting the fishery in northern Kenya (Jacobs et al., 2020).

Figure 5 shows the orientation of currents in the Indian Ocean during the South East Monsoon (SEM) season with a focus on EACC and SC. The SC reverses (Duing, 1977) and flows northwards during the SEM season effectively enhancing the speed of the EACC. It has been observed that the productivity of the North Kenya Bank is highest during the SEM season attributed to the topographic forcing of the Bank stimulating perturbation of the nutrient rich River Tana sediments. Incidentally this is the season when the sea is rough and local fishermen are unable to venture into the sea due to lack of proper fishing vessels.

Area Beyond National Jurisdiction (ABNJ) stress/impact to Kenya's' marine waters

Figure 6 shows temporal connectivity between Kenya's territorial waters and the areas beyond, as advection trajectories in months, as well as the spatial spread of water laden with micro plastics (MP). Kenya's territorial waters are highly connected to the Areas Beyond National Jurisdiction (ABNJ) with time scales of between 1 month to 6 months. Kenya's marine waters lie within the migratory belt of the Tuna fish. Overfishing or destruction of the ecosystem within the ABNJ would thus have a direct impact on Kenya's Blue economy. Research conducted on Kenya's EEZ has shown a high influx of MP from the ABNJ, and further documented ingestion of MP by fish larvae (Kosore et al., 2018).

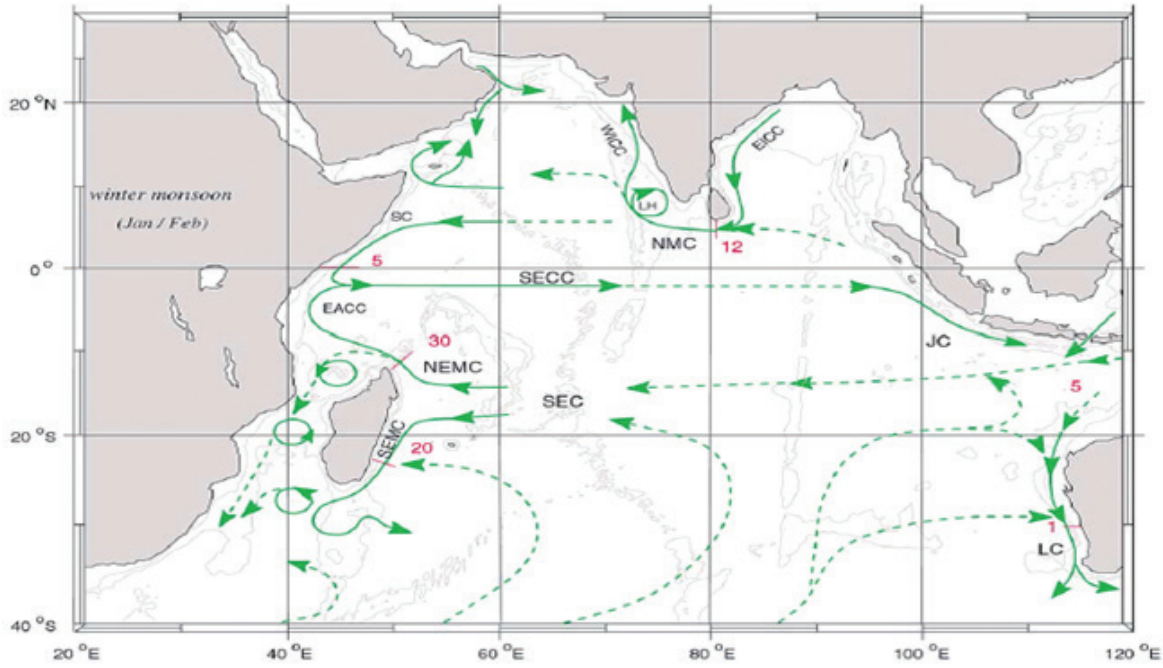

Figure 5: A schematic representation of identified currents during the North East Monsoon with special focus on the East African Coastal Current (EACC), Somali Current (SC) and the South Equatorial Counter Current (SECC).

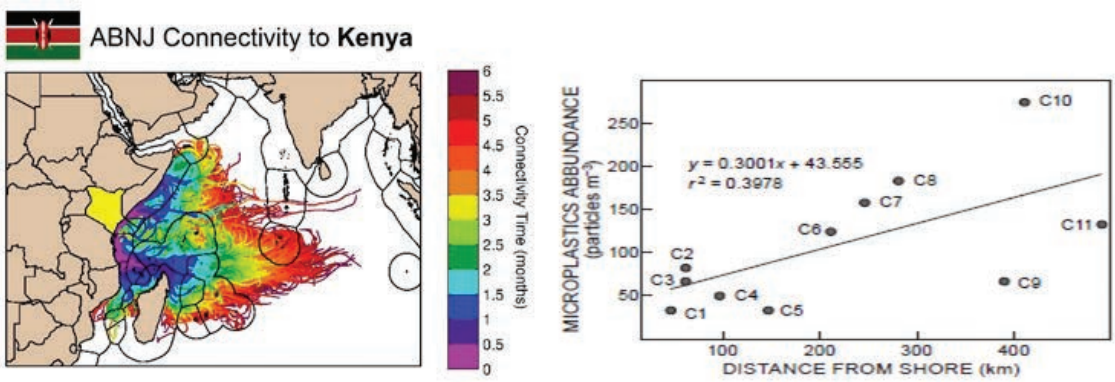

Figure 6: The time, in months, that it takes for ocean surface waters originated in the ABNJ to reach the coastal zone of the Republic of Kenya. The colour of the trajectories indicate the time in months for the surface waters to be advected to the coastal zone, termed on the colour bar as the connectivity time; also illustrated is the microplastics abundance and distribution across the EEZ. Source: Kosore et al., 2018; Popova et al., 2019.

The following are recommended for inclusion in the Marine Spatial Planning process for effective interventions to be put in place:

- Assessments of the status of nearshore critical habitats;
- Initiation community led habitat restoration interventions where necessary;
- Awareness creation on the fishery resources within the territorial and EEZ waters;
- Monitoring of changes in ecosystem functioning in the northern region to assess impact of climate change; and
- As UN member states negotiate a legally binding instrument governing the ABNJ it is important that provisions for future management regimes are informed by potential impacts on territorial waters - more so within the WIO region

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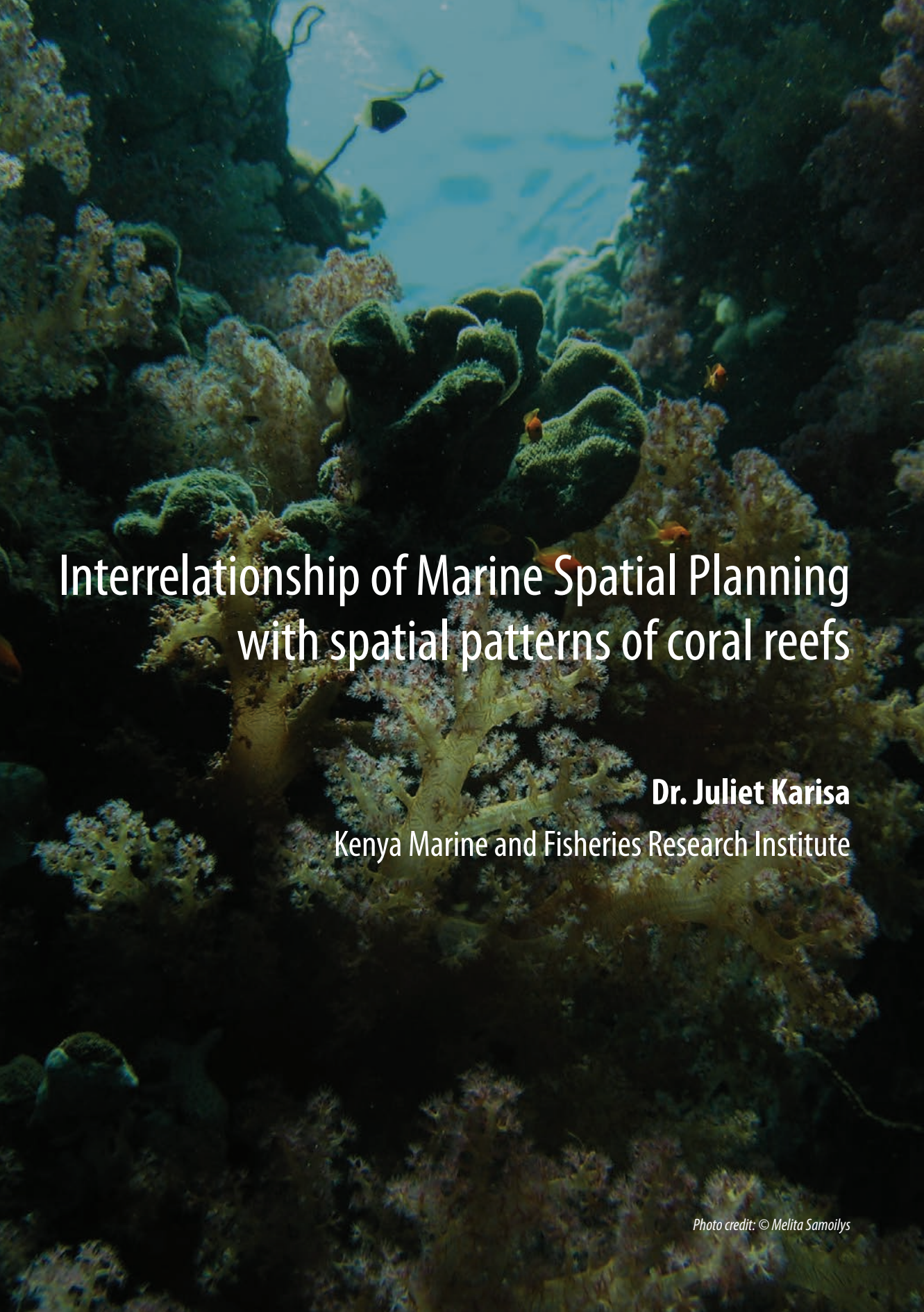

Interrelationship of Marine Spatial Planning with spatial patterns of coral reefs

Dr. Juliet Karisa

Kenya Marine and Fisheries Research Institute

Photo credit: © Melita Samoilys

Coral reef communities in Kenya

The spatial pattern of coral reef communities varies across a range of broad-scale biogeographical levels to fine-scale local habitat conditions (Karisa et al., 2020). The Kenya coast stretches along 536 km, between latitudes 10 and 50 S with narrow fringing reefs in the southern part and patchy reefs with low reef development in the north (Obura 2001, Spalding et al., 2001), (Figure 1). The distribution of coral species in Kenyan reefs is influenced by the large-scale current dynamics with the East Africa Coastal Current (EACC) bringing coral larvae from the southern 'center of diversity' for the Western Indian Ocean (WIO) region (Obura 2016). A cold-water system prevails in northern Kenya due to the convergence of the EACC with the seasonal Somali Current (SC) that is characterized by poor water conditions for reef development (Carbone & Accordi 2000, Obura 2001). The interaction of the EACC and the SC in the north creates a marginal, high-latitude and upwelling system with transitioning communities from the East African to Somali-Arabian fauna (Obura 2012). This results in high coral species diversity in the southern parts of Kenya and a decrease in diversity towards the north (Obura 2012). In addition, the presence of river systems in the central-northern region introduces small-scale influences in species distribution by creating environmental barriers that further limit the transport of larvae to the north (Gamoyo et al., 2019).

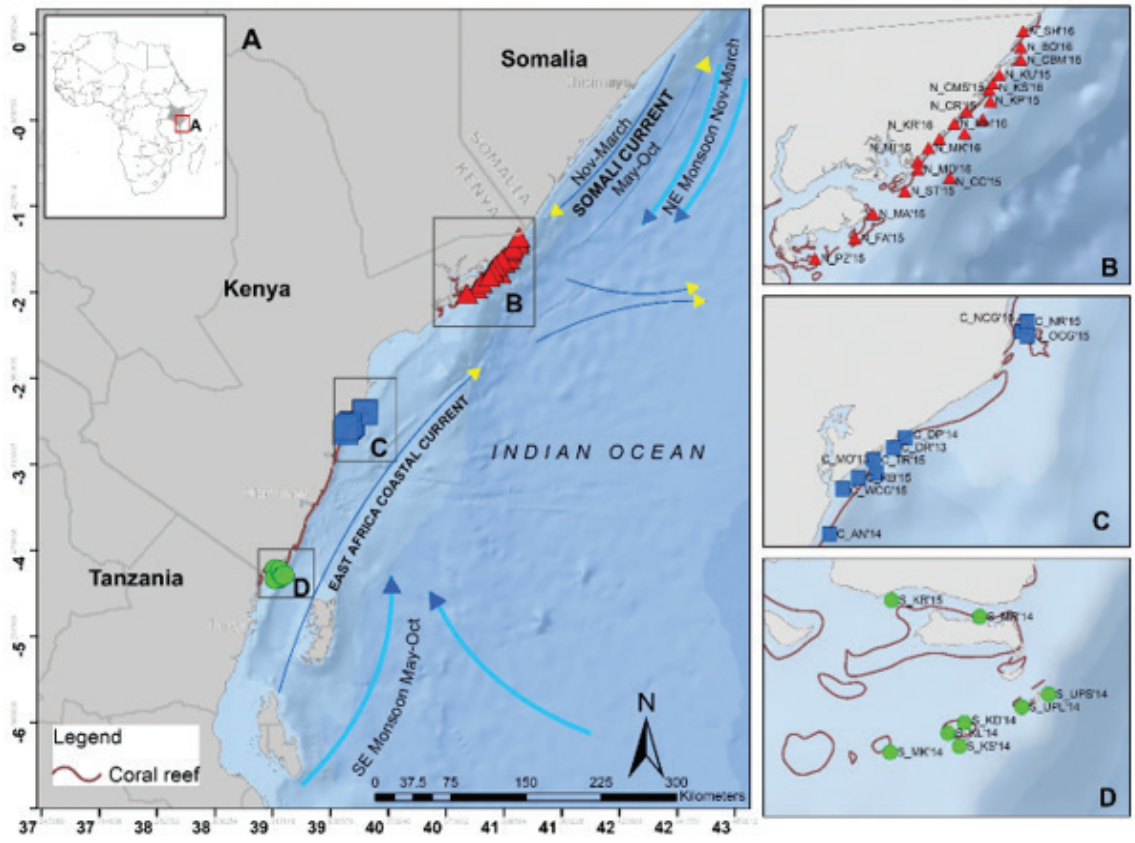

Figure 1: Locations of the study sites along the Kenyan coast divided into four geographical zones in the, (A) Hinterland, (B) North (red), (C) Central (blue) and (D) South (green). Ocean base map credits- Esri, Garmin, GEBCO, NGDC, and another contributor.

Environmental pressures and cumulative impacts in the Kenyan coastal zone

However, environmental pressures are causing challenges to the health of coral reefs in Kenya, causing decline in coral reef communities and modifying their spatial pattern. Corals flourish very well in environment that has clear water with optimal sea-surface temperatures, and relatively shallow for sunlight penetration to allow photosynthesis and free from sediments and pollutants (Tuttle et al., 2020, Zhao et al., 2021). The primary sources of environmental pressures therefore include climate change, pollution and sedimentation. Climate change is recognised as one of the greatest threats to coral reefs through increased sea-surface temperature anomalies that cause reoccurring large-scale coral bleaching and mortality events (Hughes et al., 2018). In Kenya, unprecedented increase in sea-surface temperature in 1998 caused devastating destruction to coral reefs by causing bleaching mortality that decreased coral cover by 50- 90 % with some individual sites undergoing 100 % loss in coral cover (Obura 2002). There have been subsequent bleaching episodes in 2010 and 2016, even though not to the scales of the 1998 bleaching, that have caused further decline to coral reef communities in Kenya and have also made ecosystem recovery slow over the years (McClanahan 2014). After the 2016 bleaching event, there are speculations that a second step-decline in reef health, similar to that in 1998, is possible (Figure 2; Obura et al., 2017). According to the recent IPPC report that was released in 2019, climate change is expected to continue causing havoc to coral reefs globally with 90 % of the ecosystem expected to be lost in this century if carbon emission continues at the ~2˚C above pre-industrial levels (IPCC 2019). The report goes on to say that if green gas emission is reduced to ~1.5˚C above pre-industrial levels, 30% of these reefs could be saved. These could act as 'seed banks' or refugia that can re-populate other destroyed reefs once climate conditions have been reduced to favourable conditions, something that may not happen in this century.

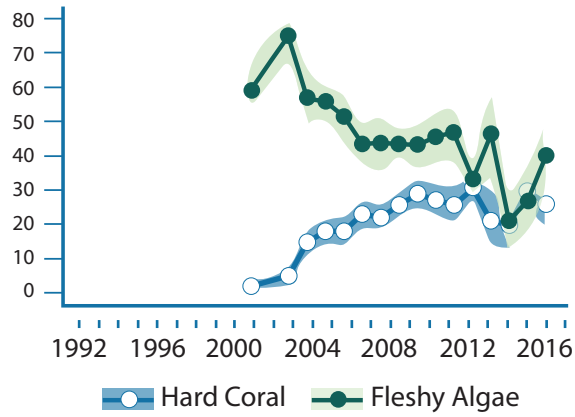

Figure 2: Hard coral and fleshy algae cover (%) in Kenya (Source: Obura et al., 2017).

Sedimentation smothers and kills corals. In Kenya, sediment influx in the ocean is experienced mainly near the Sabaki and Tana rivers. Conversion of land from natural forest to agriculture and over grazing on vegetation has exposed soil to erosion particularly during heavy rainfall or el Nino periods. This results to erosion discharging huge amounts of sediments in the ocean.

Pollution increases nutrients (i.e., eutrophication) in the ocean compromising the environment for proper coral reef growth and development. Nutrients can also kill corals. Pollution in the ocean is mainly caused by unregulated discharge of municipal or domestic waste water as well as agricultural effluents. This is a threat to coral reefs that occur in urban areas as well as highly agricultural and populated areas in Kenya (Okuku et al., 2019;

Good practices and lessons learnt from managing environmental stressors

There is a total of nine national MPAs in Kenya that are classified under two IUCN categories (IUCN 1994), incorporating a wide range of management levels which include; no-take areas (parks), multiple-use areas (reserves) and biosphere reserves (Table 1). These MPAs were established between 1968 and 1993 with the objective to protect and conserve biodiversity and ecological balance of marine ecosystems including coral reefs. The MPAs manage to protect the "fragile benthic habitat-forming organisms" from the direct physical impacts of fishing, which subsequently improves the habitat quality within the MPA, enhancing overall coral reef ecosystem structure and function (Rodwell et al., 2003). However, during the mass coral bleaching in 1998, MPAs were not spared from bleaching and there was similar coral mortality across all reefs

Table 1. Marine Protected Areas (MPAs) in Kenya and their respective designation, size (km^{++}), IUCN category and year of establishment.

MPA	Designation	Size (Km^2)	IUCN Category	Year established
Kiunga	MR & MaBR	600	VI	1980
Malindi Marine Park	MR & MaBR	6.5	II	1968
Watamu Marine Park	NP & MaBR	32	II	1968
Malindi & Watamu	NP & MaBR	177	VI	1968
Mombasa	NP	10	II	1986
Mombasa	NR	200	VI	1986
Diani	NR	75	VI	1993
Kisite	NP	28	II	1978
Mpunguti	NR	11	VI	1978

MR - Marine Reserve; MP - Marine Park; MaBR - Man and Biosphere Reserve; NR - National Reserve

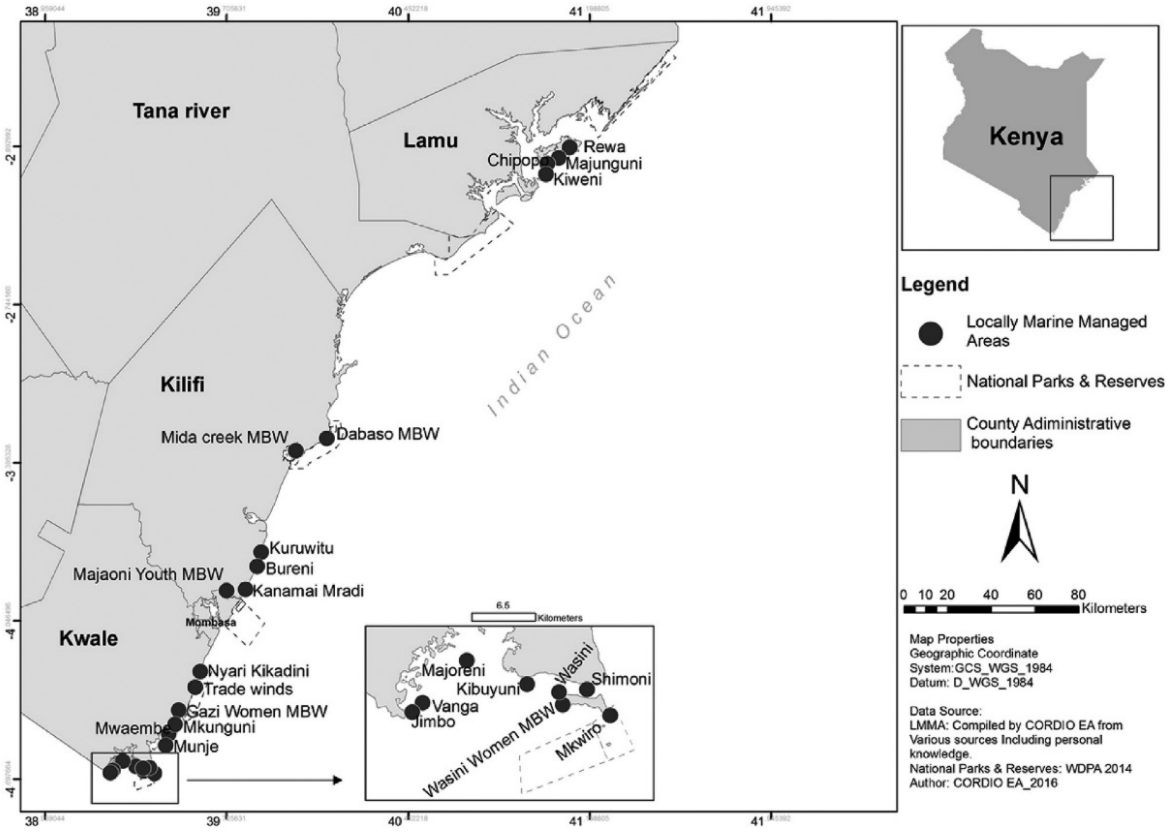

Figure 5: Location of LMMAs along the coast of Kenya (Source: Kawaka et al. 2017).

regardless of protection (Obura 1999, McClanahan et al., 1999). With bleaching events becoming more severe and frequent, there is need to create and re-design existing MPAs to be climate resilient by ensuring that there refugia to support resilience within these areas. Already, there are efforts going on to create Locally Marine Managed Areas (LMMAs), to increase the area of protection as well as to make networks of MPAs. The location of new LMMAs is critical in ensuring that they are sited in resilient ecosystems. This ensures survival in extreme climate events especially bleaching from high temperatures.

There are 24 LMMAs which include areas with coral reefs (Kawaka et al., 2017; Figure 5). Successful implementation of new and existing MPAs will require up-to-date information on coral reefs to aid design and management strategies that incorporate climate change not only to safeguard biodiversity but also to enhance the resilience of coral reefs.

Marine Protected Areas (MPAs) offer one way of reducing pressure to coral reefs to increase their chances to cope with climate change. Many countries across the world have been taking serious steps to adopt the international goal of turning 10 per cent of coastal and marine waters into MPAs by 2020 (IUCN 2010; Figure 6). And now the post-2020 Global Biodiversity Framework supports the SDG 14 goal of having 30 % of global marine area under MPAs by 2030. An important step further is to create and manage these MPAs to be climate resilient (Karisa 2020). This requires the application and operationalization of resilience-based management (Anthony et al., 2014, McClanahan et al., 2012, Maynard et al., 2010, Hughes et al., 2010, Obura and Grimsditch 2009, Mumby et al., 2008, Nyström et al., 2008). For effective management of coral reefs, information is needed on the structure of coral community at all scales of temporal and spatial aspects including biogeographic and habitat influences.

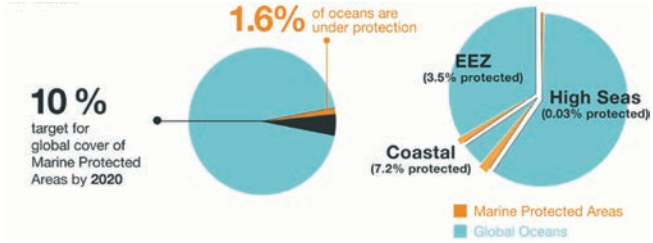

Figure 6: Percentage marine area showing the targeted global 10 % MPA cover by 2020 and the current area under protection with different representation across high seas, EEZ and coastal resources/habitat (source: post-2020 biodiversity framework development).

Key considerations for the Marine Spatial Planning process

Marine spatial planning represents an important step to improving collaboration amongst multiple users of the marine environment towards a shared vision and outcomes. MPAs are a strategy of MSP, but usually at lower spatial levels (Figure 7), and has great potential to transform the way the oceans are managed. MSP is not an end in itself nor is it a specific policy – rather it is a planning framework that focuses on the unique and dynamic spatial planning requirements in marine ecosystems to sustain the goods and services society needs or desires from these environments over time (IUCN, 2012).

A recent study indicated that the spatial pattern of resistance and recovery potential of coral communities from bleaching events primarily operates at ecological scales rather than biogeograph-

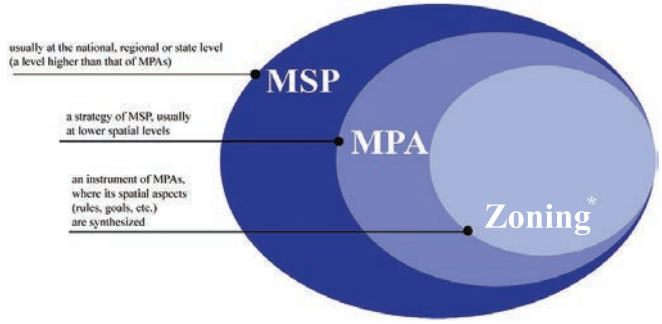

Figure 7: An illustration showing MSP as the umbrella tool that incorpotates MPAs at lower spatial levels.

ic scale (Karisa 2020). Ecological scale is a unifying concept that connects ecosystems (Levin 1999; Chave and Levin 2003). MPAs provides one of the tools that could be used to enhance resilience through management of ecological components. The current MPAs in Kenya were designed to conserve biodiversity by embracing static approaches that protect ecologically important populations (Tuda and Omar 2012). However, climate change has brought in new challenges to coral reefs that makes the existing MPAs inadequate to alleviate coral bleaching mortality from thermal stress. Review on existing management plans will ensure coral reef managers capture new ideas that can enhance ecological resilience such as maintenance of coral reef connectivity, source reefs and refugia for key functional groups.

One way of doing this is by re-designing and creating new MPA networks that include replicates of representative habitats with high resistance and recovery potential, to bleaching in order to spread the risk of coral loss from other localized disturbances and even failures in management among others (NRC 2000, PISCO 2007). Sites that show high resistance potential are expected to undergo less coral mortality helping reefs to have a reproductive population after bleaching mortality. For example, MPAs networks that include reefs that have previously not been considered as of conservation priority because they have been in nearshore turbid zone (Morgan et al., 2016) or previously considered degraded (Abelson et al., 2016). Ultimately, these reefs with high resistance potential could act as sources of larvae to other distant reefs that would have undergone high bleaching mortality but possess high recovery potential e.g. as sinks. This approach of habitat complementarity can be accentuated by fully protecting some of these reefs in order to maximize survival of coral communities not only at the ecological function level, but at a broader scale of entire ecosystems. This means there is need to consider and prioritize sites with different habitat types found at each of the representative geographic zones.

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Environmental stressors and management lessons from seagrass ecosystems

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Photo credit: © Lillian Daudi

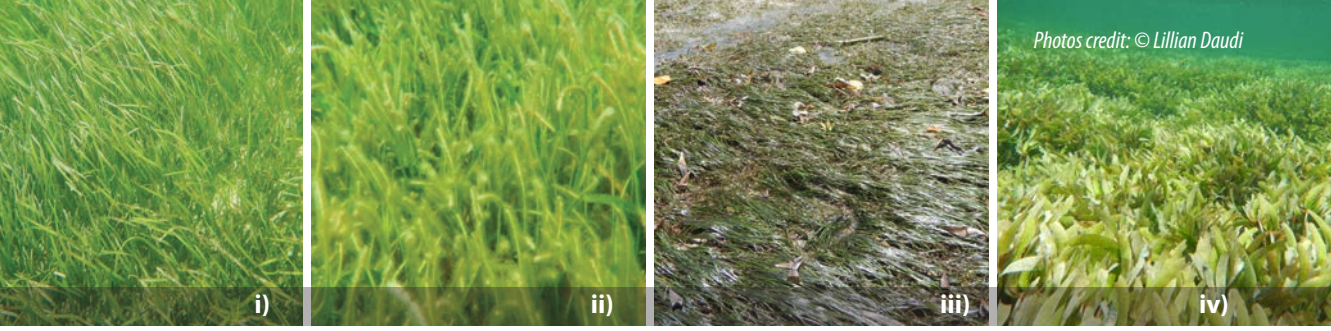

Figure 1: Photo: i) Halodule uninervis species at Watamu ii) Highly epiphytized Syringodium isoetifolium at Diani iii) Intertidal Zostera capensis seagrass at Kiunga iv) Thalassodendrom ciliatum meadow at Lamu.

Importance of seagrasses

The seagrass ecosystem is a vital resource in the marine environment. These ecosystems perform several key functions including the provision of food for life in the ocean. Seagrass ecosystems also act as natural carbon sinks capable of storing significant amounts of carbon in the sediments for long periods of time (Fourqurean et al., 2012; Githaiga et al., 2017). Due to their photosynthetic processes, seagrass meadows provide an opportunity to counter ocean acidification that results from rising carbon dioxide levels in water affecting organisms such as shellfish and corals. Recent research has shown that seagrass meadows can modify pH levels in coastal waters hence hindering this effect by raising the ocean pH levels (Ricart et al., 2021). Coastal communities depend on seagrass ecosystems for their livelihood and social well-being. There are approximately 72 species distributed across the temperate and tropical oceans (Short et al., 2016).

Status of seagrass beds in Kenya

In Kenya, seagrasses are distributed along the coastline occurring majorly within the shallow sandy intertidal and subtidal lagoons. Twelve species have been reported along the Kenyan coast with *Thalassodendron ciliatum* as the dominant occurring species which form dense extensive meadows (Isaac and Isaac, 1968; Ochieng and Erftemeijer, 2003; Richmond, 2011). These meadows provide a livelihood to coastal communities by supporting artisanal fisheries. Healthy seagrass meadows along the Kenyan coast also provide important habitats for large number of invertebrates, fish, and algal species (Daudi et al., 2013).

Despite their importance, they have been largely left out of management discourse, as compared to other ecologically sensitive habitats; the mangroves and coral reefs. The use of monitoring changes in seagrasses meadows can provide an indication of coastal ecosystem health and can be used to improve our capacity to predict expected changes to associated resources upon which local coastal communities depend.

Seagrass stressors in Kenya

Many environmental factors, including sedimentation, trampling, destructive fishing habits and coastal developments affect the structure and functioning of biotic communities within the seagrass meadows of Kenya. Sedimentation from upland areas through major rivers that drain into the ocean (van Katwijk et al., 1993) has been experienced especially for major rivers that drain into the ocean. In addition, other factors such as boat anchors and trampling in shallow areas with high human traffic have led to the destruction of seagrass habitats. Destructive fishing practices also continue to pose a threat to seagrass

meadows along the Kenyan coast specifically with the use of beach seines that uproot seagrass plants. Further, dredging for development of new ports and maintenance of existing ports as well as sand harvesting have also contributed to the degradation of seagrass meadows. Hotels along the beaches have also contributed to this loss by clearing of intertidal seagrass meadows for swimmers. Population explosions of the sea urchin *Tripneustes gratilla* is another threat to seagrasses that has been reported along the Kenyan coast since 2001 and is a recurring phenomenon (Alcoverro and Mariani, 2002; Zanre and Kithi, 2004; Crona, 2006; Eklöf et al., 2009). Such incidents of herbivory have led to widespread degradation of the seagrass *Thalassodendron ciliatum* (Figure 2). Overgrazing by sea urchins could be in this case be ranked as one of the major stressors to seagrasses in Kenya due to the magnitude of loss that has been experienced.

Lessons learnt for managing seagrass stressors

Although the Kenyan seagrass ecosystem has been altered over the past decade, it nonetheless remains a biologically diverse and productive ecosystem. Some species have thrived, but others, including green turtles, dugongs, and sea horses, listed as threatened or endangered under the IUCN, have declined dramatically. In addition, species composition and environmental conditions in the seagrass habitats have undergone large changes over the period. Environmental stressors which are sometimes complex and interactive have led to seagrass loss with slow recovery rates and habitat fragmentation in some cases. Consequently, some areas have experienced ecosystem changes, such as changes in the dominant seagrass species (Daudi 2010) affecting the structure of food webs (Figure 2) and associated communities (Daudi et al., 2013). Studies within seagrass meadows of Kenya have shown that recovery of seagrass associated fauna depended on natural seagrass recovery or success of rehabilitation (Daudi et al., 2013). Further, meadows with long lived canopy because of minimal disturbance supported higher productivity than those exhibiting high turnover of canopy due to high disturbance. For this reason, there is need for an integrated, analytical approach to understanding the effects of environmental stressors on the seagrass ecosystems and its components to provide important and useful insights that can lead to enhancement of the seagrass ecosystem and its species.

The rapidly increasing rate of seagrass degradation compared to the low rates of natural recovery experienced in Kenya have necessitated the demand for seagrass rehabilitation in Kenya. This has been to preserve and expand the existing seagrass beds to ensure continuity of these ecosystems. This has been conducted through active

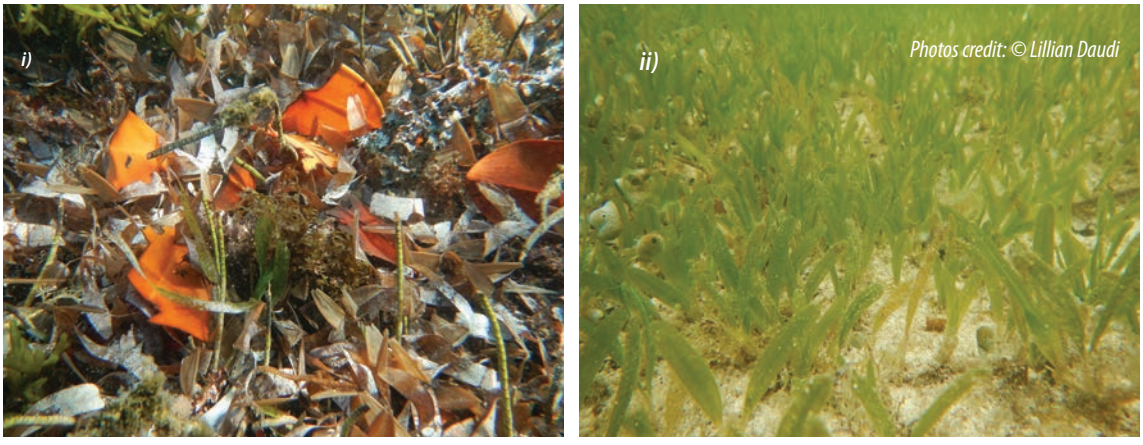

Figure 2: Photo: i) Stumps of grazed Thalassodendron ciliatum at Kiunga ii) Halophila stipulacea colonizing a disturbed area at Watamu.

transplanting of seagrass plants and subsequent monitoring of restored pilot sites. Different techniques exist and there were some successful replantation pilot projects using some of these techniques locally (UNEP-Nairobi Convention/ WIOMSA 2020). One example has been the use of hessian bags to plant seagrass units (Figure 3) which has the additional benefit of increasing settlement of sediments for further colonization by pioneer seagrass species (Uku et al., 2021).

Therefore, seagrass rehabilitation through replantation continues to be a potential factor for mitigation of seagrass loss along the Kenyan coast. In addition, it provides an opportunity for addressing the issues of ocean acidification that would enhance conservation and management of coastal ecosystems. Further, sheltered areas showed more success by protecting the planted units until they stabilized. The use of participatory rehabilitation where communities adopt the techniques and undertake rehabilitation at community levels also proved to be successful. To enhance these rehabilitation efforts, innovative techniques applicable for high energy seagrass environments need to be adopted.

In recognizing that effective management and recovery of ecosystems can be achieved through a strategic integrated approach based on a seascape model, the National Coral Reef and Seagrass Conservation Taskforce, developed the Coral Reef and Seagrass Ecosystems Conservation strategy of 2013. The implementation of this strategy required the participation and collaboration of several stakeholders including the government, funding agencies, the private sector, NGOs, and the community. Collaborative efforts have been weak and there is need to review the strategy to incorporate greater collaboration and emerging lessons from seagrass research in Kenya.

Decision support tools for tackling seagrass stressors

Early detection of stressors in seagrass ecosystems is critical although the outcome may not be controlled. Methods for identifying stressors in seagrass ecosystems exist (García-Marín et al., 2013; Lopez y Royo et al., 2010; Martínez-Crego et al., 2008; Romero et al., 2007), that can provide a test bed for evaluating various stress models.

Figure 3: Photo: i) Planted seagrass transplants at Wasini using hessian bags ii) Wasini replanted site after three years.

This could be achieved by ground-truthing within seagrass habitats and involving participatory engagements to investigate ecosystems at critical sites which has not been previously done comprehensively.

In addition, engaging experts for sound up-to-date science decisions that minimize impacts in areas earmarked for coastal development is also critical. Environmental stressors may continue, and it is very likely that some of these will lead to more losses. If the possible likely stressors and subsequent alterations to the seagrass ecosystem can be identified, grouped, and generalized, then this may inform the appropriate contingency planning and necessary adjustments in existing monitoring programmes for preparations for possible ecological effects. There is therefore need for improved understanding of the complex responses and resilience of these meadows to internal and external stressors.

Upscaling of best practices in seagrass rehabilitation to cater for the loss of habitats due to developments through coastal engineering works using simple low-tech methods is important. This can be achieved through mapping potential areas for rehabilitation and engaging existing community-based Beach Management Units (BMUs) for successful rehabilitation. Further, establishment of long-term rehabilitation projects with set out success parameters to measure progress is key to ensure communities are adequately informed on the impacts of rehabilitation.

Changes to the seagrass ecosystems can put endangered species at additional risk and reduce or eliminate the positive effects of management actions. Therefore, conservation of these ecosystems should consider the key species of concern in these ecosystems. Currently, we lack definitive evidence based conservation that targets the seagrass ecosystems. There is need for a deliberate inclusion of seagrass conservation and management in the marine protected areas (MPAs) to support key functional biota. This can be achieved through the integration of policy instruments to protect seagrass and promote resilience to long-term change. For example, strengthening the implementation of the ICZM framework to support connectivity of seagrass and other ecosystems for enhanced productivity and resilience is important. The linkage between seagrass conservation, rehabilitation and livelihood is also necessary to enhance the management of these ecosystems. In recognition of the blue carbon contribution by seagrasses, payment of ecosystem service (PES) models, which have been successful in the conservation of mangrove ecosystems such as the *Mikoko pamoja* project (Plan Vivo Project) should be considered. Inclusion of seagrasses in Nationally Determined Contributions (NDCs) are also an important consideration. Community-based conservation provides an opportunity to fill this gap in seagrass protection by encouraging community groups to manage natural resources in an inclusive and structured approach (UNEP 2020).

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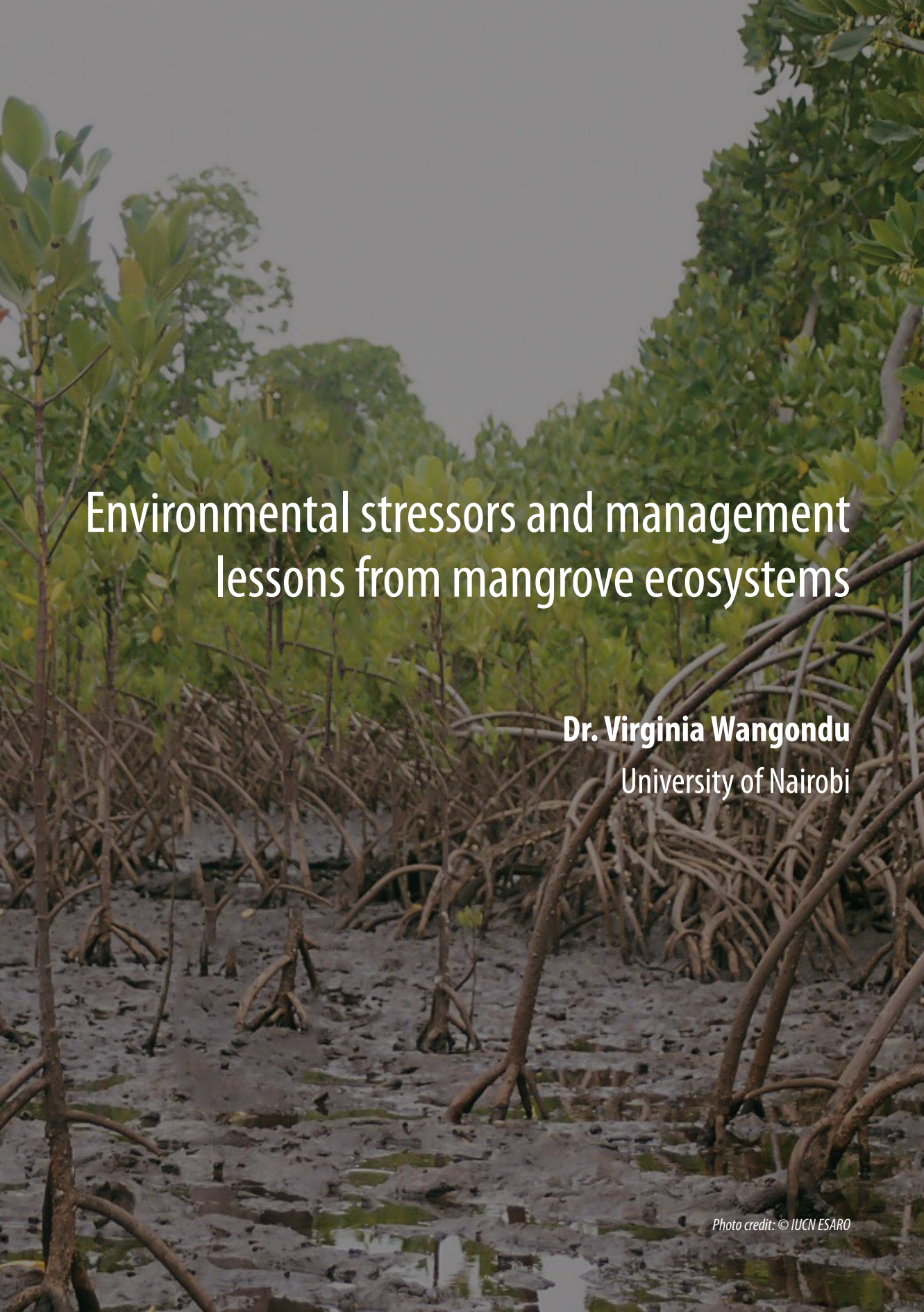

Environmental stressors and management lessons from mangrove ecosystems

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Why are mangroves important ecosystems?

Mangroves are halophytic plants that occur on sheltered tropical and subtropical coastlines throughout the world. Globally they occupy approximately 181,000 km^2 of coastlines, an estimated of 18 million hectares (Spalding, 1997). They are important ecosystems for the goods (wood, fuel, honey) and services (shoreline protection, habitat, fisheries, tourism, and nursery grounds) that they provide to coastal communities. They are also an active carbon sink playing a major role in carbon sequestration thus having a positive impact in climate change mitigation. In the new realization that marine ecosystems are underutilized, they are thought to harbor many resources with bioprospecting potential. However, with the rising human population, and decrease in formal employment opportunities, demand for mangrove goods to meet economic needs has risen considerably. This has resulted in continued extraction and cutting of mangroves leading to mangrove forest degradation. Duke et al., (2007) projected a world without mangroves where we will cease to enjoy mangrove services in the next 100 years, and yet this has been disregarded and mangrove destruction still continues unabated.

Environmental stressors in mangrove ecosystems

Environmental stressors of mangrove ecosystems can largely be attributed to anthropogenic activities, which together with climate change have led to 20% loss of mangroves since 2005 (FAO, 2007). The rise in human population along the Kenya coast has a ripple effect on the demand for mangrove forest resources. At least 64% of the world mangrove loss is attributed to human activities (Spalding et al., 1997; Valiela et al., 2001). In Kenya, approximately 3 million people in four counties directly or indirectly rely on mangrove harvestable goods. The Food and Agricultural Organisation (FAO) and United Nations Environmental Programme (UNEP) (2016) ranked harvesting of fish (92%) and firewood (72%) in mangrove ecosystems among households in Mida Creek and Tana Delta respectively. Conversion of mangrove forests to other land use types such as salt production, aquaculture and jetty projects (Abuodha and Kairo, 2001). The recent construction of the Lamu Port has exacerbated the clearing of mangroves increasing pressure to the already threatened mangrove ecosystems.

Pollution of mangrove ecosystems is another stressing factor. Rise in population and construction of industries along the coastline has resulted in an increase of both plastic and chemical pollution. In Makupa Creek, approximately 10 hectares of mangroves were destroyed by oil spills between 1983-1993 (Abuodha and Kairo, 2001). This has continually exposed both the flora and fauna in the mangrove ecosystems to many detrimental and irreversible environmental effects. Muohi et al., (2003) reported the presence of heavy metals copper, zinc, lead and cadmium in sediments at Makupa Creek and Port Reitz Creek in Mombasa, which was attributed to industrial activities and the presence of a nearby municipal waste dumping site.

Climate change is also exerting considerable amount of stress to mangrove ecosystems. Increase in the levels of carbon dioxide and other greenhouse gases in the atmosphere is projected to contribute to sea level rise, ocean acidification, rise in sea surface temperatures and an increase in the frequency of hurricanes and storms, which could have dire effects on mangrove ecosystems. In particular, varied regional effects on mangrove ecosystems are likely to emanate from increase in sea level rise, change in precipitation patterns, and increase in temperatures and frequency of

storms (Ward et al., 2016). Climate change could also impact the phenological patterns of mangrove, which could change growth and fruiting patterns that could impact availability of seed and propagules for natural regeneration and artificial rehabilitation of degraded mangrove habitats (Wang'ondu et al., 2017, 2014, and 2013).

Legislation, governance and policy issues could directly or indirectly impact negatively on mangrove ecosystems. In relation to mangrove management, the impact could influence mapping and gazzetement of mangrove areas, policy development and law enforcement to handle issues of illegal mangrove destruction and encroachment. Governance also has an implication on conservation and sustainable utilization of mangrove ecosystems. Conflict between the governments, law enforcers and community on resource utilization has continued to play out among coastal communities. Exclusion of the community from mangrove management forums often pits the community against government activities in mangrove conservation and restoration matters since they felt marginalized from economic gains from these ecosystems. The marginalization of local communities has been attributed to the lack of effective formal organizations and finances to represent the poor and associated coastal communities (McClanahan et al., 2005).

Efforts for mangroves management in Kenya

Despite continued loss of mangrove ecosystems, concerted effort has been made to address mangrove degradation and enhance conservation and sustainable utilization. Firstly, various rehabilitation and restoration projects have been initiated that have led to restoration of previously degraded mangrove forests through artificial reforestation. Such activities were initiated in 1995 at Gazi Village, Kwale County (Kairo, 2001). Such effort has resulted in the recovery of these forests and contributed further to artificial regeneration of non-planted mangrove species (which could not happen previously) and colonization by benthic fauna on the restored sites (Figure 1) (Bosire et al., 2003, 2004).

Secondly, research and policy development has played a major role in mangrove management in Kenya. The development of a National Mangrove Management Plan through support from the Kenya Coastal Development Project in 2017 is a major step towards the achievement of the conservation and management of the mangrove forest ecosystem in Kenya. The development of this Plan brought together various stake holders ensuring that coastal communities were effectively represented in laying out strategies and interventions to curb mangrove degradation. Further development and launching of the Guidelines on Mangrove Ecosystem Restoration for the Western Indian Ocean Region in 2020 (Kairo (2020) was

Figure 1: Scientists and community members collecting data for the Mangrove Management Plan project in one of the planted Rhizophora mucronata *stand in Gazi Bay, Kwale County. (Photo by V. Wangondu).*

another milestone in the walk towards enhancing a future world with mangroves for generations to come. The Sustainable Blue economy Conference hosted by Kenya and held at the University of Nairobi in November 2018 further emphasized recognition by the Government on the potential of aquatic and more so marine ecosystems in contributing to the country's economy.

Community participation is another effort that the Government and other stakeholders have recently incorporated in the mangrove rehabilitation and management projects all geared toward the realization of Kenya's Vision 2030 and the Sustainable Development Goals (SDGs). For example, coastal communities have been engaged in decision making platforms for governance of the mangrove resources, research and conservation projects for an all-inclusive strategy towards the realization of well managed mangrove ecosystem. To further reduce the pressure on mangrove forests, coastal communities through various stakeholders have promoted the planting of other tree species such as Eucalyptus, Cypress, Casuarina, Mukeu and Mvule, as alternative sources to meet community needs for wood, fuel and other uses.

Also under community participation is the implementation of projects that are fully owned by the local community. One successful community-run initiative is the carbon offset project known as "*Mikoko Pamoja*" established in Gazi Village in 2013 (https://www.mikokopamoja.org/). Revenue generated from the sale of carbon credits has benefited the community in conservation of mangrove forests, support for local development projects in water, sanitation, education and health. This is a classic example of a project that benefits environmental conservation, addresses climate change and improves the wellbeing of the community.

Mangroves are among the most active carbon sinks and could play a major role in climate change mitigation. This ecosystem was not included in the Nationally Determined Contributions (NDCs) whose aim is to attain a 30% reduction in Greenhouse Gases (GHG) emissions by 2030, relative to a business-as-usual scenario of emitting 143 $MtCO_2$ annually. However, effort to have mangroves included in the NDCs has been on-going with a pilot meeting held in Lamu in 2019. Owing to the high carbon sequestration rates of mangroves, in comparison to other ecosystems, inclusion in the NDC's is long overdue.

Key lessons learnt in the management of these environmental pressures

National recognition of the importance of mangroves forests is key in ensuring Government implementation of policies as well as functional legislative frameworks geared towards mangrove ecosystem conservation and sustainable utilization. Such include governance, policy development, inclusion of mangroves in NDCs, enhanced community participation at various levels of governance, promotion of community driven conservation and collaboration among stakeholders.

There is also need for the government to increase funding for research, training and knowledge dissemination activities for mangrove ecosystems. Policy development that is informed by research findings is critical and will go a long way in enhancing successful mangrove conservation. It is important to note that WIOMSA has been on the forefront in funding marine research for seasoned and upcoming research scientists for a long time. There is also the need for mapping mangrove resource, in line with the saying: "You can't conserve what you don't know". Much effort especially through the recently developed mangrove management plan

has been invested in mapped mangrove areas in the country. However, this effort needs to be continuous and to factor in spatial temporal changes that could be brought about by environmental or anthropogenic factors.

Campaigns for reduced deforestation and increased restoration should also be taken up by all stakeholders. Deforestation is instant, forest recovery is a process. Increased community participation and scaling up of community projects will enhance quality and promote conservation of the mangrove forests.

Development of the Integrated Coastal Zone Management (ICZM) approach that was started in the 1990s should be further promoted to factor in more stakeholders and reduce marginalization in key decision-making platforms. This will promote ownership and conservation of mangrove ecosystems with environmental and human benefits.

Marine Spatial Planning (MSP) considerations for mangrove management

Marine Spatial Planning (MSP) has become a crucial step in making ecosystem-based use and management of the ocean a reality (Douvere, 2008). To ensure the MSP as a processes is able to address environmental challenges associated with its implementation in Kenya, it is important to put the following into consideration:

- The MSP process should have an all-inclusive process of various stakeholders and key players in the conservation and management of mangrove resources;
- Resource mapping of mangrove fishery products, which is dominated by subsistence, artisanal commercial fishers, is likely to be greatly affected by the marine spatial plan. Mapping of non-fisheries products (microorganisms/invertebrates) within mangrove areas (they support processes vital for a functional ecosystem). There is lack of data for most of these resources yet they have the potential for bioprospecting for bioactive compounds;
- Species specific consideration in the MSP. It should be noted that there is varied utilization of mangrove products depending on the species to meet specific community needs. Conservation effort should not thus be generalized but should be species specific.
- The MSP process should emphasize reduced and controlled cutting (closed season) and restoration/planting and the need for embracing alternative livelihood sources to meet community needs.
- Emphasize and campaign for effective governance (law enforcement/ community policing) of mangrove areas.
- Licensed mangrove harvesting should be put in place for accountability and sustainability.

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Transboundary environmental pressures and management options

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Marine Spatial Planning in Kenya - transboundary considerations

This chapter uses the Kenya-Tanzania transboundary marine area setting to show the importance of considering transboundary pressures in Kenya's marine spatial planning (MSP) process. The concept of MSP has emerged as an integrated and comprehensive approach to ocean governance that aims to ensure sustainable use of marine space while also resolving competing user interests (Ehler and Douvere, 2009). Kenya's varied maritime economy can expand, but many threats can curtail the growth of the Blue economy, including climate change, pollution, and conflicting demands on marine resources. A sustainable Blue economy in Kenya requires reconciling new marine uses with traditional uses while maintaining environmental protection and responding to key threats. MSP will enable the Government of Kenya to plan and coordinate ocean activities in collaboration with stakeholders and local communities. Work has already begun in Kenya towards laying the foundations for MSP to support its Blue economy implementation.

Marine spatial planning considers the range of human activities planned for a given marine area over time (such as fishing, cultural uses, conservation areas, energy development, etc.) to keep the ocean healthy and productive for generations to come. Where MSP has already been undertaken, however, it has generally been nationally oriented. Because seas and coastlines are connected between states, the formulation and implementation of marine spatial planning (MSP) should also consider be transboundary issues (van Tatenhove 2017).

Issues of transboundary resource governance and particularly those dealing with threats across common boundaries are critical in formulating MSPs. For example, the marine ecosystem across Kenya and Tanzania shows high ecological connectivity. The various ecosystems that comprise coral reefs, seagrass beds, fish, etc. are all cross-boundary entities that transcend existing orders (Figure 1a). Threats that affect Kenya as a country are not localized but are felt cross the boundary in Tanzania (Figure 1b). The Kenya-Tanzania transboundary marine system also shows high social connectivity with the movement of migratory fishers across the border (Figure 1c) (Wanyonyi et. al. 2016). This movement is influenced or driven by resources that span both countries. The level of connectivity that exists in terms of ecosystems and the services they provide is very evident, hence the need for a cooperative approach to marine resource management.

Several studies and assessments have been conducted in the WIO region to demonstrate the level of connectivity of the ecosystems and the extent of threats, and how these threats cut across the boundaries (Gamoyo et al. 2019). For example, studies on coral reefs show that the imminent threats to corals extend beyond one country to the other (Otwoma et al. 2018). Several initiatives have been undertaken in WIO to assess the status of ecosystems in the region (Figure 2). These include an assessment of threats to the coral reef of the WIO region. Other reports demonstrate how threats transcend borders and cause activities in one country that adversely affect another. Other publications include various WIO regional state reports, The Transboundary Diagnostic Analysis of Land-based Sources of Pollution and Activities, and the study on the recently proposed Kenya-Tanzania Transboundary Marine Conservation Area. All these reports clearly show existing connectivity between the two countries and how threats affect the countries. Therefore, it is important to emphasise that we need to think more of a landscape or seascape approach, even as we consider managing common problems within our own country. Since activities in one country can negatively affect those of another country, the focus should not just be on what is happening on one side, but what is happening across borders and in the region.

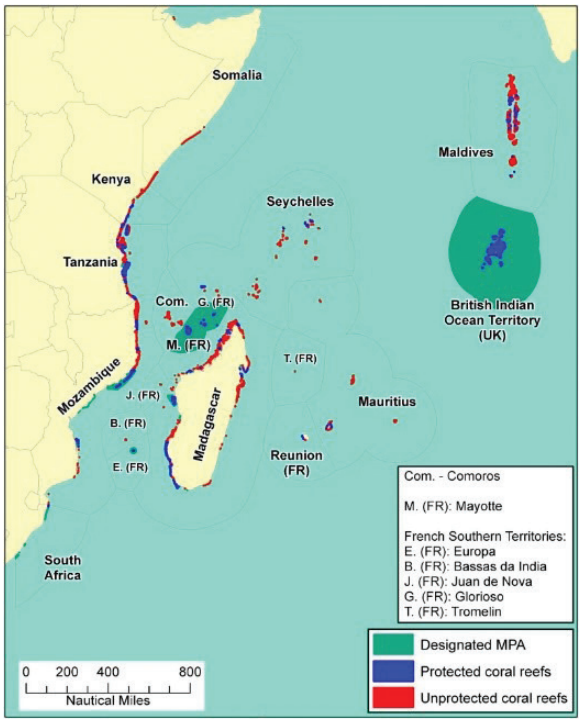

Figure1 a: Spatial distribution of coral reefs and of MPAs in the WIO showing countries' exclusive economic zones (Noam et al. (2018).

Figure 1b: Threat to coral reefs across the in the WIO region (WRI, ICLARM and UNEP, 1998).

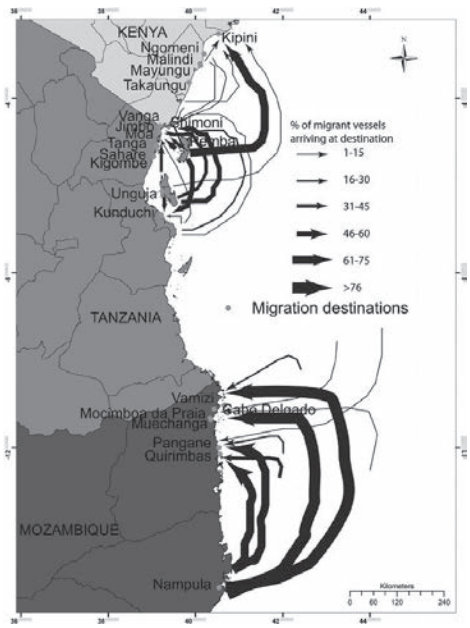

Figure 1c: The movement of fishers across the shared boundary (Wanyonyi et. al. 2016).

Figure 2: Published documents about environmental pressures from a transboundary diagnostic analysis. ASCLME/SWIOFP, ii; UNEP-Nairobi Convention and WIOMSA, The Regional State of the Coast Report: Western Indian Ocean, UNEP and WIOMSA, Nairobi, Kenya, 2015.

Figure 3: A schematic presentation of common drivers and pressure in the Kenya-Tanzania border.

Key issues for a transboundary and marine ecosystem-based spatial planning

Diversification and intensification of maritime activities across the Kenya-Tanzania border has increased stress and environmental pressures in the transboundary marine system (UNEP-Nairobi Convention and WIOMSA; MPRU/KWS, 2015). Studies across the WIO region also show that the drivers that cause pressures are also similar across countries. These drivers include population pressure, poverty, weak governance, low levels of awareness and climate change (Figure 3). These drivers cut across many countries and are similar in many cases. Therefore, the results and pressures are also the same. Mobility of fishers across the Kenya-Tanzania border and ecological conditions on both side of the border make it essential to enhance cross-border strategies, cooperation and planning to ensure coherence across biogeographical boundaries (Tuda et. al. 2019). Therefore, all dynamics of marine environment should be considered in transboundary planning in line with ecosystem-based marine spatial planning (EB-MSP).

A transboundary Marine Spatial Planning approach

Kenya and Tanzania have applied different management measures to address threats in their marine areas. Although the actions of Kenya and Tanzania have focused on similar concerns both countries follow different marine resource management methods (Tuda and Machumu, 2019). Kenya and Tanzania have a contiguous coastline (Figure 4), meaning that resource loss and degradation of marine ecosystems in one country are likely to adversely impact those of the adjacent country. Although the border between Kenya and Tanzania "splits" the transboundary marine ecosystem in two for political purposes, species and ecological processes move freely across the border. The similarities in Kenya and Tanzania's social and environmental systems require a transboundary planning approach and collaborative management.

The distinctions in marine management approaches also mean that MSP in Kenya should also consider cross-border planning and management objectives and governance. Transboundary conservation has emerged as a practical way to

overcome differences across jurisdictions and encourage cooperative working across international boundaries so as to achieve shared conservation goals (Groves et. al. 2019). Marine transboundary conservation (MTBC) is a co-operation process to achieve marine conservation goals across one or more international boundaries. MTBC has been shown to have several benefits, including enabling greater ecological integrity that contribute to species' long-term survival (Knight et al. 2011). In addition, it can enhance the connectivity of areas under conservation management, reduce the fragmentation of habitats, and allow increased dispersal opportunities for individual species (Almany et al. 2012).

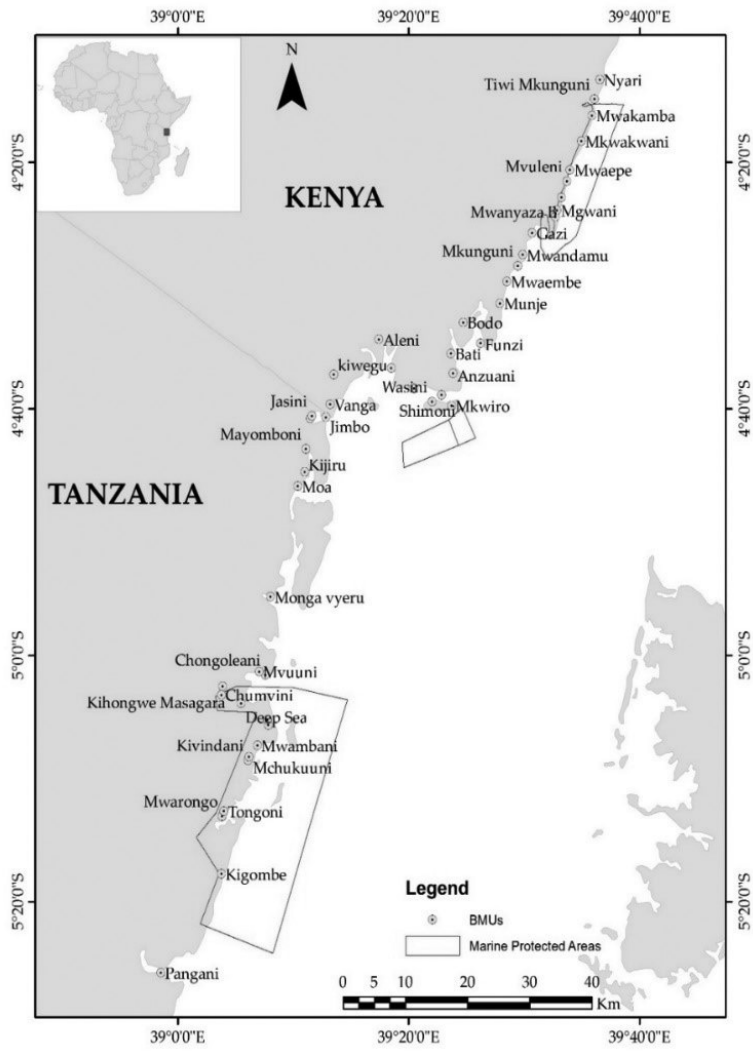

Figure 4: Map showing the Kenya-Tanzania border region. In this region there are 3 established marine protected areas (MPAs) and several community fisheries closures that are managed by Beach Management Units (BMUs).

Biodiversity conservation is usually the primary goal of MTBC, but—as biodiversity often brings benefits to people— socio-cultural and economic factors may also be important drivers. Kenya and Tanzania have recently agreed to collaborate in marine transboundary conservation. This opens up the possibility of using MSP to plan transboundary marine conservation area while taking into consideration conflicting users and cross-border threats.

Recommendations

Marine Spatial Planning (MSP) is an integrated and comprehensive approach to ocean governance and is used to establish a rational use of marine space and reconcile the conflicting interests of its users. MSP allows both a high level of environmental protection and a wide range of human activities and emphasizes coordinated networks of national, regional and global institutions. The MSP process would be a good framework to implement the transboundary conservation initiative between Kenya and Tanzania. MSP can help reduce conflicts and create synergies between different activities in the transboundary marine

system and protect the environment by assigning protected areas, calculating impacts on ecosystems, and identifying opportunities for multiple uses of space. In addition, MSP can help address how, and to what extent the governments could work with various jurisdictions across the border to address cross-border environmental problems within the "two systems" governance framework. For both Kenya and Tanzania, a successful marine transboundary conservation using an MSP framework would require that both sides identify local and transboundary interests in sectors and key issues, understand the different national MSP processes, aims and objectives and agree on common solutions to shared problems (i.e common vision and common goals to boost economic growth in the shared transboundary marine system).

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Land-based sources of marine pollution as an environmental stressor

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Introduction

Land Based Sources and Activities (LBSA) are the major drivers of degradation of the coastal and marine ecosystems globally (UNEP/GPA 2005). In Kenya as in other coastal developing countries, land based sources and activities also contribute immensely to the degradation of the coastal and marine environment (GOK, 2009 and 2017). Understanding of the LBSA issues in the country is critical for the formulation of strategies for reversing degradation of the coastal and marine environment. This section therefore provides a synthesis of the land-based sources of marine pollution and degradation of the coastal and marine environment in Kenya. Emphasis is put on the synthesis of the causes and impacts as enumerated in various studies that have been undertaken along the Kenya coast and Western Indian Ocean in general (WIO) Region (Diop et al., 2011; Richmond et al., 2009; UNEP/Nairobi Convention 2009).

Environmental pressures related to land based sources of marine pollution

In dealing with land based sources and activities, it is important to differentiate between the various components of the DPSIR (Drivers, Pressures, Status, Impacts and Responses) framework (Kristensen, 2004). The DPSIR framework identifies a chain of causal links between Drivers, Pressures, State, Impacts and Responses. The drivers which are also referred to as the 'driving forces' include the economic sectors and human activities, while 'pressures' refers to emissions, waste discharges, among others. The 'state' refers to physical, chemical and biological changes that occur on the environment or ecosystem as a result of emissions and waste discharges to the marine environment. On the other hand, 'impacts' are focused on resultant changes on ecosystems, human health and functions. These impacts eventually triggers management 'responses' which refers to management actions or interventions undertaken to minimize or control the 'Driving forces, Pressures, undesirable State and Impacts'. Pressures basically refers to specific human activities that stress or exert 'pressures' on the environment, as a result of production or consumption processes. Production or consumption processes can be divided into three main types: Excessive use of environmental resources; Changes in land use and emissions (of chemicals, waste, etc) to air, water and soil.

According to the UNEP Global Programme of Action for the Protection of the Coastal and Marine Environment from land-based sources of pollution more than 80% of the causative agents of the pollution of the coastal and marine environment originate from land (UNEP/GPA 2005). The priority LBSA source categories include marine litter, nutrients and wastewater. The WIO-LAB Transboundary Diagnostic Analysis (TDA) unravelled issues related to land-based sources and activities affecting pollution of the coastal and marine environment in the WIO Region (Richmond et al., 2009). WIO-LaB TDA identified three problem areas:

- **Problem Area 1:** Physical alteration and destruction of habitats;
- **Problem Area 2:** Alteration of river flows and sediment loads: and
- **Problem Area 3:** Water and sediment quality degeneration.

These problem areas are relevant to the Kenyan situation since Kenya was part of the WIO-LaB Project process. The country's State of the Coast Reports have also acknowledged these problems in as far as the management of the coastal and marine is concerned (GOK, 2009 & 2017).

Degradation of critical coastal habitats/ecosystems

The main issues in as far as the degradation of the coastal and marine habitats/ecosystems are concerned include (i) Over-harvesting of coastal and marine resources, (ii) Sewage and wastewater discharges, (iii) Dumping of solid waste and debris, (iv) Changes in longshore sediment transport dynamics, (v) Smothering due to sedimentation, (vi) changes in freshwater discharges and (vii) Climate change (global warming). As can be noted in Figure 1, dumping of solid waste and wastewater in mangrove areas is a major problem along the Kenya coast.

Photo credit: © Prof. Johnson U. Kitheka

Figure 1: Solid waste deposition in a mangrove wetland within Port-Reitz Creek, Kenya.

Alteration of freshwater flow and sediment load to the coastal zone

Alteration of river flows can have major impacts on the coastal geomorphology and ecosystems. Complex hydrological processes that determine freshwater and sediment flow to the coast are yet to be fully investigated. There has also been little effort in understanding the river basin-coastal/marine ecosystem linkages in the country. Lack of this understanding is constraining formulation of appropriate intervention measures in river basins that are hydrologically linked to the coast either through direct river runoff or through groundwater flow (Figure 2).

The main issues in as far as the alteration of freshwater flows and sediment load are concerned include (i) quantity and quality of water at river mouths, (ii) timing of the river flows and or discharges at the river mouths and (iii) increase or decrease of river sediment load.

Figure 2: Athi river discharge of terrigenous sediments and freshwater to the coast.

The direct root-causes of the alteration of freshwater flow to the coast as detailed in previous studies include damming, climate change, increased urban water demands and water abstraction for agricultural and industrial uses. Damming of the Tana river in the recent has greatly impacted on the hydrology of the river with major impacts downstream, in the Tana Delta. It is expected that the hydrology of the country's two largest river systems draining to the Indian Ocean (Tana and Athi river) will be greatly impacted after construction of the proposed multi-purpose dams (Kitheka, 2013; Kitheka and Mavuti, 2016).

Previous studies have shown that the alteration of freshwater flow to the coastal zone can have several direct impacts that include; (i) Siltation or erosion of bays, estuaries/deltas; (ii) Increased seawater intrusion affecting coastal agriculture and groundwater aquifers; (iii) Modification of riverine, estuarine and marine ecosystem community structure and functions; (iv) Loss of important coastal habitats and biodiversity and (v) Deterioration in water quality. The details on the extent of these impacts can be discerned in the Kenya State of the Coast Reports (GOK, 2009 & 2017).

Water and sediment quality degradation

The degradation of the water and sediment quality is a matter of concern along the Kenya coast. The common pollution problems associated with the water and sediment quality degradation include Microbial contamination; Suspended solids; Chemical pollution; Litter (Solid waste) and Nutrient over-enrichment.

The main causes of water and sediment quality degradation include (i) Disposal of untreated or undertreated wastewater; (ii) Industrial discharges of under or untreated effluents, (iii) Contaminated runoff from agricultural, industrial or urban areas, (iv) Discharge of sediments, municipal waste, solid waste and debris; (v) Leaching of agrochemicals (fertilizers and pesticides) from storage facilities, dumpsites or irrigation return flows, (vi) Inadequate collection and disposal of solid waste and (vii) Public littering of beaches and shoreline.

Underlying root causes and impacts of degradation of marine ecosystem

The underlying root causes of the degradation of the coastal and marine environment (habitats and ecosystems) in Kenya are diverse. These include (i) Increasing Population, (ii) Poverty and inequality, (iii) Economic pressure, (iv) Inadequate financial resources, (v) Lack of alternative livelihood systems, (vi) Coastal governance weaknesses, (vii) Globalization/international trading policies, (viii) Global climate change and (iix) Low level of education. The underlying root causes have been examined in some detail in the Kenya's State of the Coast Reports (2009 and 2017). At regional level, the underlying root causes and impacts have been analyzed in some detail in the WIO-LaB TDA (UNEP/Nairobi Convention 2009 and Richmond et al., 2010).

The degradation of the coastal and marine environment has numerous human and environmental impacts. These include (i) Loss of vital ecosystem functions; (ii) Decrease and/or loss of biodiversity, (iii) Reduction in marine productivity; (iv) Decline in fish production/yield; (v) Water-quality degradation; (vi) Decreased aesthetic value; (viii) Changes in coastal dynamics and (iix) Coastal instability (coastal erosion and siltation). The socio-economic consequences include (i) Loss of vital natural resources; (ii) Reduction in touristic value; (iii) Reduction in income levels, (iv) Increased public health problems, (v) Lack of alternative livelihoods and (vi) Lack of employment opportunities.

In as far as management interventions are concerned, more concerted effort needs to be focussed on addressing the underlying root causes as opposed to direct causes. The underlying root causes which are usually socio-economic in nature, results in direct causes which are more obvious as one can directly establish cause-impact relationships. Most of the projects aimed at reversing the degradation of the coastal and marine ecosystems in Kenya (and WIO region at large) have focused more on addressing direct effects as opposed to underlying root causes. It is therefore not surprising that there have been little success in as far as the reversal of the degradation of the coastal and marine environment is concerned.

Lessons learnt in management of LBSA environmental pressures

Several lessons can be synthesised from various projects implemented in Kenya and the WIO Region, particularly those that have focussed on addressing the LBSA issues. These projects include the UNEP-GEF WIO-LaB Project that addressed the LBSA issues in the WIO Region and the Strategic Action Programme for the Protection of the Coastal and Marine Environment from LBSA (WIO-LAB SAP). The main lessons that can be enumerated in this report include the following;

i. Political will at the highest political level at national or county government level is necessary for success of LBSA interventions.

ii. Integrate interventions in national and county government budgetary and planning processes.

iii. Processes driven by national or county government institutions with proper mandate and jurisdiction have higher chance of success.

iv. Community driven approaches still problematic-few examples of success. New models of community involvement are required.

v. Improvement of living standards of communities is central to the success of LBSA interventions.

Integrating LBSA issues in Marine Spatial Planning (MSP) process

Marine Spatial Planning (MSP) is about allocating marine (and coastal) space for various compatible (and sometimes incompatible) uses to balance demand for development with the need for the protection of the marine ecosystem in order to achieve socio-economic benefits (cf. Ehler and Douvere, 2009). In Kenya, MSP is basically a new planning concept that is yet to take root in government departments charged with the responsibility for spatial planning.

Most of the spatial planning efforts in the country have been focused on coastal land through the Integrated Coastal Zone Management (ICZM) processes. For the MSP to adequately address LBSA in Kenya, the following recommendations should be taken into consideration.

i. Focus MSP on key hotspot areas such as; Shanzu-Bamburi-Mombasa-Likoni-Diani-Funzi Bay Area; Watamu-Malindi-Ngomeni area; Mpeketoni-Lamu-Kiwayu Area;

ii. Demarcate in detail the location of key critical coastal/marine ecosystems/habitats including their current status;

iii. Demarcate in detail points of discharge and areas of dispersion of wastewaters/sewage/litter (solid waste)/contaminants along the coast;

iv. Demarcate in detail points and areas of discharge and dispersion of nutrients including eutrophic/dead zones along the coast;

v. Demarcate in detail location of dumpsites, points of entry and dispersion of litter (solid waste);

vi. Demarcate in detail points of river discharges and areas of dispersion of freshwater and terrigenous sediment load along the coast;

vii. Demarcate in detail points and areas of discharge and dispersion of groundwater (submarine springs) along the coast; and

viii. Demarcate in detail points and areas of seawater intrusion into coastal groundwater aquifers.

The undertaking of the above listed demarcations and surveying activities should subsequently inform the process for designation of specific compatible uses of coastal-marine space. This process is also important for the identification of specific interventions required to address LBSA pressures along the Kenya coast.

Conclusions

In conclusion, MSP should aim at preventing further degradation of the coastal – marine ecosystems in Kenya. This can be achieved by integrating the MSP process with other innovative and bold initiatives that are aimed at addressing the underlying root causes of the continued degradation of the coastal and marine environment in Kenya. MSP should start by focusing on key hotspot areas along the coast. Detailed mapping of points and areas of entry and dispersion of LBSA related parameters should inform allocation of marine space for various compatible/incompatible uses. It is also important to emphasize the fact that engagement of relevant and appropriate national and county government institutions in MSP process is critical for its success and subsequent implementation. The integration of LBSA and MSP processes is critical for controlling degradation of the coastal and marine ecosystem in Kenya and WIO region at large.

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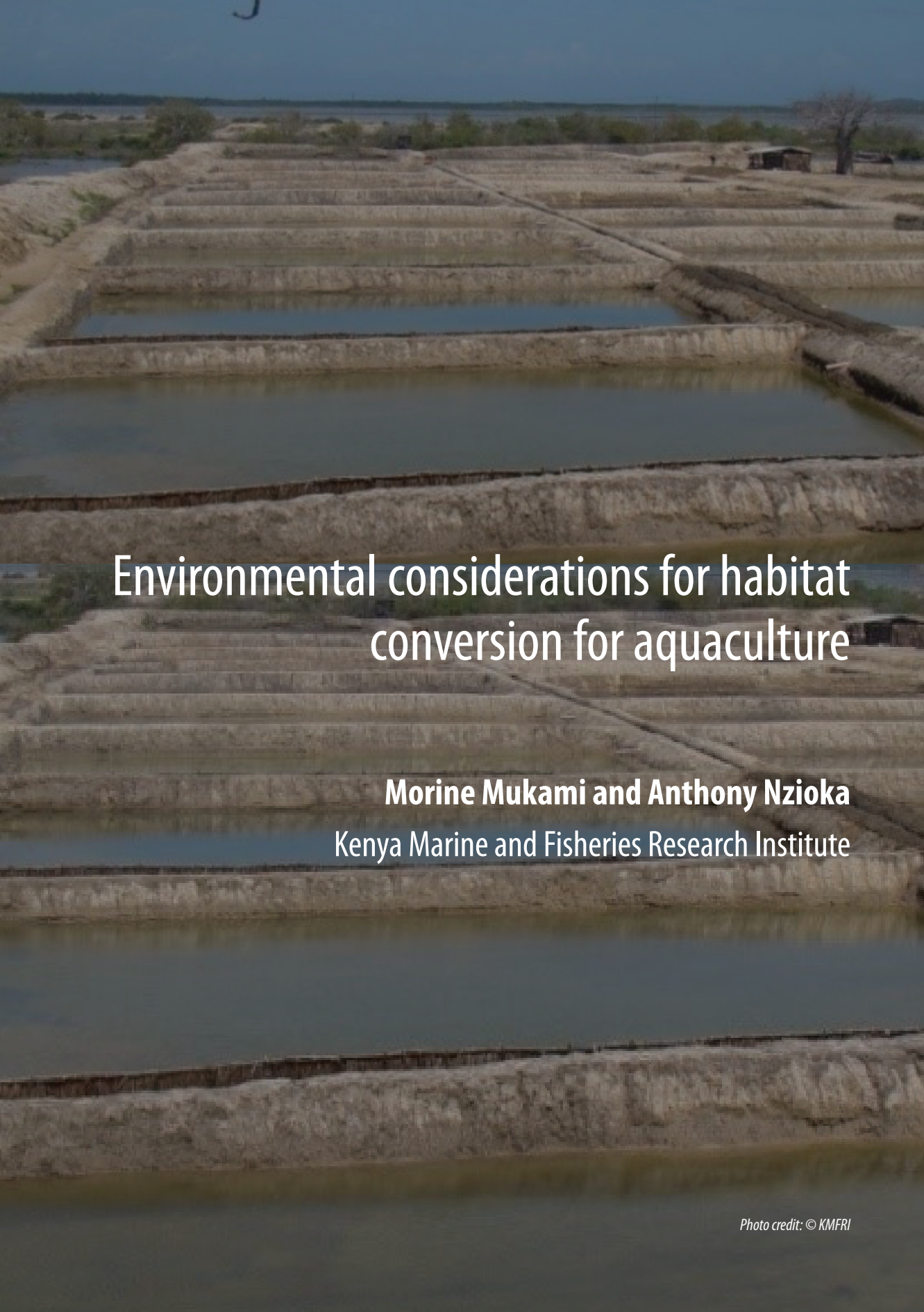

Environmental considerations for habitat conversion for aquaculture

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Introduction

Aquaculture is referred to as the culture of aquatic animals and plants under controlled conditions either in freshwater, brackish or marine environments. Aquaculture, which is the fastest growing food sector in the world as a result of increasing demand for seafood (Harvey, 2017) and decreased wild stocks (FAO, 2016), contributes to nearly half of seafood annually (FAO, 2020). According to the 2020 World Global Data Sheet, the global population is estimated to reach 9.9 billion by 2050 a 25% rise from 7.8 billion in 2020 therefore global aquaculture is projected to grow further as the demand for healthy and nutritious food will also be on the rise. The aquaculture sector directly employed nearly 21 million people in 2018 (FAO, 2020) thus indicating that it is an important source of income and employment. It is also a viable alternative to fishers who cannot afford heavy capital investment required for deep sea fishing. The aquatic environments that have experienced depleted stocks can also be restocked through aquaculture.

In Kenya, coastal aquaculture referred to as mariculture, is practiced in offshore areas, estuaries and within the marine waters. Currently the farmed species include milkfish, crabs, mullet, seaweeds, Artemia, sea cucumber, freshwater and marine prawns. The production levels of coastal aquaculture in Kenya is still low compared to freshwater aquaculture. The low production levels could be attributed to lack of effective mariculture policies and strategies, inadequate services such as quality feeds, affordable seeds, extension, low funding and investment in the sector, dependence on few species and traditional farming methods, weak linkages between research and extension among others. However, the production is expected to rise with aquaculture being targeted to contribute to food security under the Blue Economy. The focus of the Blue Economy and the shift to advanced culture systems and technologies are anticipated to boost aquaculture production.

Environmental pressures of aquaculture

Mariculture, though important, can lead to enhancement, adjustments or degradation of habitats, disruption of trophic systems, and depletion of natural seedstock, transmission of diseases and reduction of genetic variability. In Kenya for example, except for seaweeds, other seed stocks are sourced from the wild since there is a lack of traditional techniques to produce fish seedlings. There is also no marine hatchery to support seed production. There is an argument that harvesting the wild seed stocks enhances survival of the fry since there is minimal predation unlike in open waters. However, it is not sustainable to undertake mariculture using the wild seed stock because it interferes with the natural food webs and thus affects trophic levels.

The following is a list of the most common environmental pressures caused by aquaculture.

1. ***Sedimentation*** – Of all the wastes released by marine fish cages and ponds into the environment, particulate organic waste in the form of uneaten feed and feces are usually the most significant fraction. These wastes settle on the seabed near the culture systems and they provide a net input of organic carbon and nitrogen to the sediments. The accumulation of waste can cause major changes in the benthic community and may exceed the environment's capacity to bioprocess this material. Environmental deterioration caused by the high organic matter concentrations in the sediments may affect the health of farmed fishes and profitability. The solid wastes increase organic input, oxygen demand, smothering fauna, resulting in anoxia and changing benthic community structure.
2. ***Change in bio-geochemistry*** – Nutrient enrichment as a result of feeds may result in increased phytoplankton growth (eutrophication), increased micro-algae growing on seagrasses or seaweeds, changes in the balance of organisms (ratio between diatoms, flagellates, cyanobacteria, may increase risk from toxic phytoplankton). Uneaten feeds may also introduce heavy metal concentration in the water while overdependence of fish meal as a fish feed may threaten the wild stocks and disrupt the marine food web.

3. ***Change in coastal processes*** –There are minor alterations to coastal currents when cages are erected and there is potential for minor mpacts on sediment drift for low-lying ponds in coastal plains.
4. ***Impacts on infrastructure*** – Direct removal (dredging or building – ponds) can have an impact based on the magnitude and distribution of the infrastructure.
5. ***Land and seascape modifications*** – Construction of mariculture structures such as ponds, pens, cages change the aesthetic value of the land or sea.
6. ***Disturbances*** – These are caused during construction of culture systems, cleaning the culture systems, harvesting and feeding the cultured plants or animals.
7. ***Habitat and trophic alteration*** – Active and passive means of preventing wild animals from predating on farmed stock e.g., using frightening devices, physical barriers, extermination etc. Changes in behaviour and life strategies of both predators and non-predators affected by the predator control mechanism could alter trophic levels.
8. ***Use of chemicals*** – This can be associated with structural materials such as cages, soil and water treatments through liming and fertilization of ponds, disinfectants and antibacterial agents used to enhance hygiene and prophylactic use, pesticides applied in ponds, feed additives, anesthetics and hormones used in cages and ponds.
9. ***Pathogen transmission*** – This arises due to low quality water, containers and equipment in open systems here there is no barrier between the farm and the aquatic environment. High stocking densities in the culture systems also increase prevalence of pathogen infestation. Un-stocked ponds provide ideal habitats for mosquitoes, snails etc. thus increasing disease prevalence e.g. malaria
10. ***Interbreeding with wild organisms*** – Escapees from the culture systems into the sea can result in genetic alterations such as loss of gene pool, loss of fitness and direct competition for space as well as food or mates
11. ***Introduction of alien species*** – Introduction of new species leads to habitat alterations, trophic alterations, spatial alterations, interbreeding, introduction of parasites and diseases.

Table 1. Aquaculture pressures and the amount of pressure exerted on different mariculture systems.

Pressure	Aquaculture production systems						
	Fish cages	Crab pens	Crab cages	Seaweed farms	Land based ponds	Artemia ponds	RAS and Raceways
1. Sedimentation							
2. Change in bio-geochemistry							
3. Change in coastal processes							
4. Infrastructure impacts							
5. Land & Seascape modifications							
6. Disturbances (construction, cleaning, harvesting, feeding, etc.)							
7. Habitat and trophic alterations							
8. Chemical use							
9. Pathogen transmission							
10. Inter-breeding with wild organisms							
11. Introduction of alien species							
Level of pressure exerted:	High		Moderate		Low	Negligible[1]	

[1]*Negligible = undetected*

According to the Secretariat of the Convention on Biological Diversity (2004), besides the negative effects mariculture could have on the environment, it can cause enhancement in some instances. For example, the attraction of flamingoes in Artemia farms has enhanced the aesthetic value of the area. Fish cages and seaweed farming sites have also acted as fish aggregating devices thus enhancing biodiversity. Replanting of corals and restocking of depleting aquatic environments are also positive impacts of mariculture.

Lessons learnt in management of these environmental pressures

Though mariculture exerts pressure on the environment, the demand for seafood by the increasing population will still have to be met. However, mariculture has to be carried out more efficiently without putting too much pressure on the environment. Most of the pressure exerted arises due to lack of information by most stakeholders. Besides having good working policies to guide mariculture development there is more that needs to be done by the main players. Figure 1provides practical aspects that should be undertaken to minimize or mitigate environmental pressures brought about by mariculture ventures.

Marine Spatial Planning considerations for aquaculture

The negative environmental impacts attributed to aquaculture have often resulted from inappropriate site selection, poor planning, and lack of attention to environmental protection. To minimize these negative impacts, it is important to undertake an assessment of site suitability. Site suitability evaluation is done at the initial stage to determine the suitability of a location for fish farming. This is the most critical stage for determining whether cage fish farming venture will be a success and also supports the reduction of operational costs. In assessing the best site several factors are put into consideration such as water quality parameters, environmental, socio-economic factors etc. Aquaculture proponents evaluate potential sites based primarily on their biological suitability, technical feasibility, and cost considerations.

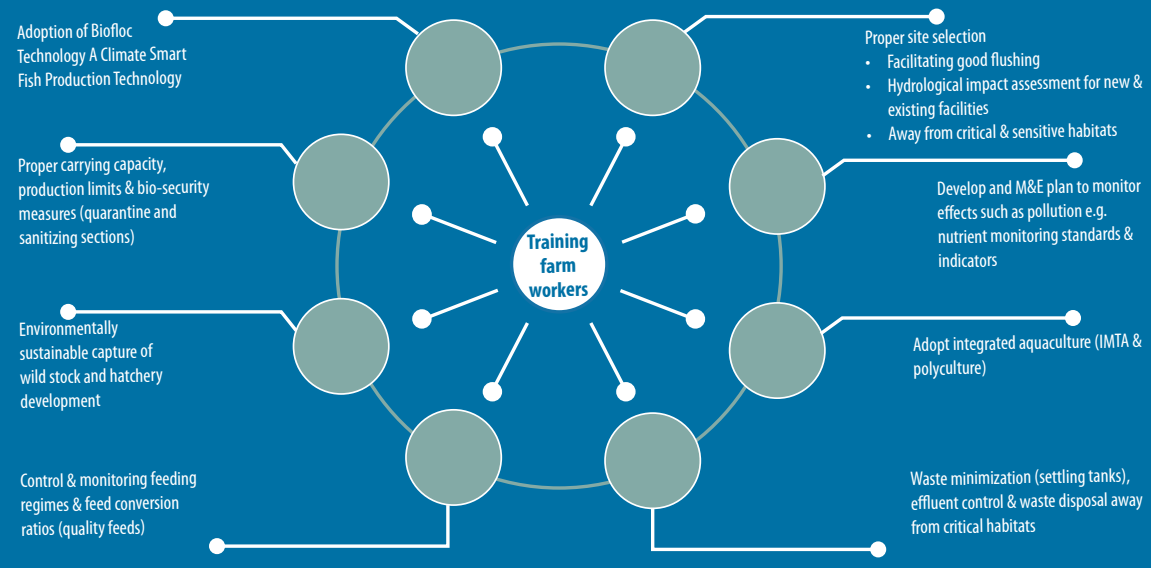

Figure 1: Lessons learnt in managing environmental pressures accelerated by aquaculture.

Around the globe, increasing human activities in coastal and offshore waters have created complex conflicts between different sectors competing for space and between the use and conservation of ocean resources (Stelzenmüller et al., 2017). Aquaculture siting is conducted in a much more broader, multiple-use context where tradeoffs are more complex. Although aquaculture is usually mentioned in reports on Integrated Coastal Zone Management (ICZM) and MSP, they rarely focus specifically on aquaculture siting because of their multiple use orientation (Olofsson and Andersson, 2014). However, as stated by Lovatelli et al. (2014), "meeting the future demand for food from aquaculture will largely depend on the availability of space [and] 'MSP' is needed to ensure [that] allocation of space". Emerging marine spatial plans should therefore consider aquaculture facilities (e.g. cages, seaweed farms, sea cucumber pens etc.) as part of their future operations. MSP can allocate space for aquaculture at sites with both:

i. Favorable operational characteristics (economic and ecological)
    a. Data consolidation for existing mariculture entities and determine the marine space needed in the MSP process

ii. Lower potential for conflict with other sectors
    a. Proper site visits and stakeholder engagement to determine other resource users in different mariculture sites
    b. Use Geographic Information Systems (GIS) –for multi-criteria based evaluation to get the suitable sites

Finally, there is need to analyze future conditions with an understanding of:

a. how sectors intend to develop in an area and
b. how ecological and social conditions may change, taking into consideration, unexpected occurrences such as those triggered by climate change

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Impacts of COVID-19 on the environmental resource base

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Environmental pressures

Figure 1: Face masks on sale to members of the public as a COVID prevention measure.

The coastal and marine environment is an important source of livelihood, food and nutrition security, income and employment to coastal dwellers (FAO, 2021). These benefits were disrupted by the COVID-19 which was declared a pandemic by WHO in March 2020 (WHO, 2020). Initially, COVID-19 had been reported in December 2019 as a virus in China. Kenya detected its first case in March 2020 and this brought about a number of containment measures that included local travel restrictions and suspension of international passenger flights, dusk to dawn curfews, closure of schools, hotels and restaurants. Other measures that were put in place by the Government included the prohibition of public gatherings, processions or movement, social and physical distancing, introduction of the "work-from-home" concept, wearing of masks in public places, sanitization of hands, monitoring of body temperatures and testing for the virus in suspect cases. The containment measures resulted in loss of jobs and drastic reduction in economic growth both in Kenya and globally. Businesses collapsed resulting in loss of employment that led to increased pressure on coastal and marine environmental goods and services as citizens joined artisanal fisheries for survival, illegal harvesting of mangrove wood and charcoal burning for survival.

These containment measures critically disrupted the fish market value chain due to dusk to dawn curfews, cessation of movement, and closure of hotels and restaurants which resulted in increased fish post-harvest losses and income losses due to drastic decrease in demand for fish and fisheries products. As people started working from home, enforcement of environmental laws and regulations was weakened. This was caused by fewer officers conducting monitoring, control (MCS) and surveillance at sea or at the landing sites. Thus it was possible for the fishers and traders to engage in illicit activities with the belief that they would escape conviction. This was eye opening as new directives and protocols had to be adhered to, most of which, had never been considered or planned for.

Due to the COVID-19 pandemic, the government's expenditure priorities changed with more resources being channelled to cater for tackling the pandemic. The national budget was therefore revised to reallocate more resources to the Ministry of Health to set up measures to curb the spread of COVID-19 and to take care of those infected. This left other ministries constrained for cash to implement their targets.

The increased use of personal protective equipment by health practitioners and the wearing of face masks by all citizens (Figure 1), led to their unplanned disposal which further resulted in pollution of marine environment.

Key lessons learnt in management of these environmental pressures

Many citizens lost their jobs in key economic sectors such as tourism. Many of those who lost employment joined artisanal fisheries for survival while others embarked on illegal harvesting of mangrove wood and charcoal burning. As pressure increased on the environmental goods and services due to increased fishing effort and harvesting of mangroves, the following lessons were learnt:

1. Food insecurity was reported among those who had lost employment, orphans, single parents, persons living with disabilities and other vulnerable and marginalized groups. Thus relief food was distributed, but it was considered insufficient leading to conflicts among the recipients and other people who felt they had been neglected. Thus it was clear that Marine Spatial Planning (MSP) should consider how to manage conflicts.

2. Vulnerability mapping of households that depend on marine environment is necessary to address everyone in the community particularly those dependent on the natural resources. Conflicts that arose in the distribution of relief food stemmed from lack of data that could be used to objectively identify which households needed food aid most. Therefore it is imperative for livelihood and income analysis to be undertaken to improve targeting of relief interventions to the most vulnerable households during pandemics. The Government of Kenya in collaboration with by the World Bank through the Kenyan National Bureau of Statistics (KNBS) and the United Nations High Commissioner for Refugees (UNHCR) as well as the University of California, Berkeley undertook a high-frequency phone survey on the socio-economic impacts of COVID-19 in Kenya from May 2020. The respondents were contacted every 2 months so that the government would map the impact of COVID-19 on householdshttps://www.worldbank.org/en/country/kenya/brief/monitoring-covid-19-impact-on-households-and-firms-in-kenya#1. Preparations for disaster management in MSP is fundamental. There should be anticipation of future challenges, provisions for adoption and mitigation. Disaster risk reduction and an emergency response mechanism are also needed.

3. Proper disposal of personal protective equipment (PPEs) should be observed to avoid the pollution menace. Unplanned disposal of PPEs goes against the efforts set up by Government to control the use of plastics. Kenya is a champion in this amongst countries globally and in the region banning single use plastics.

4. Marine environmental conservation initiatives that were adversely affected by economic and logistical difficulties need to have a mitigation plan.

5. There is need to invest in alternative and supplementary livelihoods to build resilience among coastal communities.

6. Huge post-harvest fish losses were realized in the coast of Kenya due to drastic reduction in demand for fish as the fish market was disrupted by COVID 19. Once an actor in the value chain was affected by the COVID-19 containment measures, then a ripple effect happened and subsequently had downstream and upstream effects. Household spending reduced drastically affecting the supply and demand chains. Figure 2 shows the change in the size of purchased fish during the pandemic period.

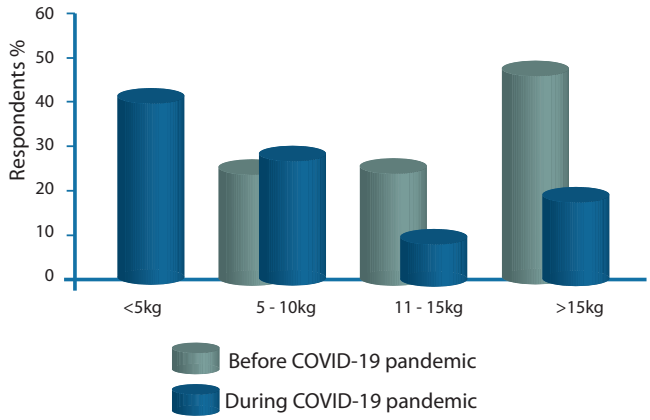

Figure 2: Daily fish purchases by fishmongers before & during COVID 19 pandemic in the coast of Kenya.

What an MSP process should consider during times of risk

In order to address resource use conflicts and the problems that are associated with pressures on coastal and marine environment and COVID-19, the MSP should consider the following:

1. Ensure there is an effective pollution abatement mechanism in the MSP process to check non-conventional sources of pollution such as personal protective equipment.

2. Establish a strong emergency response mechanism to curb damages associated with accidents and incidents such as an oil spill occurring where mariculture projects are set up.

3. Ensure involvement of all parties through effective stakeholder engagement for buy in and map those who will support the interventions and those who may be against the projects so that both parties pull together. Stakeholder expectations and interests need to be established beforehand.

4. There is need to build strong and resilient economic sectors that can withstand pandemics.

5. Vulnerability mapping of both marine environment and households that depend on it for livelihood and income should be undertaken to avoid conflicts. This will ensure maximization of benefits from the coastal and marine resources.

6. Effective monitoring and evaluation system with clear indicators should be put in place. FAO has compiled a guidance document on best practices for developing surveys and questionnaires on the impacts of COVID-19 on fisheries and aquaculture (FAO, 2020).

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Environmental governance in Kenya

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Photo credit: © Kenya Forest Service

Introduction

Key global and national environmental problems and pressures include pollution from various sources (land based, sea based, atmospheric), land degradation and destruction of habitats, climate change, etc.

These international environmental problems, which manifest in polluted and degraded waters, land and air spaces, including shared or transboundary ecosystems and spaces, have led to various legal, policy and institutional efforts and responses over the decades to address them (collectively, "environmental governance")

Environmental governance includes the complex system of the policy, legal, regulatory and institutional frameworks interacting with the government/public agencies, non-governmental actors, and the general population in terms of decision making, management and protection of the environment.

Environmental governance as a concept of political ecology and environmental policy, emphasizes sustainability as the supreme consideration for managing all human activities as they relate to the environment, and thus "whole system management". Key stakeholders and players in environmental governance include government/public agencies, private sector/business, civil society and other non-state actors.

Environmental governance frameworks in Kenya

i. Constitutional framework

Kenya's constitutional, legislative and regulatory frameworks on the environment are generally well articulated, and they include provisions that support the MSP processes currently under way in the country. The Constitution of Kenya 2010 (Laws of Kenya, 2013) provides a constitutional basis for the protection and even planning of the land and environment, including the marine spaces. Article 62(1) defines "public land" to include: "(i) all rivers, lakes, and other water bodies as defined by an Act of Parliament; (j) the territorial sea, the exclusive economic zone and the seabed; (k) the continental shelf; (l) all land between the high and low water marks", and all of the foregoing are vested in the national Government and held in trust for the people of Kenya, and shall be administered on their behalf by the National Land Commission (NLC).

Article 69 of the Constitution obliges the State to " (a) ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; (d) encourage public participation in the management, protection and conservation of the environment; (e) protect genetic resources and biological diversity; (f) establish systems of environmental impact assessment, environmental audit and monitoring of the environment; (g) eliminate processes and activities that are likely to endanger the environment; and (h) utilise the environment and natural resources for the benefit of the people of Kenya".

Article 70 of the Constitution provides for enforcement of environmental rights, and entitles citizens to court remedy for violation, denial, or infringement of their environmental rights. Article 71 provides a requirement that Parliament must ratify agreements relating to a right or concession for the exploitation of natural resources of Kenya. Article 2(5) and (6) of the Constitution provide that the general rules of international law shall form part of the laws of Kenya, and "any treaty or convention ratified by Kenya shall form part of the law of Kenya under this Constitution". This means that all multilateral environmental agreements (MEAs) to which Kenya is a party are

consequently part of the laws of Kenya. These laws are global, regional and sub-regional MEAs. They include the 1982 UN Convention on the Law of the Sea (UNCLOS) which has provisions for the governance of ocean and sea spaces.

ii. Legislative frameworks

Key legislative frameworks include the framework Environmental Management and Coordination Act (EMCA) 1999, as amended 2015 (particularly section 55), as well as sector laws for water, energy, forestry, wildlife, mining, etc. They include the Water Act 2016; Forest Conservation and Management Act; Fisheries Management and Conservation Act; Wildlife Conservation and Management Act no 47 of 2013.

There are also devolution/county related laws that include the County Government Act, and the Inter-Governmental Relations Act

iii. International frameworks

The 1982 UNCLOS, to which Kenya is a party, is an all-important and pivotal instrument regarded as the "constitution for the oceans", and recognizes that "problems of ocean space are closely interrelated and need to be considered as a whole" (Pyć, 2019). It has direct relevance for the MSP process that Kenya is currently undertaking

The 1985 Nairobi Convention (Amended 2010) together with its additional protocols: Specially Protected Areas and Wildlife (SPAW), Emergency, and the Land Based Sources and Activities (LBSA), and the Integrated Coastal zone Management (ICZM), are of immediate relevance to Kenya's MSP process.

Key lessons learnt and requirements for MSP

The importance of well-established governance frameworks and structures that are capable of implementation and enforcement, and particularly constitutional, legislative and regulatory tools that protect the environment and natural resource base from pollution and degradation cannot be overemphasized. There is also need for better coordination mechanisms among governmental/public sector agencies themselves, and between public sector and private sector and non-governmental actors, in order to synergize regulation, management, education, research and innovation, production, environmental conservation, and sustainable utilization of environmental and natural resources.

There is also a need to understand and undertake marine spatial planning in Kenya's territorial waters, Exclusive Economic Zone and seabed, and Continental Shelf in order to account for and accommodate competing and often conflicting uses and demands on the marine spaces and resources.

In order to achieve effective governance and regulatory frameworks, there should be overall and strict compliance with legal and regulatory requirements both in the process and outcome of MSP, including environmental impact assessments, strategic environmental assessments and environmental audits. Moreover, there should be better alignment with the national, regional and global policy goals and priorities, including those stated in Kenya Vision 2030 and its series of Medium Term Plans (MTPs), National Fisheries and Ocean Policy, Africa Agenda 2063, the 2050 Africa Integrated Maritime Strategy (AIMS), and the UN Sustainable Development Goals (SDGs). Finally, there should be concerted multi-stakeholder and inclusive public participation to achieve shared prosperity and equitable benefit sharing especially for local communities and to ensure no one is left behind.

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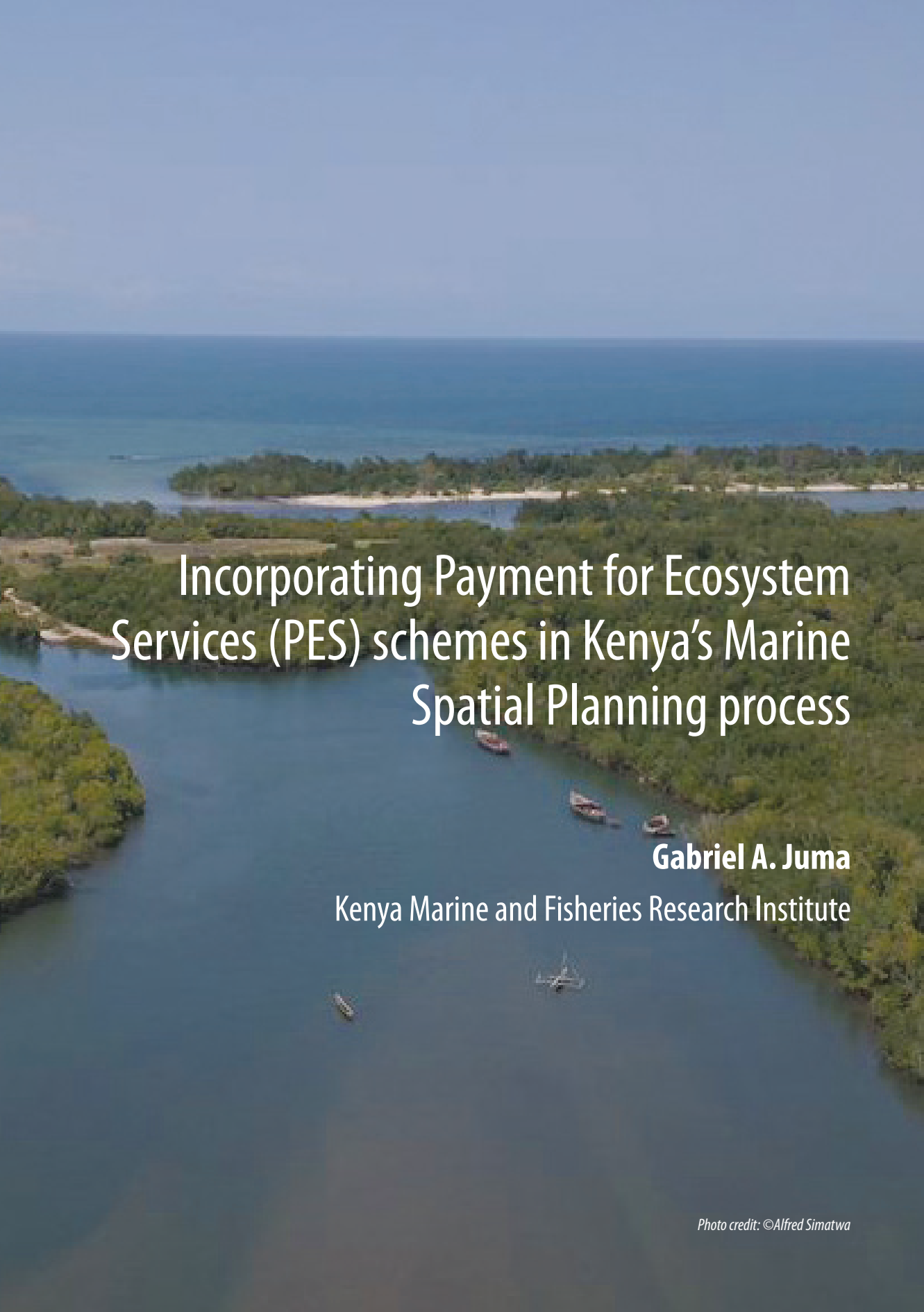

Incorporating Payment for Ecosystem Services (PES) schemes in Kenya's Marine Spatial Planning process

Gabriel A. Juma

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Photo credit: ©Alfred Simatwa

Introduction

Human society is dependent on healthy and resilient marine ecosystems for their goods and services. These include food, timber, medicine, climate regulation, water quality and cultural uses among others (Wilberg and Miller, 2007), valued at approximately US$20 trillion yr-1 globally (Trends, 2010). However, as day to day conservation and management approaches are based on immediate financial returns, most ocean ecosystem functions and structures are often ignored. Additionally, inadequate market valuation for these ecosystem services (ES) coupled with global anthropogenic pressures such as pollution, climate change and ocean acidification have led to their degradation, causing a reduction in the effectiveness and quality of services provided.

In response to the ever-increasing pressure, payment for ecosystem services (PES) concept has recently emerged as a conservation tool that translates non-market and indirect marine ecosystem benefits into incentives to enhance service provision (Trends, 2010). The incentives are offered to landowners, fishermen or communities in exchange for managing the adjacent coastal ecosystems and resources that provide environmental services (Kagombe et al., 2018). Markets (mandated by law or voluntary) are upcoming for carbon sequestration and marine biodiversity offsets as well as regulation of commercial fisheries.

Although many coastal communities and managers are increasingly adopting PES concept as a conservation strategy, lack of inclusion of ongoing and potential PES projects into marine spatial planning (MSP) process remains a challenge for many developing countries. This leads to collapse of PES projects, since allocating other activities in PES sites creates conflicts in their ecological structures and functions, hindering continued provision of goods and services. This points to the need for incorporation of ongoing and potential PES schemes in Kenya's marine spatial planning process. Synergies between the MSP process, and successful PES establishment and implementation process and case studies of working PES schemes in Kenya are discussed in this section.

Steps to establishing a PES project and their link to maritime planning

For the establishment of any PES project, the basic requirements include the identification of the service buyer, understanding of the market conditions, identifying the service; and the legal and institutional framework of the service provider (Fripp et al., 2014), (Figure 1).

The establishment of a successful PES project takes four broader categories including:

i. Identification of the ecosystem service prospects and the potential buyers This process involves defining, assessing and measuring the ecosystem services within the environment of focus including carbon sequestration, fisheries, recreation, food and energy production. Additionally, the market value and the potential buyers of the services are identified (Farley & Costanza, 2010). In the MSP process, identifying and mapping ecosystem services should be prioritized to prevent allocation of maritime activities which result in competing interests. Similarly, an ecosystem service-based MSP recommends roadmaps for sustainable utilization and resilience of the coastal ecosystems.

ii. Assessment of the technical and institutional capacity This step includes assessment of the policy, legal, marine uses, land ownership management responsibilities and rights. The existing rules and regulations for PES deals and markets are also examined. Additionally, it involves site selection and survey for available support from organizations

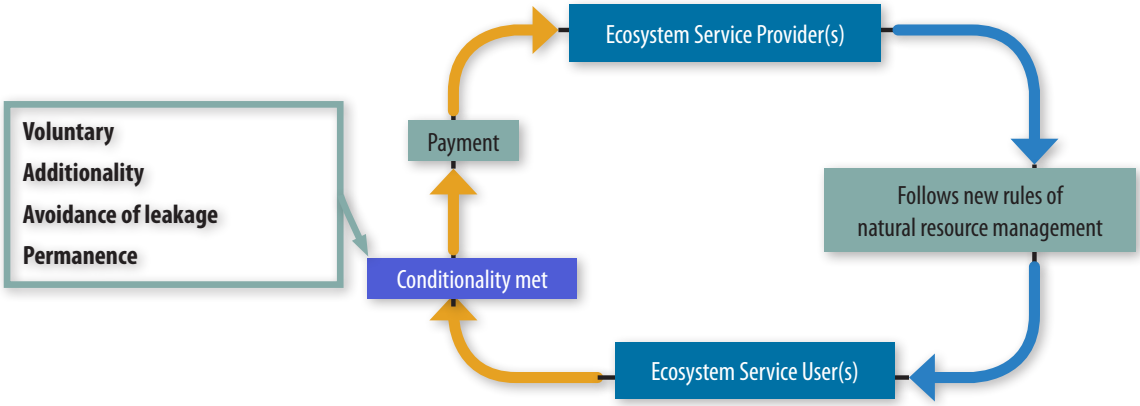

Figure 1. Illustration of requirements for establishing a PES project

and services. In the MSP process, incorporating ongoing and potential PES sites and reviewing relevant technical and institutional policies surrounding the ecosystem services informs evidence based, transparent, and sustainable frameworks for management of coastal resources.

iii. Structuring of agreements Here, designing of management plans to provide the ecosystems services and review of payment options to adopt for the project is done. Proponents also look into benefit sharing schemes and establish equity in payment options. The developed management plans should inform the larger MSP process on the short term and long-term structure and function of a given ecosystem. The MSP process should, therefore, recognize ecosystem services and allocate activities in a way that all sectoral needs are considered.

iv. Implementation of PES agreements This stage involves finalizing the project management plan, verifying PES benefits, ascertaining service delivery and initiating monitoring and evaluation process. Recognition of these processes in Kenya's MSP process promotes integrated and systematic zoning for competing activities. Since many coastal and marine ecosystems are remote, assessing non-use values is particularly relevant to MSP process (Börger et al., 2014).

Working PES projects in Kenya

i. *Mikoko Pamoja* **Community Based Mangrove Carbon Offset Project** *Mikoko Pamoja* is a community-based mangrove carbon offset project established in 2013 in Gazi bay, Kenya. The initial project development involved a series of community consultations. This enabled the proponents to understand goals and objectives of the project; and the role of the community in ensuring sustainability of the project. Baseline surveys included measurements of vegetation biomass, biodiversity assessment, resource mapping as well as socio-economic conditions of the area. This was followed by development of technical specifications detailing cost benefits of project in terms of climate, community and biodiversity benefits (Huxam, 2013).

The project is verified under the Plan Vivo System and Standards, a framework for supporting communities to sustainably conserve their natural resources with a view to generating biodiversity, community and climate benefits through the PES concept; in this case carbon. It is verified to sell 3000 tCO_2/annum, in a contracting period of 20 years within the 117 ha of mangrove forest area. Income from carbon credits, worth over US$ 13,000 each year, is used to fund continued mangrove conservation activities such as plant-

Figure 2: Community members participating in mangrove planting exercise to increase forest cover under Mikoko Pamoja Project, Photo credit @ Mikoko Pamoja.

ing and monitoring as well as priority projects chosen by communities (Figure 2), such as education, health, and water. Community consultations are currently ongoing to bundle seagrass ecosystems into the ongoing mangrove carbon scheme, with the aim of increasing incentives and functionality of these systems.

ii. Vanga Blue Forest Project Vanga Blue Forest (VBF) project is the second community-based carbon mangrove offset project established in 2019 in Vanga bay, Kenya as a replication of *Mikoko Pamoja*. The project is co-managed by village communities in Vanga, Jimbo and Kiwegu; hereinafter collectively referred to as VAJIKI. Resident population within VAJIKI is 9000 people. The major economic activity in the area is fishing that contributes about 80% to the local economy. Fishing is predominantly male dominated and is carried out within the nearshore marine ecosystems, particularly in the mangroves and seagrasses. Other economic activities in the area are subsistence farming, small businesses, and mangrove harvesting. Income of about US$30,000 yr^{-1} generated from annual sale of 5500 tCO_2 is used to support local development projects in water and sanitation, health and environmental management. Through VBF the community is protecting 460 hectares of natural mangrove forests of Vanga bay and positively impacting community livelihoods.

The building blocks of developing and implementing *Mikoko Pamoja* and VBF have been identified as good science, government support and community acceptance. Participatory approach in the planning process including involvement of communities, government agencies, international partners and non-governmental organizations has been key. Additionally, resource mapping and development of mangrove management plans aided the spatial planning process. Due to their spatial coverage and impact to biodiversity, community and climate, including such PES projects in MSP process is vital.

Recommendations for PES inclusion in MSP

Synergies are found to exist between PES concept and the MSP process since both aim at coordinated and sustainable use of marine ecosystems and resources. MSP is a good process through which capacities of ecosystem service valuation to fit within Kenya's policy context can be tested. To enhance incorporation of PES in marine planning process, the following steps are recommended;

i. Identifying other ecosystem services and potential PES schemes. Through long-term collection of time series and baseline economic and ecological data, research into ecosystem service identification and valuation is supported. This will likely support marine planning process.

ii. Development of integrated databases for ecosystem valuation and assessment. These databases can be developed at the national level to facilitate sharing among different users and to enhance maximum utility.

iii. Stakeholder participation in marine planning process. Since some ecosystem services may not be documented, consulting communities and other stakeholders who primarily interact with the ecosystems enhances tapping of relevant information to support ecosystem-based MSP process.

iv. Harmonizing regional and international policies and management approaches for transboundary ecosystems. This will ensure that activities in the transboundary area supports sustainable provision of the ecosystem services and incentives.

Coastal managers, communities, decision makers and marine planners in Kenya need to work together in the above processes and other MSP stages to support ecosystem based marine planning efforts. Allocating marine activities based on ecosystem values promotes sustainability since the planning process addresses the multi-sectoral needs and offers more opportunities for PES projects. With the changing environmental conditions, failure to support PES schemes and to strengthen ecosystem service valuation in maritime planning, may jeopardize a coordinated and sustainable use of maritime resources which is the overall goal of MSP process.

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Opportunities and challenges in community environmental interventions

The Late Hon. Arafa Baya (HSC)
Bidii Na Kazi Women Group

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Introduction

Mida Creek has been a key mangrove ecosystem along the Kenya coast. It forms part of the Watamu – Malindi Conservation area and constitutes the RAMSAR site in this region (Omodei et al., 2004). Mida Creek lies within the Watamu Marine National Reserve (3°20'S, 40°00'E). The area hosts diverse coral reef, seagrass and mangrove environments and it is an Important Bird Area (Kairo et al., 2002, Owuor et al., 2019). Mangroves dominate this ecosystem and cover an area of 1746 ha (Owuor et al., 2019). There has also been increasing interest in Mida Creek due to studies ancient ports in this region such as Kilepwa (modern day Kiripwe) used as collection points for the transport mangrove poles (Pollard and Bita, 2017).

Environmental pressures in Mida creek

Some of the environmental pressures at Mida creek include:

1. Habitat loss due to sea level rise;
2. Sea erosion and mainland soil entering the creek;
3. Agriculture;
4. Population expansion;
5. Tourism, which causes trampling on mangrove roots; and
6. The ban on mangrove harvesting has led to overfishing in the creek.

Figure 1: The late Ms. Baya (left) demonstrates to Hon. Najib Balala, Kenya's Cabinet Secretary for Tourism how to plant mangrove propagules (seeds). ***Photo credit @ Mikoko Pamoja.***
On previous page, *Mida Board Walk that was championed by Ms Arafa.*

Important considerations for Marine Spatial Planning in Mida Creek

These pressures have critical impacts on the survival of the ecosystem that are linked to the Arabuko Sokoke forest and several aspects are key considerations in developing the Marine Spatial Plan (MSP) for Kenya using Mida Creek as an example. These are as follows:

1. Management of tourism: In dealing with the environmental impacts there is need to include management interventions for tourism in MSP. It is important to ensure that interventions include support to manage the tourist numbers and avoidance of trampling of mangrove roots and associated marine habitats;

2. Women and youth in environmental conservation: These two groups are often forgotten yet they play a big role in conservation activities around the creek. Women are not involved in leadership and governance for community groups and this raises issues in resource-use management. Community mobilization led to the conservation of Arabuko Sokoke Forest and Mida Creek. There are more than 150,000 mangrove seedlings planted in Mida Creek through community efforts. Women are also doing the mapping in Mida Creek for areas suitable for bee-keeping and eco-tourism;

3. Existence of unique resources: Unique cultural and marine resources exist in this area. This means that zone/area specific management approaches need to be undertaken because each community and their needs are different. The plans for Mida Creek will be dependent on Arabuko Sokoke Forest because these are interlinked ecosystems and communities. There is need to include biodiversity conservation in the MSP process. The youth are involved in Agri-tourism, eco-tourism, and leisure. Fishers are encouraged to fish responsibly and need to be empowered to fish away from the Creek.

4. Engagement with researchers: Researchers need to communicate clearly the work they have done with the communities. If the members of the community are well informed, they will contribute in assuring sustainability of conservation efforts/research work. Involvement of women is crucial, through building their capacity to participate in research work. This will enhance good faith between the community and researchers and will lead to more community-based research.

5. Support for interventions in the Creek area: There are different government actors in Mida Creek, creating uncertainty in benefit sharing. Conflict of interest emerges, since a community member can be part of a Beach Management Unit (BMU), Community Forest Area (CFA) and the National Environmental Management Authority (NEMA) simultaneously. Policies and laws need to be streamlined and harmonize to avoid institutional conflicts.

It is important to understand that there are historical community interactions with the ecosystems at the coast and this needs to be taken into consideration in MSP processes. Ecosystem resilience research that integrates communities needs to be undertaken in order to enhance sustainable resource utilization of these fragile resources which have served past generations in this region.

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Is co-management a panacea for environmental pressures?

Nyaga Kanyange
The Coastal & Marine Resource Development (COMRED)

Photo credit: ©WIOMSA

Understanding co-management

Definitions for co-management or collaborative management are wide and varied. Berkes et al., (1991) describes co-management as the sharing of power and responsibility between government and local resource users while Borrini-Feyerabend et al., (2000) views it as a situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources. The principles behind co-management are that of pluralism and subsidiarity (Plummer and Fitzgibbon, 2004). Therefore, co-management can be viewed as people driven or as a participatory bottom-up approach to resource management, contrary to command and control or top-down approach. However, bottom-up does not mean that the government is not involved, it implies that the needs of stakeholders are taken into consideration during decision making processes. Co-management was adopted in Kenya as a means of inclusivity in decision making, where stakeholders are given the responsibility (and not necessarily the power) over use of their resources.

Co-management from an historical perspective

Examples of co-management can be traced as early as 1296 in traditional and indigenous systems, such as in Asia-Pacific where decision making in forestry and fisheries was a collective process (Brown, et al., 2005). In Africa and particularly East Africa, fisher communities, sometimes even clans or families, had user rights over specific resources and therefore were the main decision makers over the use of such resources. However, this was disrupted by colonial administration that viewed the entire resource as 'commons' for the purpose of state utilisation. This command-and-control regime resulted in resource decline and conflicts arose. This notwithstanding, Kenya has made strides in addressing marine environmental pressures such as illegal fishing along its coastline mainly through establishment of Co-management Area Plans (CMAPs) for coastal fisheries and forest management plans for forest (mangrove) management. These plans fit well and complement the larger framework of marine governance, specifically marine spatial planning. This has been possible due to existence of enabling sectorial laws and policies guided by the constitution of Kenya, 2010 and implemented by different agencies.

Barriers to successful co-management

Co-management and spatial planning require inter-agency collaboration in order to succeed. In Kenya, there are several key government agencies mandated with management, development and governance of coastal and marine environments. However, capacity gaps, in addition to conflicting mandates hinder them from fully achieving their mandates. These include gaps in policies and laws, technical skills, technology, data and finances among others.

Despite each agency having its own sectoral laws and policies and in view of recent amendments, enforcement remains a problem. For instance, both wildlife and fisheries laws, despite provisions for preventing illegal and destructive extraction (e.g. fish), they do not prescribe specific gears for specific fish. Given the high diversity of marine fish, this deficiency results in further environmental destruction. Another example can be seen in maritime and environment regulations where noise and vibration threshholds during activities such dredging and exploration are not prescribed. Impacts for this omission include cumulative sedimentation and sudden disappearance of fish as reported by fishers.

The issue of inadequate technical skills has hampered delivery of quality services in many sectors. Whereas Kenya exports skilled manpower every year, deficits are felt within its own sectors, largely due to in adequate capacity. Recently, the maritime sector was impacted by a deficit of technical skills due to the uniqueness of skills sets required in this sector. Additionally, the maritime sector continues to attract low numbers of job seekers due to lack of awareness in maritime opportunities among the Kenyan population, shortage of training colleges and high training costs.

Failure to embrace modern technology has a direct impact on efficiency of management systems across all sectors. Complex aspects of impacts of climate change, pollution (e.g., oil spills), resource use conflicts and weather patterns (e.g., cyclones, storms, tsunamis, etc.) can be solved through modern technology. The manner in which this information reaches the consumer can also be enhanced through technology, in a simple but sophisticated manner. By 2019, the number of mobile subscriptions in Kenya had reached 55 million (Statistica, 2021), providing a good opportunity for addressing environmental challenges by communicating key environmental messages to this population through mobile phone messaging.

Data deficiency has also been identified by coastal and marine players as huge gap hindering decision making. In the absence of data or having little data, people rely on the precautionary approach that is often not comparatively convincing. For example, there has been a long-term debate about the presence of tuna in Kenyan waters. However, without updated catch and biomass data, this premise remains invalid and a disadvantage to the country. Further, gathering of huge data sets across sectors requires the requisite infrastructure for analysis, sharing, storage and archiving. Investment in such infrastructure requires to be made a priority.

A multi-sectoral approach to co-management

Addressing environmental challenges requires concerted effort and therefore a multi-stakeholder approach is important, in retrospect, a bottom-up approach. Involvement and participation of stakeholders during inception, design and implementation of co-management and MSP processes increases the sense of ownership and general success of activities. As soon as a pool of stakeholders are onboard, operational dynamics change and needs to be managed. One way of addressing this is through a multi-stakeholder forum, where stakeholders are unified in one voice. A case example is the Shimoni-Vanga seascape multi-stakeholder forum that covers the lower southern Kenya coast, from Shimoni to Vanga bordering Tanzania. The forum, anchored in the Ministry of Interior and Coordination of National Government through the County Commissioner's office and in collaboration with County Government of Kwale, meets every quarter to deliberate seascape issues. During such meetings, stakeholders discuss pertinent issues affecting the seascape, present new projects and address emerging challenges.

Key considerations

As Kenya embarks on the MSP process, there is perception among coastal communities that there will be 'losers' and 'winners' in the end, perhaps because all stakeholders have not yet been brought on board vessel, the 'MV MSP'. One group perceived as 'losers' is the small-scale fishers that comprise majority of near shore coastal inhabitants. There is perceived fear among fishers that instead of expansion of their fishing grounds, a bigger chunk of the sea will be allocated to commercial use, such as industrial fishing, trawling and mining, leaving them with the already over-exploited near shore fishery. Similarly, there is little information on opportunities and alternatives that MSP presents for small-scale fishers involved in co-management activities in Kenya.

Recommendations for the MSP process

During the MSP process in Kenya, a few key recommendations are proposed:

- Although co-management can help to a great extent in addressing environmental pressures, it is limited in scope and a wider and well-coordinated approach is required;
- Extensive awareness and capacity building to CBOs and communities is needed to demystify MSP;
- Addressing deficiencies in areas such as laws, policies, technology and technical skills among others is important in achieving optimal benefits from MSP;
- Stakeholder identification, involvement and participation are pre-requisites to successful MSP; and
- MSP planning lies in the hands of statutory agencies, it is paramount that Community Based Organizatinos are enlightened on the MSP process and how to effectively engage in the process.

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Marine Spatial Planning and its role in management of environmental pressures

Dr. Adnan Awad
The Nature Conservancy

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Introduction

The ocean space has multiple different resource uses within it, and this creates a complexity in its utilization due to the varying nature of these activities. These activities oftentimes have competing interests and range from mariculture and oil and gas to conservation and fishing activities. As Kenya develops its Blue economy, it is essential to consider all the various pursuits that are presently underway and those that will develop in the future in the nation's ocean arena. Marine Spatial Planning (MSP) is a key process that will support Kenya's Blue economy by regulating the various activities in the ocean. Developing MSP in Kenya may involve the prioritization of different resource uses and one such use is conservation (Figure 1). Conservation in a Blue economy is essential because it will ensure the longevity and protection of ocean resources which will subsequently promote economic development through utilising these resources. To ensure continuous sustainable coastal resource use, it is essential to align government policies to place conservation as a key stakeholder in the MSP process.

There are several environmental pressures placed on Kenya's coast that impact coastal and marine biodiversity. These include extraction and harvesting, land conversion, coastal development, nutrient runoff, sea surface temperature, acidification, sea level rise, and extreme climate events. Some of these pressures are related to global causes such as climate change while others are direct results of localized anthropogenic activity. The key coastal and marine habitats are coral reefs, seagrass beds, and mangrove forests and there is a need for adequate information about them together with adequate values placed on them in the MSP process. Kenya's exclusive economic zone includes protected areas of nearshore habitats. Future utilization of deep seafloor resources might be undertaken in the coming years as the country's Blue economy develops and it is crucial to take these factors into consideration in the onset of MSP.

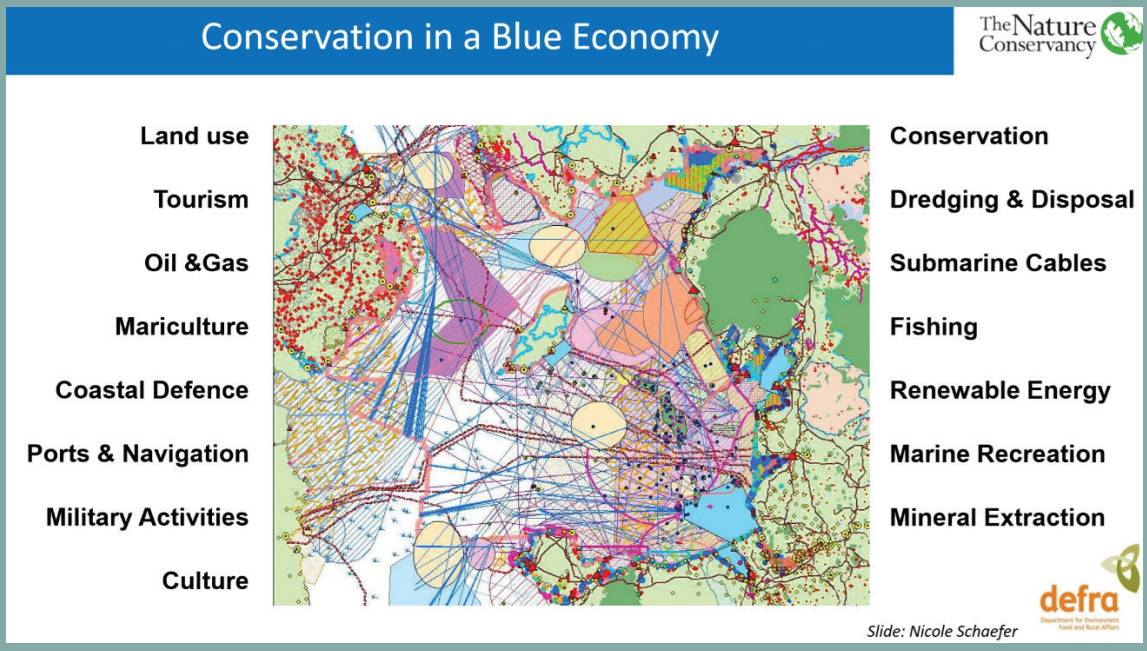

Figure 1: Individual resource uses layered upon each other show the complexity of the ocean space.

Managing environmental stressors

The Nature Conservancy (TNC) works to manage environmental stressors through the provision of ocean support which includes ocean protection of reef systems, coastal wetlands and mangroves through ocean planning and mapping, ocean governance, sustainable financing, and climate risk and resilience. TNC also provides support for fisheries and aquaculture, and this involves using fish path, sustainable aquaculture, and tuna and IUU. Community engagement through community-based conservation is also integral in managing environmental stressors. This includes promoting livelihoods, gender equity, human rights, and ensuring that there are social safeguards in community-based conservation measures.

MSP and environmental pressures

Implementing MSP requires developing zones to manage both current and future uses and activities. This entails developing strategies to avoid, reduce and minimize environmental degradation in marine waters. MSP can further be integrated through planning and zoning regulations and policies to address environmental pressures. For cumulative human impacts, MSP can use an ecosystem-based management (EBM) framework to address impacts and threats.

MSP as a stand-alone intervention cannot address some environmental pressures. Other marine policies such as Integrated Coastal Zone Management (ICZM) and consideration of a climate smart MSP will prove beneficial in complementing MSP activities. Marine spatial plans make provisions from the coastline to the EEZ boundary and ICZM, which is a process that involves planning for the development of coastal resources, includes both terrestrial and marine ecosystem components - usually specified from a distance inland and offshore from the coastline (Clark J.R., 1994). An ICZM process framework can address environmental pressures that originate on land. The policy scope for ICZM usually includes land use development agencies and many sectors not typically involved in MSP such as agriculture, storm and wastewater, pollution control, and housing development. Thus, a strong ICZM can play a significant complementary role for MSP by making provisions for management of coastal land based activities that impact the ocean.

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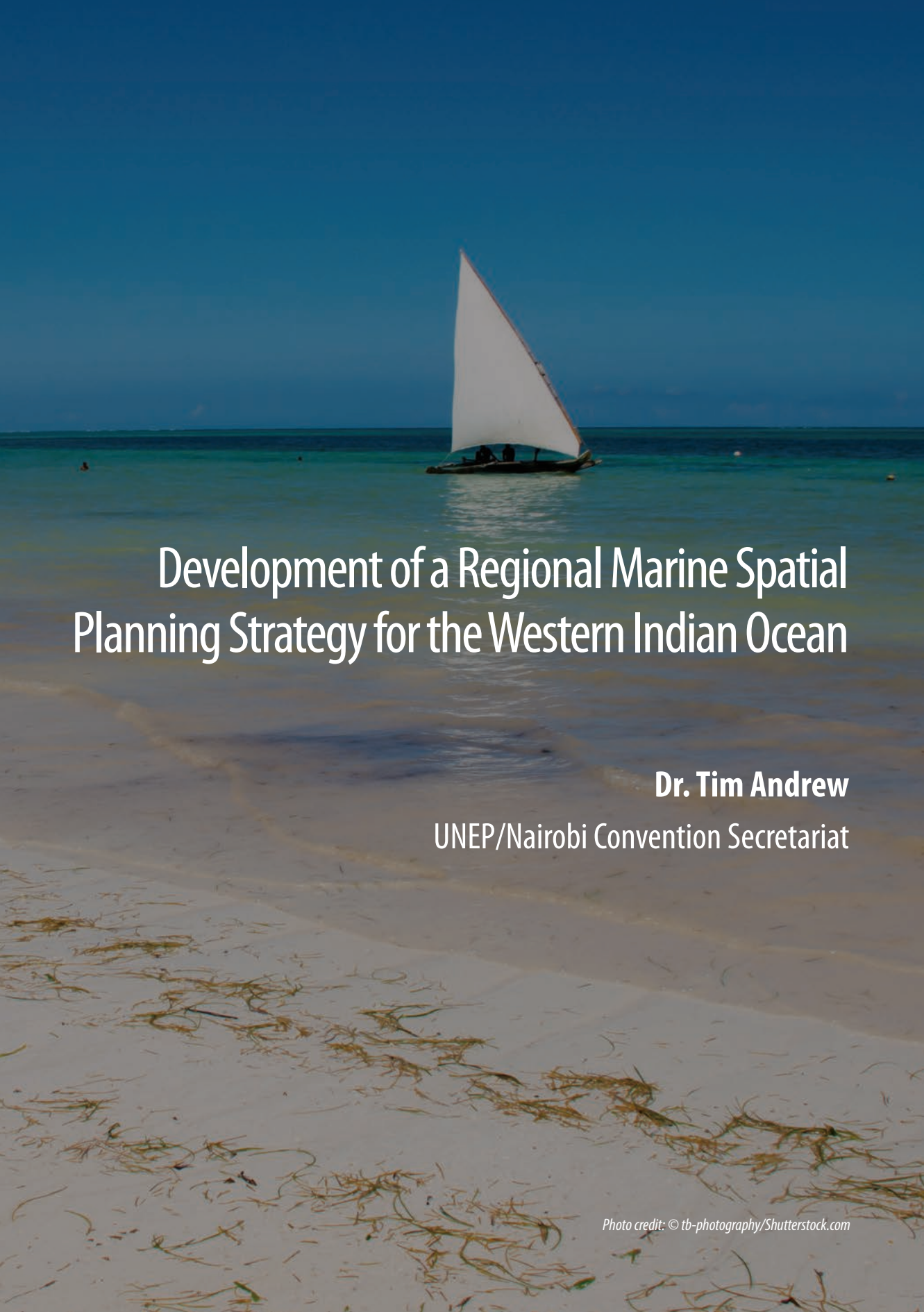
PART II:

MARINE SPATIAL PLANNING IN KENYA – KEY CONCEPTS AND NEEDS



Development of a Regional Marine Spatial Planning Strategy for the Western Indian Ocean

Dr. Tim Andrew

UNEP/Nairobi Convention Secretariat

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Introduction

The Blue/Ocean economy is an emerging concept for developing and managing coastal and marine resources for sustainable economic development. It offers wide opportunities for responsible and sustainable economic growth from the traditional sectors of shipping, tourism, fisheries, and boat building, and new industries including aquaculture, marine renewable energy technologies for wind, wave and tidal energy, bioproducts (pharmaceutical and agrichemical), and blue or ocean carbon (carbon storage in mangroves, sea grass and salt marshes). Further, the Blue economy supports the achievement and implementation of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs), especially SDG14 'life below water', and recognizes the need for ambitious, coordinated actions to sustainably manage, protect and preserve coastal and marine resources for present and future generations.

The sustainable use of the ocean and its biodiversity depends on appropriate planning and management of various human activities and uses. Hence, Marine Spatial Planning (MSP) processes can provide useful frameworks to assist planning and management of different activities in coastal and marine areas. MSP should proceed as 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 are usually specified through a political process. Ecosystem-based MSP processes with broad stakeholder support can play important roles in bringing long-term stability and transparency for economic operators, whilst ensuring that the health of the marine environment does not deteriorate.

Following commitments of the Contracting Parties of the Nairobi Convention on the adoption of MSP for sustainable development, the Convention Secretariat has embarked on a process of facilitating the development of a regional Marine Spatial Planning Strategy for the Western Indian Ocean (WIO) region. The countries of the WIO have developed and adopted MSP approaches for different purposes. However, the levels of implementation of MSP varies across countries. For example, more advanced MSP processes have been implemented in Seychelles and South Africa; whereas, implementation of MSP in other countries is still in the formative stages sounds better. Despite these differences, the regional context provides an opportunity for joint learning, improved cooperation, and capacity building to support implementation of MSP across the WIO region more consistently.

While arrangements for MSP may exist in individual countries, a strategic approach to facilitate shared learning and coordination at a regional level is lacking. Although spatial planning is generally undertaken by governmental authorities for their individual territories and jurisdictions, it has increasingly been recognized that planning should consider transboundary processes (i.e. ecological and biophysical processes) and activities (e.g., shipping, fishing). Hence, it is recommended that planning authorities within neighbouring countries should find synergies and commonalities to address initiatives with cross-border implications. The imperative for transboundary MSP is arguably much stronger in marine environments compared to terrestrial environments, because coastal and marine ecosystem dynamics, which are largely influenced by ocean currents, transcend administrative boundaries. This then should encourage wider ecosystem-based considerations to accommodate

ecological and biophysical processes occurring in a region. Moreover, an ecosystem-based management perspective directs attention beyond borders, which can ensure management of habitats, species and human activities and their connections. This in turn can reduce conflicts across neighbouring countries, make best use of shared or adjoining resources, and encourage collaborative governance of shared seas. In line with this and as a contribution to major outcomes of the SAPPHIRE and WIOSAP Projects being executed by the Nairobi Convention Secretariat, a regional MSP strategy is vital to harmonize the different initiatives in the countries of the WIO region. This was reiterated by the Parties to the Nairobi Convention and partners at a meeting to discuss MSP in the WIO held in Dar es Salaam in March 2019 where the Nairobi Convention Secretariat was requested to work with partners to develop a regional MSP Strategy. The regional Strategy will also provide a framework for possible adoption at country level especially for countries at the very initial stages of their MSP processes.

This chapter first provides a brief background and rational for the development of a regional MSP strategy for the WIO, followed by a description of the Nairobi Convention and its mandate to develop the Strategy. Some examples of MSP related-activities in Kenya and the WIO are then provided, and a concluding section highlights some of the ongoing and planned activities involving MSP that the Convention is supporting.

Background and rationale for the development of a regional MSP strategy for the WIO

The countries of the Western Indian Ocean (WIO) have developed and adopted MSP approaches for different purposes. However, the levels of implementation of MSP varies across countries. For example, more advanced MSP processes have been implemented in Seychelles and South Africa; whereas, implementation of MSP in other countries is still beginning. Furthermore, different coastal and marine sectors have historically been managed individually resulting in lack of coordination in decisions affecting management of coastal and marine resources. It is important to apply a harmonized approach in the development of coastal areas and utilization of coastal and marine resources and space among all the competing needs and associated stakeholders.

A regional approach to MSP can have added benefits by applying a broader perspective to some of the challenges associated with marine and coastal governance. A regional context provides an opportunity for joint learning, improved cooperation, and capacity building to support implementation of MSP across the WIO region more consistently.

A regional strategy will aim to harmonise policy and legislative structures towards common goals and objectives of an ecosystem-based approach to ocean management. Finally, a regional approach will provide a coordinated structure for knowledge and data sharing, incorporate broad stakeholder engagement and increase communication and collaboration with relevant organisations in the region.

What is the Nairobi Convention?

The Nairobi Convention for the protection, management and development of the marine and coastal environment of the Western Indian Ocean was first signed in 1985. It is one of eighteen global Regional Seas Agreements under the banner of UNEP's Regional Seas Programme. The Convention is a legal framework and platform for regional collaboration between countries and agencies in the WIO. It has a mandate to protect, manage and develop the WIO at regional level, and a vision to provide a mechanism for a partnership between the 10 governments of the WIO


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countries, civil society and the private sector, working towards a prosperous WIO Region.

Mandate for promoting the use of MSP

Several decisions of the Contracting Parties to the Nairobi Convention have been taken in the past. For example:

In 2015, *Decision CP8/10.4: Blue and Ocean Economy To urge Contracting Parties to cooperate in ….. developing area-based management tools such as marine spatial planning* to promote the Blue economy pathways in the Western Indian Ocean Region.

In 2018, *Decision CP.9/1.2: Work programme for 2018–2022* To request the secretariat to develop and support the implementation of priority areas, including ….. marine spatial planning, integrated coastal management…..

Decision CP.9/10: Marine spatial planning for the blue and ocean economy.

- To also urge the Contracting Parties, to cooperate to build and develop area-based management tools, such as marine spatial planning, to promote Blue economy pathways in the Western Indian Ocean region;
- To request the secretariat, in collaboration with partners, to develop capacity-building programmes on marine spatial planning as a tool for sustainable economic growth.

Further, participants at a regional meeting of partners on MSP in March 2019 held in Dar es Salaam, Tanzania recommended that the Convention Secretariat *establish a regional MSP Technical Working Group (TWG) and develop a Regional MSP Strategy*.

Establishment of the MSP Technical Working Group (TWG) and development of the Strategy

In early 2020, the Secretariat called for nominations from the Contracting Parties for members of the MSP Technical Working Group (TWG). Two representatives from each country then established the TWG under the auspices of the Nairobi Convention. The first meeting of the TWG was held in July 2020. At the same time, the Secretariat recruited the Institute for Coastal and Marine Research, Nelson Mandela University, South Africa, to work in collaboration with the Western Indian Ocean Marine Science Association (WIOMSA) and the Regional MSP TWG Group to develop the Strategy.

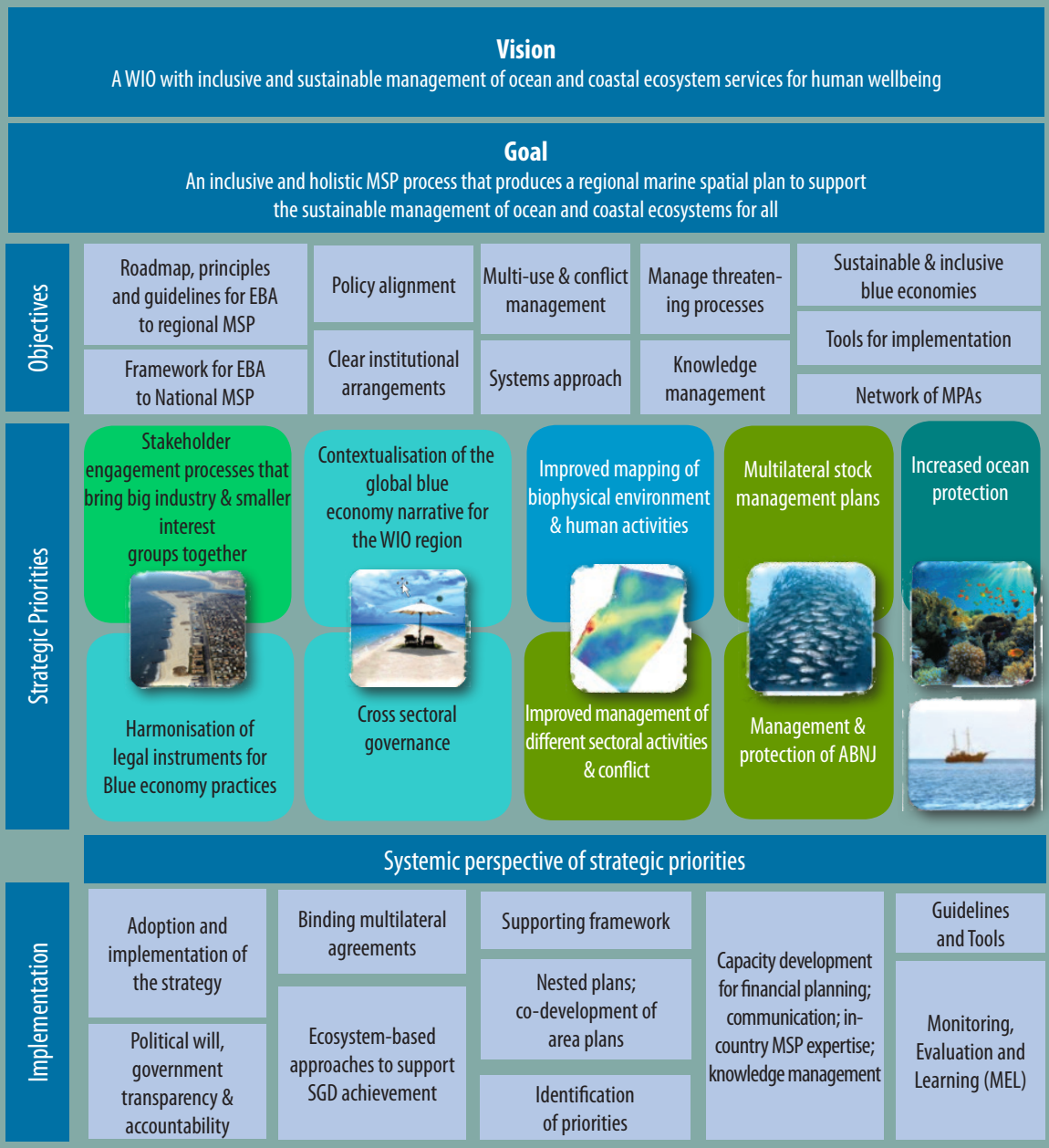

Figure 1: A schematic summary of the Regional MSP Strategy.

The objective of the assignment was to develop a regional MSP strategy for the WIO region following commitments of the Contracting Parties of the Nairobi Convention on the adoption of MSP for sustainable development. The strategy was to be based on a thorough situation assessment of MSP in the WIO and include consultation with as many key stakeholders as possible. This element was somewhat reduced due to the Covid-19 pandemic preventing extensive travel

or direct interactions. The timeframe provide for this process was from August 2020 to February 2021. A summary of the strategy developed is presented in Figure 1.

Ongoing and planned actions of the Nairobi Convention involving MSP

Now that the regional MSP Strategy has been developed, a process of adoption took place through the Conference of Parties of the Nairobi Convention in November 2021. Capacity development around implementation at a national level is also planned. This domestication is necessary to enable the elements of the regional strategy to be implemented. Some national level activities such as the Kenya Blue economy Assessment being undertaken by the University of Nairobi, Kilifi County MSP, EU-GoBlue (Jumuiya) Project, and MSP related to the Transboundary Conservation Area between Kenya and Tanzania are ongoing with support from the projects of the Convention. Capacity development is also being conducted, mainly with the MSP TWG on cumulative impact assessment in support of MSP through a partnership with the Swedish Agency for Marine and Water Management (SwaM), as well as with other partners such as the IOC-UNESCO.

Spatial planning approaches are also being integrated in the process of developing a Regional Ocean Governance Strategy which is being led by the Regional Economic Communities (RECS) and other stakeholders who are part of a Core Team, and management of the Joint Management Area between Seychelles and Mauritius.

Several consultations and guidance documents related to Ocean Governance and Sustainable Blue economy will be completed in 2021; all of which promote the use of MSP as an important tool in achieving regional aspirations. These approches led to several decisions at COP 10 of the Nairobi Convention in November 2021.

The Convention is also supporting several ongoing site-level demonstration projects in WIO countries that include MSP to improve local integrated ocean governance and Sustainable Blue economy development, especially in the environment and fisheries sectors. These projects are intended to provide best practice and lessons-learned for other areas of the WIO.

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An assessment of Kenya's key economic sectors of the Blue economy and the role of Marine Spatial Planning

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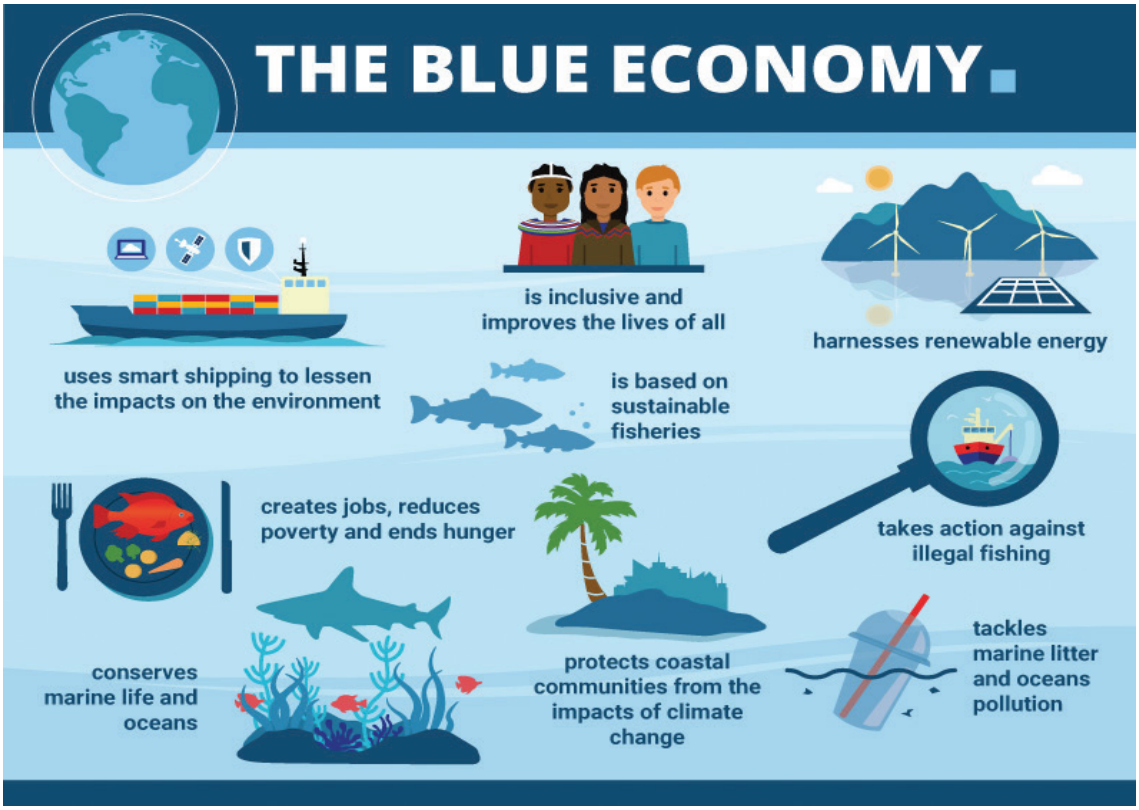
Introduction

The Government of Kenya hosted its first ever Sustainable Blue economy Conference (SBEC) in November 2018. In the outcome document of the conference, the Nairobi Statement of Intent on Advancing the Global Sustainable Blue economy Kenya committed to establish an Institute for Blue economy and Ocean Studies (IBEOS) (The Maritime Centre/Fishforce Academy) at the University of Nairobi. The main purpose of the Maritime Centre is to undertake research and offer technical assistance and capacity building in all matters relating to the ocean, and the sustainable use of its resources.

For a Sustainable Blue economy (SBE) to be realized in Kenya at the national and local levels, guidance and an evidence base on the economic contribution of ocean sectors is necessary to inform the development of supporting policies and strategies and Marine Spatial Planning (MSP). In this context, a partnership with the Nairobi Convention Secretariat and the Maritime Centre is undertaking an assessment study of sectors that contribute to the Blue economy in Kenya. The study is aimed at providing an overview of the contribution, values and potential of the various maritime sectors. It will also provide recommendations and policy options on the sectors with the highest potential, together with criteria for prioritisation both in the short to long-term.

A brief overview of Kenya's key maritime sectors

Kenya's Blue economy includes conventional sectors such as coastal tourism, fishing, shipping and maritime transport, aquaculture/mariculture and newer unexplored sectors such as wind and wave energy, offshore oil and gas, marine biotechnology. These have great potential to contribute to wealth creation and employment, reduction of poverty and sustainable economic growth.



Some highlights on Kenya's maritime sectors include:

a. Coastal Fisheries

The small-scale fisheries in Kenya, often referred to as artisanal, employs 10,000 people and supplies 95% of the country's total marine catch, generating an estimated US$ 3.2 million per year and accounting for between 2% and 6% of total fish production in the country. An estimated 60,000 coastal residents depend on the sector, hence the entire fisheries sector only contributes 0.5% to the national GDP. However, it still continues to be a vital component to economic activity in the coastal regions.

b. Coastal tourism

Tourism contributes 5% to total GDP, however, when considering all linkages within the sector, it is estimated that tourism contributes upwards of 11.6%, which would make it the country's third-largest contributor to GDP after agriculture and manufacturing. It is Kenya's third largest foreign exchange earner after tea and horticulture. The sector makes up 4% of total employment in the country, providing nearly 483,000 jobs in 2008, and contributes 18% to total foreign exchange earnings, between 52% and 68% of which is derived from coastal tourism.

c. Ports, harbours and maritime transport

Key ports include Mombasa port, which is the largest and busiest and the new Lamu port. Mombasa port is the gateway to the hinterland of East Africa, including South Sudan, Uganda, Rwanda, Burundi, and democratic Republic of Congo (DRC), among others. The ports collectively contribute enormously to the coastal and national economy and connect the world to Kenya and other hinterland countries through road and rail connections.

Photo credit: ©WIOMSA

d. Coastal oil and gas

Oil and Gas is not yet a major sector in Kenya, and its contribution to GDP is not adequately detailed in the national accounts. The Government is encouraging oil exploration under the coordination of the National Oil Corporation of Kenya (NOCK) .

There is a modest upstream oil industry with a refinery in Mombasa, and this port is also considered as the gateway to the "northern corridor", covering the supply of Kenya, Uganda, Rwanda, Burundi, Eastern DRC and Southern Sudan. Thus, the capacities of Mombasa port for oil and gas storage, and transportation to the landlocked countries (pipelines, road, rail) have a regional strategic importance.

e. Mariculture

Mariculture activities in Kenya include prawn, crab, finfish and seaweed farming. Past reviews have concluded that these activities are largely small scale, experimental, are generally found all along the southern coast, and use pond culture, cage and pen culture, and stake and line culture (Figure 1).

f. Coastal mining

Kenya is not an important mineral producer. Mining and quarrying accounted for 0.5% of Kenya's 2008 GDP. Mineral exports accounted for between 2% and 3% of Kenya's total exports. Mining and quarrying was estimated to employ more than 50,000 Kenyans.

In the coastal region, key mining activities include Kwale heavy sands, cement manufacturing using locally available limestone, coral limestone and sand mining, both for the local and export markets.

The role of marine spatial planning in Kenya's Blue economy

Marine Spatial Planning is fundamental to deliver the implementation of Kenya's Blue economy to:

- address the interconnectedness of major infrastructural projects: current and future;
- ensure that investments are made with a focus on addressing spatial competition in the ocean and conflicts between sectors;

Figure 1: Crab culture as part of mariculture activities in Mida Creek Photo credit Mwaluma.

- enhance environmental protection through protected habitats and ecosystems and pollution controls; and
- achieve socio-economic objectives, and cultural needs for island and coastal communities.

Since MSP is cross-cutting, the determination of how and where to implement marine spatial planning provisions varies from country to country. Some considerations that Kenya could take into account are:

a) Designing MSP as a tool or legislative process

MSP can be used as a tool within the existing sectoral laws on environment, fisheries, planning and others. Seychelles has successfully developed its MSP as a tool that cuts across numerous regulations, policies and strategies relevant to spatial planning, managing biodiversity and economic development in the marine environment.

MSP could also be incorporated into Kenya's legislative framework. It would enable MSP to be enforceable, and thus able to achieve its defined objectives. This step would institutionalize the process, ensures that all parties are bound by a lawfully adopted plan. South Africa as an example has enacted a Marine Spatial Planning Act to guides its process.

b) Interactions of MSP with other plans in the coastal zone: ICZM Policy, coastal counties spatial plans

Kenya has an Integrated Coastal Zone Management (ICZM) Policy in place while some coastal counties have developed County Spatial Plans. Integration of MSP with ICZM and terrestrial physical planning could be considered. Where possible, MSP could also be integrated to river-basin management plans.

Integrating MSP with these processes would be of great benefit in developing a seamless and integrated land-ocean boundary management system. This would capture the physical interaction between land and sea to address the impacts of land-based activities such as pollution at sea.

c) MSP in areas beyond national jurisdiction and connectivity

MSP practice is primarily used for the management of their internal and territorial waters, Exclusive Economic Zones (EEZ) and continental shelf areas. However, the topic of connectivity between EEZs and Areas Beyond National Jurisdiction (ABNJ) and the use of area-based management tools such as MPAs is gaining traction. Kenya can only effectively achieve this through regional cooperation and ocean governance mechanisms such as Regional Seas Programmes and Regional Fisheries Bodies for example the Nairobi Convention, South Western Indian Ocean Fisheries Commission among others.

d) Link to regional and global processes on MSP: MSP strategy for the WIO

In the WIO region, the development of a Regional MSP Strategy is ongoing within the framework of the Nairobi Convention and will be a useful guide for Kenya's MSP process. Good practice examples from countries that have developed and implemented MSP shows that regional cooperation and coordination plays a fundamental role in developing a common approach for delivering MSP leading to greater alignment of national plans. The European Union as a transnational body has for example through the EU MSP Directive been successful in providing guidance for member states on the parameters that they should take into account in developing national MSP frameworks. Additionally, the Baltic MSP Roadmap has

been used to develop coherent MSP within the framework of a regional seas convention, The Baltic Marine Environment Protection Commission – also known as the Helsinki Commission (HELCOM), and establish a common vision and commitment for member states.

Conclusion

A sustainable Blue economy if well designed through coherent MSP will enable Kenya to harness its rich coastal and marine resources to address development challenges including high levels of poverty, a youth bulge in search of employment and overdependence on exports of primary commodities. As the country develops its Blue economy sectors and designs its MSP, an approach that would deliver a co-ordinated, holistic, integrated, effective, forward-looking, plan-led, targeted outcome to the use and management of the coastal and marine resources in line with the ecosystem-based management is recommended. This will enable the country to achieve maximum benefit from the Blue economy to achieve sustainable economic growth, job creation, environmental conservation and sustainable livelihoods.

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The Baltic Marine Environment Protection Commission – also known as the Helsinki Commission (HELCOM)-https://helcom.fi/about-us/

Marine Spatial Planning in the context of Kenyan waters

Dr. Pascal Thoya

Kenya Marine and Fisheries Research Institute

Photo credit: ©WIOMSA

Introduction

Kenya coastal and marine areas are rich in natural resources that support several marine sectors. The country is also in a unique geographical position offering marine logistics support to several landlocked countries. Through its strategic development plan of Vision 2030, Kenya has identified the Blue economy as one of the areas that can be tapped to develop the country economy. Several marine industries such as fishing, tourism, and shipping are being promoted under the Blue economy initiatives. Although the ocean spaces are not intensely used, the marine sector's promotion will increase demand for ocean spaces and conflict among users. Currently, ocean governance is majorly sectoral, with each sector setting its objectives and policies. Kenya has chosen to explore Marine Spatial Planning (MSP) to support sustainable ocean development and improved ocean governance. MSP involves bringing together the relevant sectors and analysing and allocating humans' spatial and temporal distribution to achieve ecological, economic, and social sustainability. This chapter aims to consider the role of MSP in achieving national and international objectives for the different sectors. Different sectors in the Kenya marine space are examined and recommendations are provided on how MSP can help streamline ocean governance.

Key marine sectors and sectoral needs

The Kenyan coastal and marine area is endowed with various natural resources such as coral reefs, seagrasses and mangroves. These resources support multiple Blue economy industries. The dominant marine sectors include fisheries, tourism, shipping, and environmental protection. However, there new sectors such as oil and gas, that are slowly developing. All the sectors mentioned are placed in different government ministries. Consequently, several regulations and policies are applied for the management of Kenyan marine waters.

Fisheries are among the marine uses covering most space of the Kenyan coastal area. The dominant fishing activity is small-scale fisheries. Small-scale fishers operate in the near-shore areas using essential fishing gears and vessels such as dugout canoes and sailboats (McClanahan and Mangi, 2004) (Figure 1). Another essential fishing activity is prawn trawling which takes place in the Malindi-Ungwana bay region. A few foreign vessels using purse seine and longline are also licenced to operate in the Kenya EEZ. Fisheries activities fall under the Ministry of Agriculture, Livestock, Fisheries, and Co-operatives. The Fisheries Act Cap 378 is the key regulation for exploiting, utilising and conserving fisheries resources. There are other legal frameworks such as the National Oceans and Fisheries Policy 2008, The Fisheries (Beach Management Units) Regulations, 2007 (Legal Notice 402), and fishery specific management plans such as the Prawn Fisheries Management Plan (PFMP-2010) that help guide the exploitation of fisheries resources. There are still challenges that arise from the space users by fishers; for example, prawn trawlers fish still have space use conflicts with artisanal fishers (Thoya et al., 2019). Other spatial conflicts that need to be addressed in the fisheries sector include the protection of artisanal fishers' fishing areas, protection of fish breeding and nursery areas from anthropogenic impacts, and protection of the fish landing sites from land grabbing.

Mariculture is another growing fisheries subsector. The Kenya Aquaculture Sector contributes about 9% of total national fish production, a small proportion of which originates from the marine sector. There is a huge potential for the development of the mariculture sector in Kenya. Mariculture activities are expanding, especially in the creek areas such as the Mida creek, with farmers targeting oysters, crabs, and milkfish. Mariculture activities have been reported to have

Figure 1: Small-scale fishers with their catch.

significant environmental impacts in many parts of the World (Tacon and Forster, 2003). Since the sector is still in the infancy stage, identifying potential areas for mariculture and securing space for mariculture activities are a priority.

Tourism contributes to about 12% of Kenyans national Gross Domestic Product (GDP). 60% of tourists visiting Kenya spend their time at the Kenyan coast (Tuda and Omar, 2012). Coastal tourism activities include recreational fishing, diving, snorkelling, excursions in mangroves areas, boat riding, and kayaking (Ongoma and Onyango, 2014). The tourism sector is under the Ministry of Tourism and Wildlife. Its activities are regulated under the Tourism Act No.28 of 2011; due to the diverse nature of the tourism activities, some tourism activities are regulated using other sector policies. For example, recreational fishing is regulated under The Fisheries Management and Development Act, 2016. It is worth noting that most coastal tourism activities depend on natural resources and the environment therefore there is need to protect areas for coastal tourism, such as diving sites, beaches, and areas of rich biodiversity. Therefore, enabling a sustainable tourism sector depends on several ministries and consideration of Environmental Management and Coordination Act (EMCA) 1999 and the Wildlife Conservation and Management Act, 2013.

Kenya's maritime sector plays an integral part in the region and still has enormous potential to grow due to its strategic location. The maritime sector plays a vital role in exporting and importing manufactured goods and raw materials in the Eastern Africa region. Mombasa is Kenya's largest port, with smaller ports in Lamu, Shimoni, Kilifi, Malindi and Mtwapa. A new port is being constructed in Manda bay under the Lamu Port-South Sudan-Ethiopia-Transport (LAPSSET) Corridor proj-

Figure 2: Photo taken on December 9th 2020 showing construction of the Lamu Port (Photo credit: Xinhua/Charles Onyango).

ect (Figure 2). The port will have 32 Berths when fully completed making it one of the biggest ports in the region (LAPSSET, 2021). In light of the development of this port, the Kenya Maritime sector is expected to grow exponentially. The Kenya Maritime Authority (KMA) is responsible for regulating the maritime sector under the Merchant Shipping Act of 2009. There are overlaps between the maritime sector and other sectors. For example, Artisanal fishers in the coastal area have experienced the loss of fishing gears from marine vessels. Also, pollution from port activities such as dredging has affected the tourism and fisheries sectors (Natural Justice, 2021). The sector may benefit from Spatial planning to determine dedicated shipping lanes, anchorage areas, and marine activities to avoid such user conflicts.

Environmental protection is another important sector in the Kenyan coastal waters. About 9% of the Kenya coastal waters are under marine protection (Tuda and Omar, 2012). The sector is essential as it positively affects several marine sectors. The Marine Protected Areas (MPS) offer protection to fisheries, and their spillover effect nourishes the surrounding fisheries (McClanahan and Mangi, 2000). MPAs are also essential for tourism activities, such as snorkelling and diving (Tuda and Omar, 2012). Marine Environmental protection falls under the Ministry of Tourism and Wildlife. The Wildlife Conservation and Management Act, 2013 is the primary legal framework for managing marine protected areas. However, because of the interaction with other sectors, the Wildlife Conservation and Management Act

is usually implemented together with other related laws such as the Fisheries Act and EMCA. Protection of current MPAs from anthropogenic impacts and plans to expand the MPAs to meet international targets such as the Aichi targets are some of the sector's spatial needs.

Natural resources exploitation is another important sector in the marine area. Although the mining and quarrying sector currently makes a negligible contribution to the economy, accounting for less than 1% of GDP, it is anticipated that the sector will grow in the coming days. The government is optimistic about making a breakthrough in searching for offshore oil wells and has a given out concessions of several deep water oil exploration blocks to foreign companies (Shem, 2019). Natural resources exploitation activities fall under the Ministry of Petroleum and Mining and are guided under the Mining Act 2016. The sector has a lot of interaction with other sectors. Several conflicts also exist between oil exploration and fishers, Marine Protected Areas and Ecologically Significant Areas (WWF, 2018). The sector activities need to be planned to avoid these conflicts. Mapping natural resources distribution and identifying ecosystems that can potentially be affected by natural resources exploitation can benefit this sector.

Other developing sectors that may need spatial consideration include the military and communication which deals with underwater cables. Since 2009, Kenya has had about four submarine cables laid in the Kenya waters, mainly for communication (Mureithi, 2017). With technology rapidly growing, there will be a need to expand these submarine cables. The Ministry of Information, Communication and Technology (ICT) is responsible for regulating the submarine cables under The Kenya Information and Communications Act. Although the environmental footprint of cables is low, they should be planned to avoid future conflicts with other non-compatible uses (Carter et al., 2014).

Military uses of ocean space for exercise and other activities happen in along the Kenyan coast. Currently, areas for military activities are not well defined and could potentially impact other activities in the future. Military use in the marine spaces should be planned to avoid user conflict and impacts on the environment.

Kenya's national and international inspirations related to MSP

Vision 2030 is Kenya's most significant development plan. Vision 2030 was launched in 2008 and aims to enhance industrialisation capacity and transform Kenya into a middle-income country by enhancing its guide to citizens living in a clean and safe environment by 2030 (GoK, 2007). One of the critical areas that have been identified by the current government that can help achieve vision 2030 is the Blue economy (Sharon, 2020). For the Blue economy to help the country achieve Vision 2030, development of the existing maritime industries such as fisheries and mariculture, shipping and transport, tourism, and oil and potential uses such as renewable energy must be done sustainably.

At the international level, Kenya is part of several international agreements that support marine area management. Some of the International treaties that Kenya is a party to include UNCLOS 1982, CITES, UN Fish Stock Agreement, The Convention on Biological Diversity (CBD), Convention on the Territorial Sea and the Contiguous Zone, Nairobi Convention and International Convention for the Safety of Life at Sea (SOLAS). National government policies usually mainstream international agreements; however, sometimes, the international inspiration required by the treaties are not fully achieved. For example, Kenya is yet to meet the Aichi target 11 of protection of 10 per cent of coastal and marine areas, which was due in 2020.

Apart from the International treaties, countries have an obligation to meet internationally agreed goals and targets such as the Sustainable Development Goals (SDGs). Specifically, SDG 14 which calls for the "conservation and sustainable use of the oceans, seas and marine resources for sustainable development" is key for the marine sector.

MSP role in addressing sectoral needs and international obligations

MSP is a participatory process that seeks to allocate space for different marine uses to reduce conflicts and environmental impacts and promote sustainable ocean development. The MSP involves establishing authority, defining goals, identifying potential uses, creating scenarios, and allocating uses. After determining each sector's objectives and needs, MSP identifies the uses where the user will be economically feasible whilst minimising possible impacts to the environment and other ocean users (Ehler and Douvere 2009).

There is a definite need for MSP in Kenya, given the different sectoral objectives and needs. The MSP process should then analyse the possible interaction between the different sectors and offer a solution for managing potential conflicts to reduce impacts and ecosystems and deliver sustainable use. The most common approach in MSP is the zoning of spaces such that incompatible uses such as shipping lanes and fishing area are planned to happen in a different area. In contrast, compatible uses such as environmental protection and tourism can be planned to happen in the same area. This process is usually done with all the stakeholders involved and using the best information to achieve their best performance. For example, some areas with high biodiversity could be prioritised for environmental protection, while those with low biodiversity could be zoned for uses with more destructive impacts on the environment. (Grip and Blomqvist, 2021)

MSP will help in attaining both sector policies and national inspirations. By creating space for new activities that will enable the increased supply of seafood and provision of revenues. These MSP outcomes can help the government develop new industries, improve income, and eradicate hunger and poverty, and achieve the Kenyan Vision 2030. The output of the MSP is not just zoning plans but also regulations for implementing management actions. The zoned areas such as shipping routes, migration corridors, and MPAs should be anchored under the different sectoral policies regulation to ease the implementation of the proposed regulations.

At the International level, the output of MSP such as zoned shipping routes, migration corridors and protected area directly achieves international commitments such UNCLOS 1982, CITES, UN Fish Stock Agreements, The Convention on Biological Diversity (CBD), Convention on the Territorial Sea and the Contiguous Zone, Nairobi Convention, International Convention for the Safety of Life at Sea (SOLAS).

The MSP outcome of reducing environmental impacts caused by anthropogenic activities and improvement of the marine environmental status contributes hugely to the SDG 14. Other SDGs that are addressed by the MSP process include SDG 1 no poverty, SDG 2 (Zero hunger), SDG 6 (clean water and sanitation) and SDG 13 (climate action) (Ntona and Morgera, 2018).

Conclusion

Due to the spatial overlap of marine activities and the potential impact of activities on others and the environment, it is becoming increasingly challenging to implement sectoral policies. MSP enhances individual sectors' development by harmonising these uses to reduce conflict and potential impacts on the environment and

triggering growth. Sectoral policies are usually designed to help countries achieve their national objectives and international obligation and treaties. Therefore, the MSP process and the outputs can help Kenya achieve multiple sectoral policies and international obligations. For ease of implementation and enforcement, the MSP regulations should be placed within each sector's legislative framework.

The MSP process and implementation should be done in a collaborative governance approach with an inter-ministerial planning team and all relevant stakeholders. Kenya has had a history of multi-agency cooperation for Ocean management. For example, the Integrated Coastal Zone Management (ICZM) was developed by multi-sector agencies to achieve integrated management of the Kenya coastal zone (GoK, 2013). MSP is an excellent opportunity to have a coordinated effort in achieving the needs of the different sectors and trigger the sustainable development of the Kenyan's marine waters.

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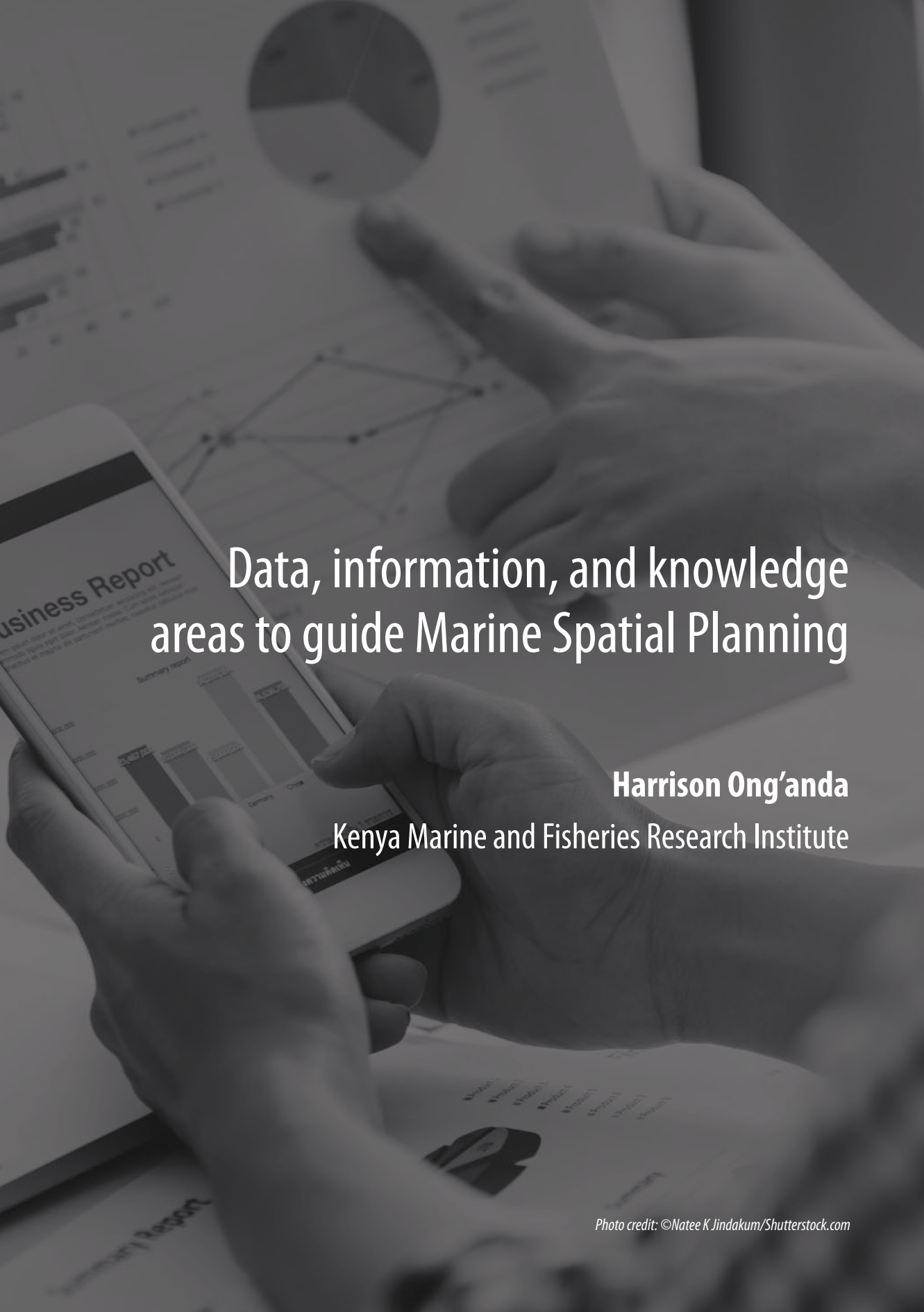

Data, information, and knowledge areas to guide Marine Spatial Planning

Harrison Ong'anda

Kenya Marine and Fisheries Research Institute

Photo credit: ©Natee K Jindakum/Shutterstock.com

Introduction

Marine spatial planning evolves around the integrity of the marine ecosystem as it supports the economic activities and its functional ecosystem roles in regulating climate and weather systems. Much of the deleterious impacts of human use is cummulative over a long period of time in the past and into the future. While the past can be understood based on past events and data, the future impacts will require a cumulative impact analysis. The planning development will rely on these impact analyses to aid on objective zonation.

The categories and levels of data contributes to the information and our knowledge of the oceans. A number of ecological and socio-economic data sets exist in various levels of processing. Knowledge management is important and there is need for a various infrastructure to handle data and knowledge management. Key knowledge areas include skilled scientists, data management infrastructure, informed stake holder, scientific equipment and legal infrastructure.

Data management infrastructure

MSP requires systematic collation of data on ecology, environment, social and economic activtities. There are areas that contain fragile or vulnerable species whereby some organisms or ecosystems exhibit slow recovery wherever there is perturbation. Certain places may have remained very natural and may play a key role as reference sites for the future. As yet some areas are of special significance for life stages of a population and would therefore determine their survival. The need for data integration is therefore crucial and would also be a means of identifying critical gaps. There is therefore need for MSP portal for key datasets on environment, social and economy – to aid in understanding impacts on current and future demands on marine space and biodiversity. The final product on data integration is a marine atlas that can be shared widely with stakeholders.

Skills identification & development

MSP data and information needs is informed by expert advice. This is very critical in the zoning process. Expert advice is relied upon in assessing and identifying compatibilities and current conflicts for identified activities. The resulting matrix is a basic input in a Strategic Environmental Assessment for the MSP. In view of this, MSP is a multi-disciplinary undertaking. In this instance the most supportive structure would be a complete and accurate database of experts. We foresee a knowledge platform to compile existing skills which will play a role in informing the process on skills gap.

A number of short skills development initiatives already exist. In this regard, the Ocean Teacher Global Academy (OTGA) has been offering regional training programs on data management. In the current phase of OTGA these trainings are now expanded to include all aspects of marine science. KMFRI is a training node for OTGA which makes access to strategic MSP training courses easier for those engaged in the MSP process.

Stakeholder engagement

One of the key roles to stakeholder engagement in MSP process is to seek a modicum of unanimity in the objectives of the process as well as the zoning proposals. A number of tools have been identified for use in spatial scenario analysis to analyse alternative uses. Decision support tools which can store, query and manipulate geographic information are critical. Often these products are delivered in the form of GIS maps and have the capability to inform stakeholder zoning processes quite effectively.

MSP Ocean literate stakeholders is critical for a successful MSP process. Thus, a strategy for a stakeholder education program should be based on demonstrations using Decision Support Tools.

Equipment infrastruture

Planning and execution of MSP must recognize existence of specialized laboratories, computing facilities & specialized equipment. There is no one institution that can have all the required equipment for data collection and processing. It is therefore critical that the MSP process compile catalogues of equipment available in the country.

Mapping of ocean resources to inform zonations will include:

- Bathymetric maps
- Bioprospecting
- Stock assessments of fish resources
- Mapping of nearshore & deep water resources
- Mapping of off-shore canyons and ridges
- GIS & RS laboratories

It would therefore be important to compile an equipment catalogue mapped against the above key themes to aid in synergies and identify equipment gaps.

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Stakeholder involvement and institutional capacity in the Kenyan Marine Spatial Planning scenario:

Participation, collaboration, cooperation, and coordination

(The key to success for MSP)

Jackson Marubu

The Nature Conservancy

Photo credit: © KCDP

Introduction

The successful completion of Marine Spatial Planning (MSP) is dependent on stakeholder acceptance and buy-in. Currently, there are beach management units (BMUs), marine protected areas (MPAs), and county integrated development plans (CIDPs) guiding the activities for Kenya's ocean spaces. There is opportunity to extend MPAs to the exclusive economic zone (EEZ) instead of nearshore spaces within the MSP process.

Conservancies in Kenya have been growing at a significant rate sine 2002 and there is currently more than 6,000,000 ha of land under conservancies. Kenya's National Parks and reserves constitute 8% of Kenya's land mass. Private and community conservancies make up 11% of the country and secure the 65% of the country's (KWCA, n.d.) Most of the terrestrial conservation in Kenya is enhanced by community conservation which is enhanced by commitments to global targets and agreements surrounding conservation. The Convention on Biodiversity (CBD) Target 11 for conserved areas is to increase protected area coverage by 2020 (CBD, 2020, p. 9). The strategy to achieve the CBD 30x30 target is to increase conservation through community and marine conserved areas. The MSP process presents an opportunity to meet such targets through increasing MPAs.

Enabling environment

Community conservation in Kenya is enhanced by an enabling policy environment. These legal frameworks include the Constitution of Kenya, 2010 chapter 5; the establishment of the Kenya Fisheries Service: Fisheries Management and Development Act, 2016; the Environmental Management and Co-ordination Act (EMCA), 2015 which provides guidelines on access to bio-resources; the Wildlife Conservation and Management Act (WCMA), 2013 on conservancies; the Community Land Act 2016; (CLA2016) the National Climate Change Policy and Act; and Species Management Strategies. (KWS, n.d.) A supportive legal framework for co-management is also now available. With support from development partners, the Kenyan government has progressively increased budget allocations to the natural resource management sector.

Stakeholder engagement

The Constitution upholds public participation and there is a need to not undermine this in the MSP process. The basic principles of stakeholder engagement are to focus on relationships and processes within the area of scope; to use adaptive management practices; to consult early and often; to ensure intersectoral cooperation and to carry out management actions at a scale appropriate for the issues being addressed with the decentralization to the lowest level as appropriate.

Stakeholder identification

It is essential for stakeholder identification to not only consider who the stakeholders are, but also what the conflicts of interest, are as overlapping and opposing interests could be involved in the process. How, and to what degree stakeholders will be affected by the project and how their perspectives might influence the project are key considerations to be made in the stakeholder engagement process. There is an overlap in public sector actions such as management and enforcement around coastal and marine resources and thus there is need for intersectoral cooperation in the MSP process. It is important to take into account what factors influence the opinions of various stakeholders. The level of involvement instead of the amount.

Some of the key stakeholder groups to be considered in MSP include the government at both na-

Technical engagement at the national/ regional level:

Working Group to understand the process and risks, identification of abilities and pathway to achieve the conservation commirtments

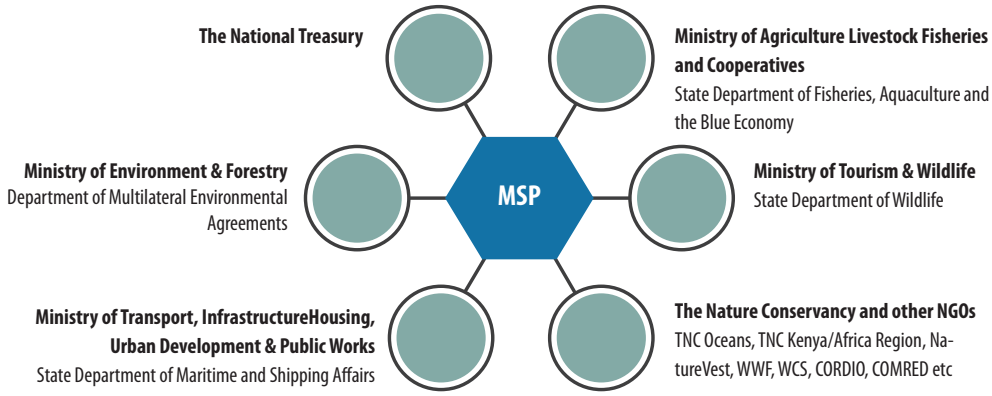

Figure 1: An example of key stakeholders to be included in the MSP process.

tional and county levels, technical agencies, host communities and demographics, research and academia, private sector players, non-governmental organizations, international and regional agencies (Figure 1). Different people fall within key stakeholder groups and analysis in the MSP process and roadblocks may occur when there is no appropriate stakeholder engagement. The process and phases of stakeholder engagement is shown in Figure 2.

How to engage stakeholders

- **Phase 1:** Clarify Context: Identify area of interest, scale, policies & regulations, and nstitutional agreements
- **Phase 2:** ID concerns: Identify goals and actions to be taken and scenarios to consider
- **Phase 3:** Concept model development: Identify driving variables and functional relationships
- **Phase 4:** Define States: Define number and range of categories
- **Phase 5:** Process data and Build model: Link GIS software. Participants fill out conditional probability tables
- **Phase 6:** Produce Maps: Land suitabilitty maps representing different stakeholder groups
- **Phase 7:** Monitor Outcomes: Measure success/ failure. Identify trade-offs

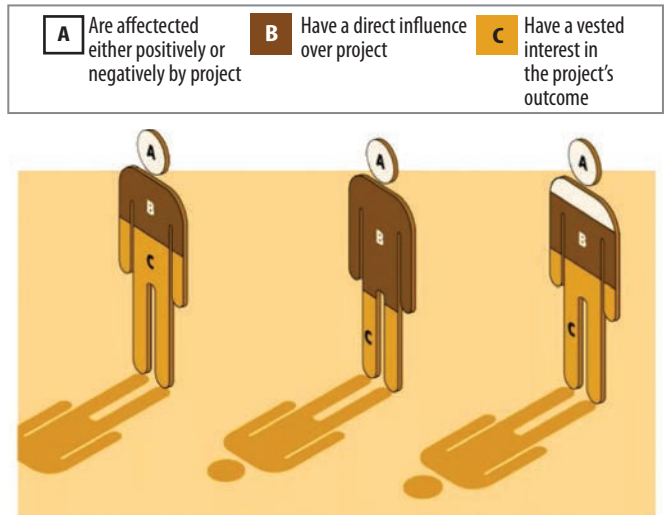

Figure 2: Seven (7) Phases of stakeholder engagement: clarify concerns, ID concerns, concept model development, define states, process data, and build model, produce maps, and monitor outcomes.

Conclusion

We are the first generation that has a clear picture of the value of nature and the enormous impact we have on it. We may also be the last that can act to reverse this trend. Kenya can learn from other MSPs in the world and use best practices and approaches to develop its own MSP.

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Urban planning and aspirations for merged terrestrial and marine sectors

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Photo credit: ©WIOMSA

Introduction to coastal cities and the concept of Marine Spatial Planning

Coastal cities are important engines in many governments, globally, as they act as conduits of economic growth, whose development depends on national policies using the sea. The economy of the coastal cities is comprised of many diverse activities and human resources that directly impact the performance of these cities and development of their communities.

A key sector in the coastal cities are ports and it is estimated that port demand volume in Africa will grow by 6-8 times by 2040. It is also estimated that 80% of global tourism takes place in coastal locations in the Western Indian Ocean (WIO) region (Birtil et al., 2021).

Figure 1 shows the GMP sectoral contribution in coastal cities of WIO categorised as direct output of ocean and the services it enables, as well as adjacent benefits it provides.

World Wildlife Fund (WWF) calculates that coastal and marine tourism contributes US$14.35 billion to the WIO region annually. These economies and other Blue economy industries that are part of the coastal city hold significant importance to the economic and socio- development prospects of the WIO. The city and the marine environment create a great connection to the global Blue economy. As listed in the sectors above (Figure 1), There is therefore need to improve Blue economy activities in coastal regions to enhance the sustainable coastal economy as well as the cities and communities.

Marine Spatial Planning (MSP), a management concept for sustainable oceans, is analogous to spatial or land use planning in terrestrial environments. Several countries worldwide have benefited from the MSP plans for their coastal regions, which is multisectoral and involves the relevant sectors. In enhancing MSP it is imperative that city and urban planners participate in the process as they play a critical role in balancing land use plans for a better marine environment.

Though coastal spatial planning is restricted to setback lines (Dodman et al., 2013), the coastal environment under the MSP requires that land-use planners and marine spatial planners work together. In the WIO region, South Africa, through operation Phakisa, Mauritius and Seychelles, are advanced in the development of integrated planning systems that merge the land and sea aspirations for maximum benefit and minimum impact.

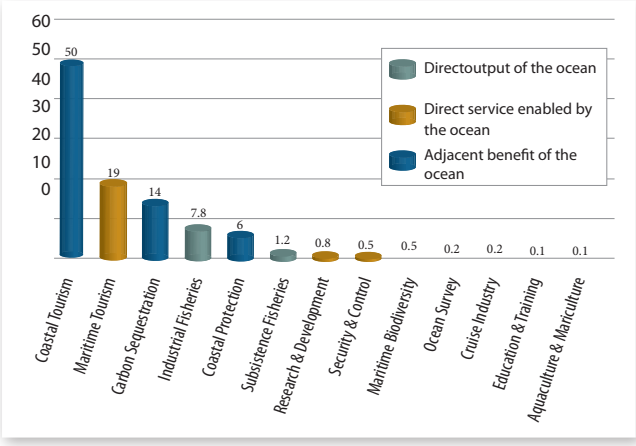

Figure 1: WIO GMP breakdown sectoral contribution in coastal cities

City planning and capacity needs relevant to MSP in Kenya

Integrated coastal city marine and terrestrial planning is a relatively new and evolving process in WIO cities. Urban and city planning authorities require enhanced capacity to participate in MSP processes. The coastal space is usually an arena of multiple stakeholders' values, interests and activities, and these require acquisition of skills that include engagements with diverse coastal and land-use stakeholders and systems (Ochanda and

Irurah, 2017). On top of the high ecological values attached to critical marine habitats and ecosystems, coastal areas are often spaces of conflicts of interests between different groups of users. Therefore, planners with environmental planning skills and a clear understanding of integrated coastal system planning are needed. They can integrate coastal cities urban design/systems planning, which will enhance their skills in applying planning regulations and merging the aspirations of the coastal cities with the marine environment and taken into consideration the interactions between these systems.

Kenya's laws that are directly linked to urban and city planning include the Constitution. Other important legislation includes The Physical and Land Use Planning Act, 2019, The Urban Areas and Cities (Amendment) Act, 2019, Environmental Management and Coordination Act (EMCA), County Governments (Amendment) Act, 2016 (No. 1 of 2016), The Environmental Management and Co-ordination (Amendment) Act, 2015 and The Land Act, 2012. These legislations have left some gaps in enhancing the integration of coastal city planning and maritime planning, creating a vacuum that has reduced the efficacy of maritime (Blue economy) benefits for coastal communities in the WIO region, while increasing the impact of land use and land-use changes to the marine environment.

Great strides have been achieved in the academic realm in producing especially environmental planners who can manage cities with diverse ecosystems. However, the University curriculum in Kenya needs to be enhanced to train planning professionals who can manage this vital area in coastal cities with the Blue economy concepts.

Increase involvement of the planning sector in Kenya's MSP process

As part of sustainable coastal city growth, the development of MSP in Kenya requires involvement of the planning sector. Also included are sectors directly involved in the functioning of the city, for example, housing and infrastructure, tourism, city livelihoods and the natural systems that are part of both the marine and the land use areas. Figure 2 shows how city sectors typically integrate in the Blue economy scenario. All the sectors are intertwined in urban and city planning, making the involvement of urban planners in the MSP process is crucial for the sustainable management of these ecosystems.

According to Watson (2009) and in the present case, land use and maritime planners must proceed with enough openness and transparency to maintain public legitimacy and environmental sustainability while ensuring that capital retains ultimate control over the cityscape and its processes. The sectoral involvement that comes with public-comment sessions is familiar to most active city dwellers. So, the stakeholders invited to discuss the city plans and marine spatial plans should have a good chance of participating and influencing the basic outlines of these ideas.

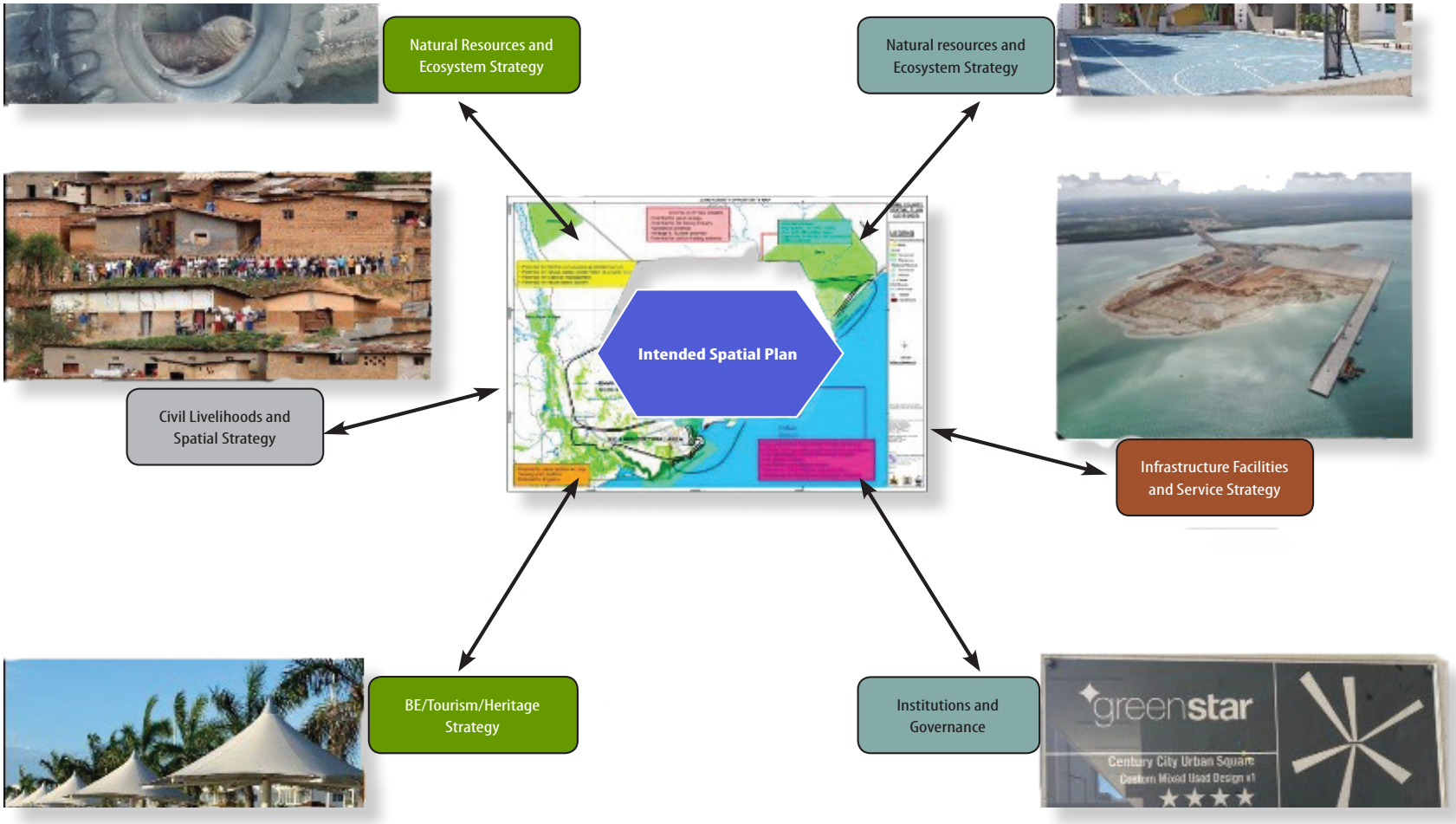

Figure 2: Coastal city sectors and integration to Blue economy.

Recommendations that can be taken up in Kenya's MSP process

- The intersection of coastal cities & the marine environment requires linkage and collective action (Birtil et al., 2021)
- Failures of coastal city/urban planning are detrimental to marine areas and vice versa.
- Lack of understanding of coastal city and marine systems produces negative impacts, e.g. sea level rise, especially on coastal communities.
- Ensure incorporation of social aspects: ensure inclusion, maximize developmental impact, and increase sustainability. (Cuthbert and McKinnell, 1997) see also figure 3 on co-contributions of each sector.
- Enabling policies are required to facilitate linkages across the region on coastal city planning and the MSP.
- Enhance the co-contribution of the city planning and the MSP into coastal economy, this can be done through:
  - Legal Space -Legal & Policy frameworks; where planners are trained to plan up to five kilometres into the ocean and jointly be responsible for this space
  - Conceptual Space - Properly assigning the physical & social sense, with the diverse environmental characteristics in mind and increase opportunities for advocacy.
  - Knowledge and practice space - Practice, curriculum diversification, and marine students' training on coastal cityscape and planner's development with an integrated marine-neighbourhood, urban/city and regional planning.

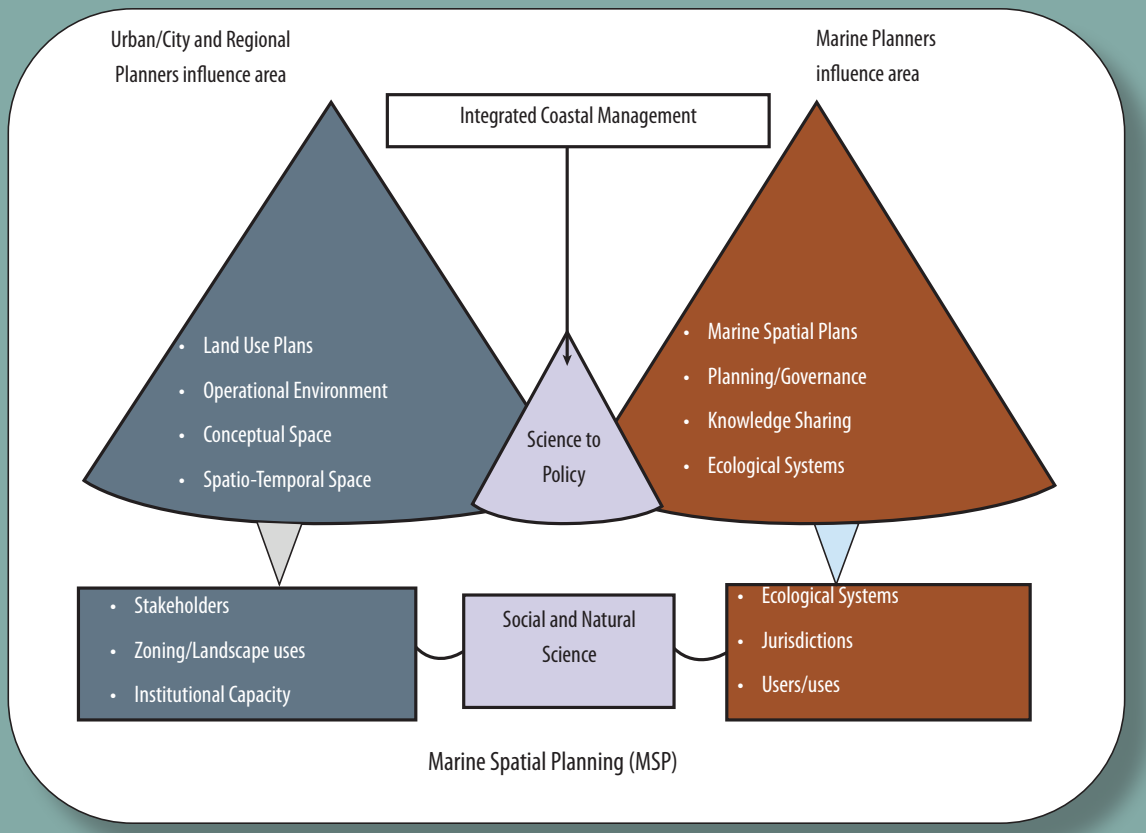

Figure 3: Areas of congruence of city planning and MSP.

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Integration of underwater cultural heritage in Marine Spatial Planning

Caesar Bita
National Museums of Kenya

Photo credit: (Bita, 2021).

Introduction

Kenya is a culturally very rich country. From the diversified cultural groups to historic sites, the country boasts of a very rich cultural heritage. The country has endeavored to develop the different cultural entities, sites and aspects into tourism packages, each having a role in the country's tourism industry. One component of the country's cultural heritage "Underwater Cultural Heritage (UCH)" is gaining local, national and international attention with local communities today acknowledging its role in their economic development. For over 2,000 years Kenya's coast was a major player in the ancient transoceanic maritime trade across the Indian Ocean Seaboard, trading with the Far and Middle East, Red Sea, Mediterranean region and Europe. During these times, there was interpenetration of cultures to this coast consequently assimilating the region into the international economic system. Evidence of this cultural intercourse is today being recovered on the seabed in several parts of the coast, forming a very important cultural resource. Many countries world-over have developed and exploited this resource, in effect earning revenue and creating employment for thousands of their citizens. This paper highlights the underwater cultural heritage of Kenya for inclusion in the marine spatial planning in order to achieve a more integrated understanding of Kenya's heritage as part of the nation's cultural reserves. The paper outlines the mandate of National Museums of Kenya (NMK) including future plans for the underwater cultural cache in Kenya.

Kenya's maritime and underwater cultural heritage landscape

The Kenya coast is part of the Western Indian Ocean, commonly referred to as the 'Swahili Coast'. Coastal communities of Kenya have had a long and continuous historical interaction with the international community. Voyages, based on regular and predictable Monsoon winds happened between this coast and the Indian Ocean, which enabled seafarers to travel to other parts of the world as far as Europe and the Americas. Further, our coast exhibited several thriving port cities such as Malindi, Ngomeni and Lamu. These towns developed extensive maritime links and were gateways for trading networks north to the Arabian Peninsula and east to India and China. In addition, trade routes existed that connected this coast with the hinterland where merchandise for international trading was collected.

The remnants of the long-standing ancient interactions have left behind material traces in the form of ships and associated cargoes that now lie buried in our oceans (Figure 1). Fascinating traditions including sailing, fishing and boat building styles, together with the infrastructure resulting from these ancient interactions remain as reminders of this past. Kenya's maritime and underwater cultural heritage therefore consists of the sum of these shipwrecks, traditions, sites and monuments associated with both long-distance maritime networks and interactions with the hinterland. Three major towns form the core of Kenya's maritime and underwater cultural landscape, including Mombasa, Malindi and Lamu. Underwater archaeological studies in these areas have recovered evidence confirming the international commerce and maritime connections.

Many sites of immense cultural values have been identified and documented in various places along the Kenya coast (Figure 2). The underwater cultural heritage in this country is very significant and valuable in terms of economic benefits to the local communities, and also nationally. For instance, there are sites that are located at the shorelines that have been developed into places of attraction, which are now earning the country revenue. It is believed that many of the underwater cultural sites can be developed into revenue generating tourist attractions.

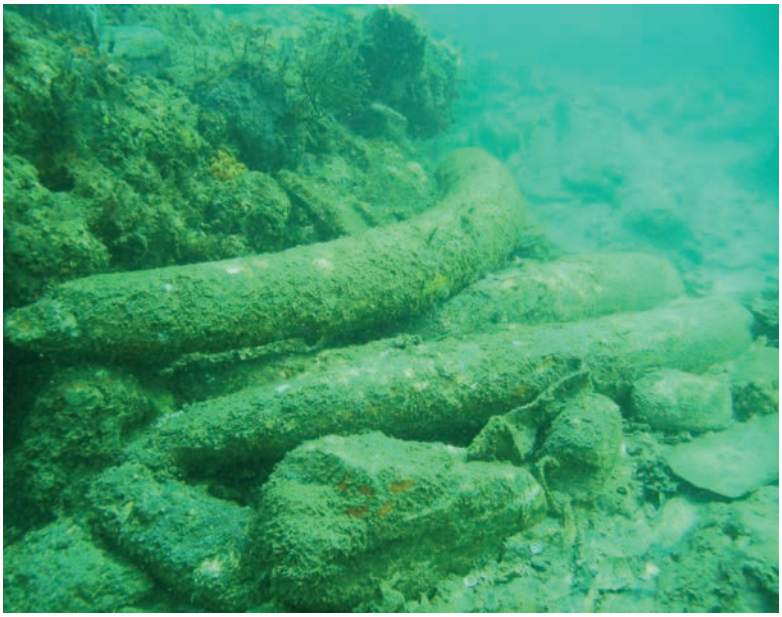

Figure 1: Ngomeni shipwreck (Bita, 2018a).

Research has confirmed that the coast of Kenya was settled for the past 2000 years. Heritage traces of this early settlement is now found both underwater and also on the shores of the ocean. Similarly, settlers on this coast have had connections with the hinterland (interior) of Kenya as part of the African continent. International maritime connections extended to as far as the Far East, the Middle East, the Americas and Europe (Bita, 2013a; 2013b). Emerging results of underwater archaeological surveys have found evidence of these links. This submerged heritage is part of

Distribution of Maritime sites in Mombasa (Bita, 2015b).

Figure2: Surveying Kota Menang shipwreck in Mombasa (Bita, 2021).

Kenya's marine resources, which is what is considered when planning to map and utilize the marine resources in this country.

Following the numerous research surveys that have been undertaken by NMK along the Kenya coastal waters, several shipwrecks and other marine resources have been identified. Figure 3 shows the Kenya coast, with Mombasa, Malindi and Lamu areas where underwater archaeological work has been undertaken and a lot of underwater cultural heritage found.

Studies have discovered over 45 ancient shipwrecks across the Kenya coast and most are located within the three centers of Mombasa, Lamu and Malindi. It is noteworthy that these are the earliest settlements and also the ones that had most vibrant international maritime connections with other countries across the Indian Ocean. Even to-date, these towns remain the main tourist attraction and business nodes within the coastal region. In earlier times and even today these towns are hubs of economic vibrancy that connect Kenya to the maritime markets global-

Figure 3: Kenya Coast with areas with greater concentration of underwater cultural Heritage Sites (Bita, 2013a).

ly. Presently, research at NMK has discovered 10 ancient shipwrecks in Lamu that date between the 14th and 18th centuries AD. In Mombasa, we have more than 30 ancient underwater heritage sites while in Malindi, we have now identified almost 15 sites. Others include historical period stone anchors that indicate transoceanic commerce (Bita, 2015a; 2015b; 2019a; 2019b; Bita, and Tripati, 2015).

Managing underwater cultural heritage

Underwater archaeology and underwater cultural heritage management is in its infancy in sub–Saharan Africa. Many countries in the region as well as agencies responsible for museums and cultural heritage are yet to develop strategies of Underwater Cultural Heritage (UCH) management. Kenya's maritime heritage is a critical element of the country's wellbeing. In addition to its intrinsic value, maritime heritage provides important goods and services, as well as space for recreation and tourism. Kenya endeavours to conserve, protect and sustainably use her rich resources to generate income through tourism and creation of employment for the ever-expanding population of youth local inhabitants. Since the first underwater archaeological expedition in the 1978-82 (Lynch, 1999), Kenya has made steps in advancing maritime and underwater cultural heritage. These include training personnel in the field of underwater archaeology.

Some of these underwater cultural heritage sites are big ships, some measuring more than 100 meters long, while some are small wooden boats of about 40 meters. These form a very important resource that needs protection and that is why NMK is the custodian of such heritage and is currently classifying them as important sites for protections. The map of Mombasa, as seen on the inset of Figure 2, shows the distribution of the shipwrecks within Mombasa Island, which NMK experts have been able to map. Some of these sites are not in very deep waters and are there-

Figure 4: Ngomeni village and location of the 15th century Ngomeni shipwreck (Bita, 2018).

fore easily accessible. Once they are considered as an attraction and converted into tourist sites, people can dive to appreciate them as sites of tourism and also study them for research purposes, where much can be learnt about ancient ship technology and seafaring.

Figure 4 is the map of Ngomeni area, which is one of the ancient human settlement sites along the Kenya coast, north of Malindi. Located within Ngomeni are some of the very ancient shipwreck sites that NMK is currently focusing on to determine whether they can be turned around and converted into an underwater museums, where divers can accompany tourists as guides in these sites (Bita, 2018a; 2018b). This site has been surveyed and is a gazetted and protected in collaboration with the local community. Communities are key stakeholders in management of underwater cultural heritage. Their involvement in the management of UCH is important. This not only ensures protection, but also bestows a sense of community ownership of the resource which in effect ensures the locals protect the site (Bita, 2019b; 2020. 2021). Otherwise, without the participation of the local people, some of the sites and the various artifacts in sunken ships along the Kenya coast would not be identified, and in some instances, they would be vandalised, especially by the fishermen (Bita, and Mahumane, 2020).

Because shipwrecks form very important aggregating devises and breeding grounds for fish, fishermen normally harvest big catches around these sites. Working with the stakeholders like the fishermen, members of Beach Management Units (BMUs) and other local communities including tour operators, helps NMK to protect these sites and ensure they are preserved. The importance of working with the local communities cannot be overemphasized and as NMK manages resources in the ocean they always ensure participation of the local people and also create public awareness on the value and importance of these sites.

Legal framework for managing underwater cultural heritage in Kenya

Kenya was the first among sub-Saharan countries to initiate an underwater archaeological expedition and to legally recognize the value of underwater cultural heritage. In managing underwater cultural sites in Kenya, NMK draws from a number of legislative Acts of Government as well as from several international conventions and statutes. The main legal tool is the National Museums and Heritage Act (NMHA) of 2006 of the Constitution of Kenya. This statute, establishes NMK as the custodian of natural and cultural heritage in Kenya. In that legal framework, all shipwrecks within the territorial waters of Kenya and 50 years of age, are automatically declared as national monuments and are protected. In addition, the law provides and empowers NMK to undertake UCH Impact Assessments for projects likely to impact on underwater cultural heritage.

NMK also draws from international conventions that the Kenya Government as a state party has ratified. Kenya is currently working on ratifying the UNESCO 2001 convention on the protection of the underwater cultural heritage. In addition, for all operation in our waters NMK applies the principles and guidelines as provided in the Annex of the UNESCO 2001 Convention. NMK has formulated policies and regulations for the preservation and management of these resources in the coast. Stakeholder engagements have been undertaken to raise public awareness as well was engagement of institutions that have a stake in the ocean. Further, we have MoUs with Kenya Fisheries Services (KeFS), Kenya Marine and Fisheries Research Institute (KMFRI), Kenya Ports Authority (KPA), Kenya Maritime Authority (KMA)

and many other government agencies that have a stake in the Kenya's waters. NMK is also working towards formalizing collaboration with the Postal Corporation of Kenya (PCK), Kenya Coast Guard Service (KCGS) and has MoU with all the counties in the coast including those with large water bodies for mutual benefit and co-management of coastal and marine resources.

NMK continues to establish collaborations with international institutions, universities and governments that have highly developed infrastructure and programmes for the management of the underwater heritage. Top partners among these are UNESCO, UK, USA, Italy, China and Turkey. These countries have assisted NMK to undertake surveys, and also to carry out much of the research at the coast of Kenya to study more about the shipwrecks and the relationship between the sites and the land where they are located.

Potential for underwater cultural heritage tourism

Kenya boasts of many sites that form very interesting resources and that can be turned around especially for cultural trades and museums - Ngomeni site is a good example. Others are Globe Star and Kota Menang shipwrecks in Mombasa, which is also home to the *Santo Antonio de Tanna*, the 17th century Portuguese ship that sank near Fort Jesus in 1697 during an effort to free the Fort from Arab invasion. The site is well preserved and located. These sites can be developed in collaboration with the local communities comprising their local divers and fishermen, who can form a pool of trained diver guides and make a living from guiding tourists and researchers down the ocean to enjoy sights-seeing and conduct research while raising revenue for the country. Kenya is moving towards achieving the dream of an underwater archaeology museum as today Malindi town boasts of the only one in the East African region, displaying such amazing wonders (Bita, 2018b). Through this approach, NMK can undertake its mandate through digitizing the underwater cultural sites while assisting the local communities to make a living. So, these are resources that, if well planned and documented, could also be integrated in the overall planning and implementation of the Blue economy resources within the Kenya coast.

Capacity needs

Over the last 5 years, Kenya increased her campaign to preserve underwater cultural heritage. Efforts employed include training NMK personnel on MUCH, development of an underwater artifact conservation laboratory, drafting relevant legal statutes and empowering institutions involved in the management and preservation of maritime and underwater cultural heritage. Further, Kenya has entered into bilateral agreements with countries that are more developed in underwater archaeology. Additionally, NMK has developed a database of maritime and underwater cultural heritage and the institution enjoys good rapport with stakeholders besides stimulating public awareness in the field. Through a fully-fledged department of public programmes and education, NMK stimulates public awareness in the field of maritime cultural heritage, through public archaeology, to the general public and in schools (Bita, 2021). This has led to a growing public interest as has been witnessed by particularly fishermen, handing over underwater archaeological artifacts to the NMK (Bita, 2019).

The world over, training of underwater archaeologists is expensive and lack of such academic programmes in local universities further compound the challenge. Underwater archaeology is not an established academic discipline in Kenyan universities despite the presence of departments of archaeology, anthropology and history. Nevertheless, Kenya has managed, through bilateral cooperations, to train 2 underwater archaeologists and

3 experts in conservation of underwater materials (Bita, 2021). Therefore, training becomes the main challenging need for managing these underwater resources. However, with appropriate collaboration with institutions that are also working in the coastal region, like KMFRI, and others, it is possible to develop a pool of experienced personnel who can actually ensure these resources are well managed. As we plan on how to benefit from these resources, there is need to create more awareness, especially among the local communities, on the existence and value of UCH. There is also need to enlighten the entire country, not only people living at the coast who are the main customers, but also people from outside who need to know more about what lies in our waters. UNESCO has facilitated a number of meetings and conferences in Kenya during which NMK has created a lot of awareness among the local people, by physically visiting the sites and also through the print and mass media. Many people are now aware that this resource exists that it can be turned around to benefit the local populations (Bita, 2021)

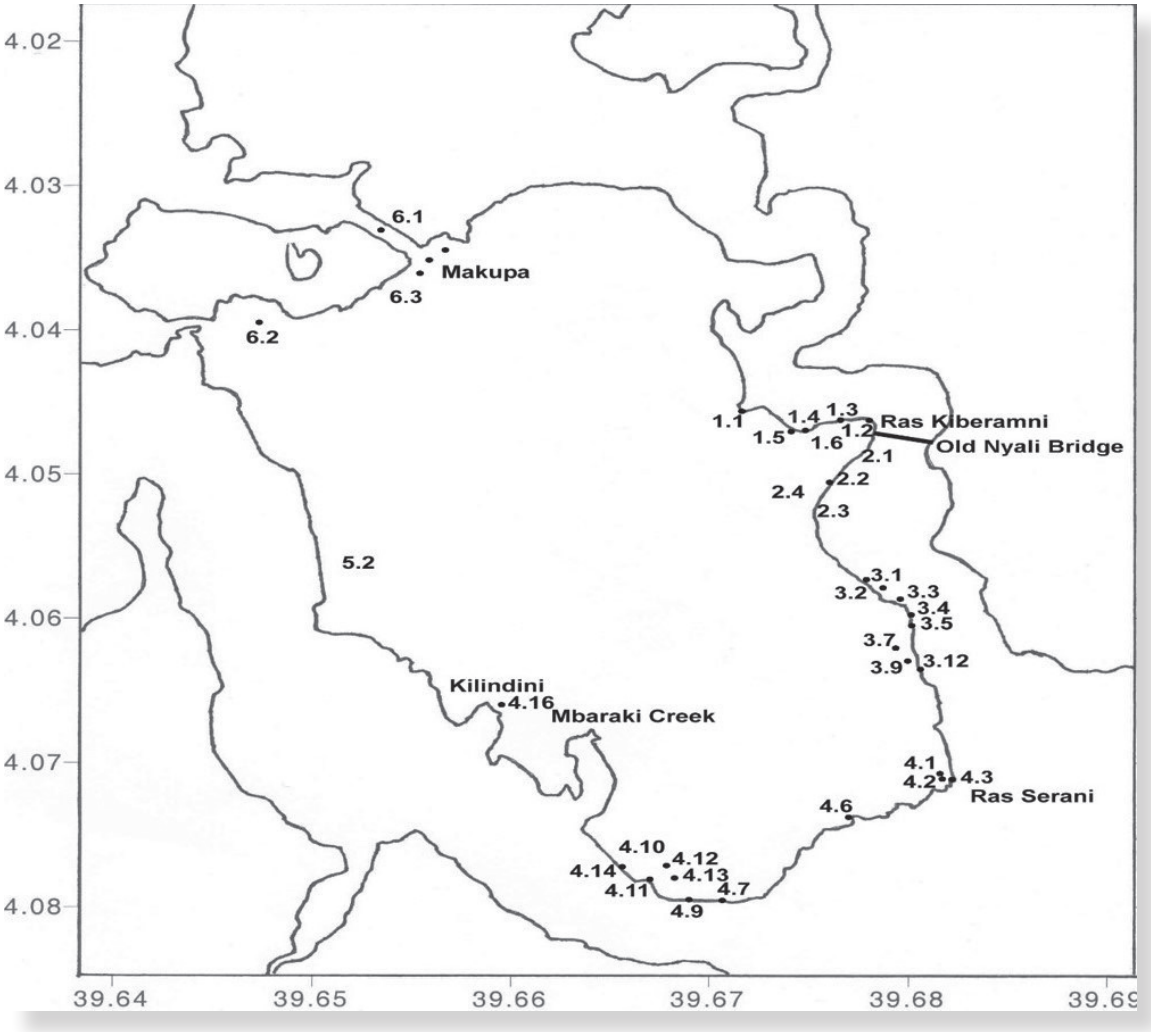

Figure 5: Location of Maritime and Underwater Cultural Heritage sites in Mombasa (Forsyth et al. 2002).

There is need to train more people in underwater archaeology. UNESCO has facilitated several training workshops in Kenya, and also around the region. Kenya has participated in a number of them hence getting more of her people trained. There is also need to conduct more surveys since underwater archaeological surveys are not like any other aquatic survey. They are very technical, and risky - requiring well trained experts. Only two persons are trained, one of them is doing much of these surveys in Kenya, in collaboration with local fishermen and sometimes personnel from other institutions.

Need to integrate UCH in MSP

As we plan to sustainably exploit the marine resource in our country, we need to ensure that we can undertake more surveys of UCH sites, identify, map their distribution in our waters (e.g. see Figure 5) and establish their relationship to the other available resources. There is need for increased collaboration with the local institutions such as KMFRI, KMA, KPA, KCGS among others, local and foreign universities and also with countries that have greater capacity in managing UCH. This approach will ensure that these resources remain a part of Kenya's resource base and are well protected.

The other need is to map UCH stakeholders including Marine Police, KWS Wardens, local administration and enhance their collaboration in managing this resource. Of more importance is ensuring that impact assessments are undertaken whenever projects likely to endanger UCH are done. NMK is mandated to ensure that any development within the Kenyan waters where there is likely to be cultural heritage, undertakes impact assessment (Bita, 2021). Much of these have been undertaken by NMK and include in Lamu during construction of the new port, in Mombasa during construction of the seawall at Fort Jesus museum, during the expansion of the Kilindini port three years ago, during development of the Mombasa Gate Bridge and laying the subsea fiber optic cables in 2008 to 2015 (Bita, 2021). Therefore, as we embark on planning marine resources mapping and use, we also need to consider the entire cycle that requires understanding the need for valuing, because when the resource is understood and evaluated a value is assigned to it and thereafter it is protected and cared for. And while the resource is cared for, humans will enjoy it and become curious to understand it more. So, that is the cycle that NMK has been following; it is an approach worth considering when planning the management of coastal and marine resources.

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Inclusion of tourism in the Marine Spatial Planning process

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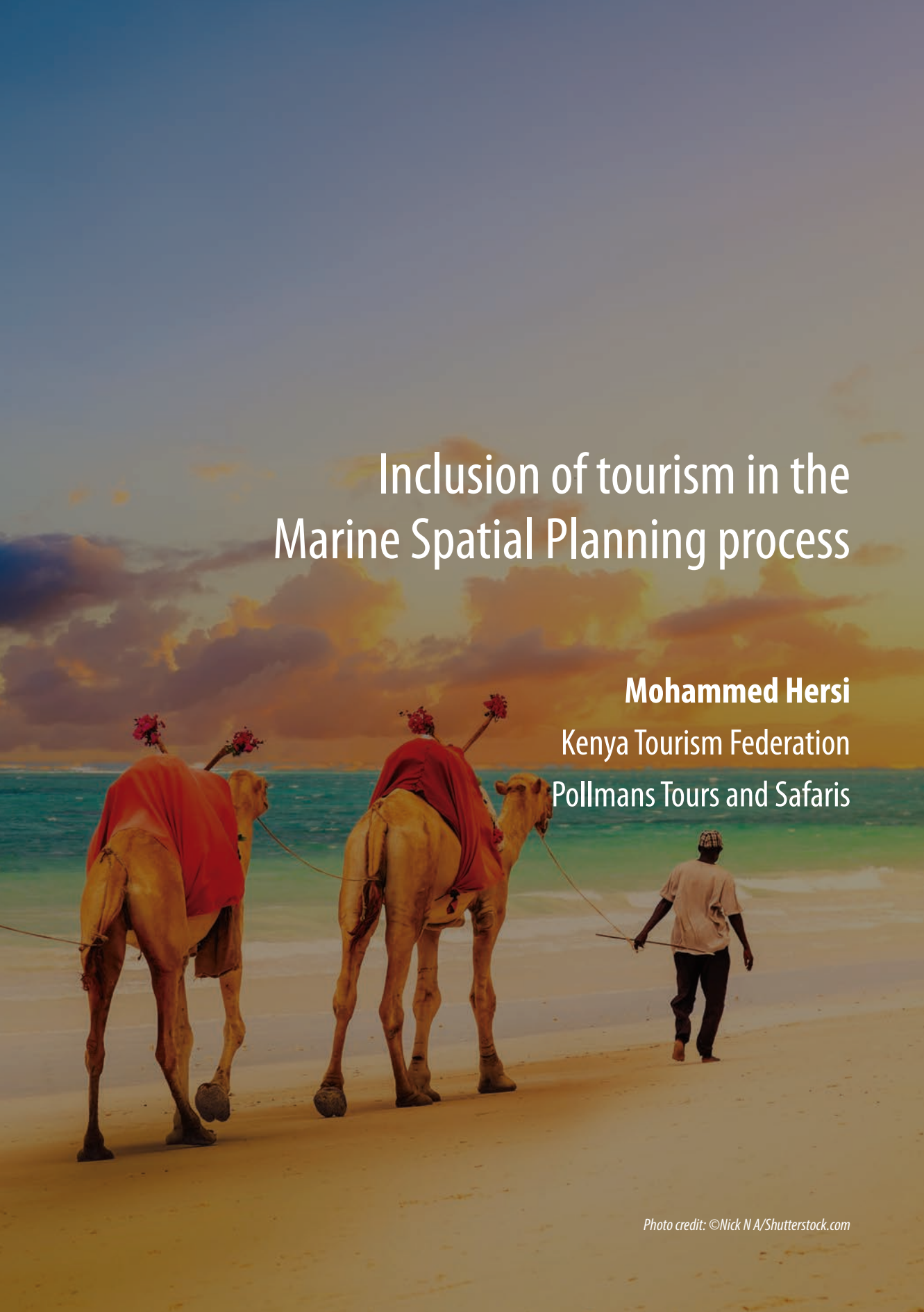

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Introduction

The importance of including tourism in the process of Marine Spatial Planning (MSP) cannot be overemphasized considering that tourists are users of the marine space and resources therein (Figure 1). There is growing concern that the environment is now facing myriads of challenges and the ocean is no exception. Therefore, whatever happens in the ocean affects all of us humans directly and it is important that concrete actions are taken to manage our oceans sustainably.

The Kenya Tourism Federation (KTF) was formed in 1997, when Kenya experienced its first crisis following political instability at the coast. The government was very busy dealing with the aftermath of what had happened, and the players in the tourism industry decided that there was a need to take charge and address the emerging issues. At that time a unit was formed to deal with safety and communication issues, which eventually turned into what is known as the KTF.

When the National Rainbow Coalition (NARC) government took charge in 2002, His Excellency President Mwai Kibaki approved formation of KTF as the umbrella federation to represent various allied associations including the tour operators, hoteliers, travel agents and all other affiliates. KTF also has a seat on Kenya Private Sector Alliance (KEPSA), where it addresses matters on tourism, and also provides input on diverse areas that cover manufacturing, agriculture etc. The overall objective of KTF is to have a single voice for addressing concerns of its members, which include enhancing ethics and standards in the tourism industry.

Importantly, KTF aims to strengthen the private sector representation while working very closely with county governments, national government and all other stakeholders, including government agencies and NGOs that address issues of the coastal and marine environment and resources therein.

KTF is always exploring avenues of collaborate with others for the purpose of improving the tourism sector in Kenya. KTF also reciprocates by providing a forum through which the tourism industry can give input in marketing activities because it is in liaison with the Kenya Tourism Board (KTB). KTB is a government entity under the Ministry of Tourism whereas KTF is in the private sector but works very closely with the government. KTF lobbies and constructively engages government on issues critical to the industry. It also liaises very closely with the "source market", which mainly comprises North America, USA, Canada, United Kingdom, European Union, and other countries where Kenya sources tourism.

The coast of Kenya is a major tourist destination, and the main reason why people come here is the presence of beautiful beaches that extend from Shimoni, in the south coast all the way to Kiunga in the north. Places like Diani beach in the south and Watamu in the north have been winning global awards for the best beach, and they are normally voted for by travellers who actually experienced these beautiful places.

Tourism has all along been a key pillar for the economy of Kenya. It is said, that "when tourism in Kenya sneezes, the national economy catches a cold", and it is clear that this situation applies even globally. And now that tourism has caught Corona, the economic situation has worsened. The current depreciation of the Kenya shilling is clearly due to the absence of tourism that is linked to the foreign exchange revenue that came in with tourists.

Figure 1: Chairs and green trees on a white sand beach. Watamu, Kenya. Photo credit: ©Wead/Shutterstock.com

It is estimated that there are over 40,000 beds along the Kenya coast currently, including all the private villas and the vacation rentals homes. Locations like Diani have close to 1,000 homes that are private villas or leased under Airbnb arrangement while a place like Mombasa has close to 1,900 of these. Watamu and Malindi have an additional 1,500 private facilities.

So, all these are people who are all benefiting from one form of tourism in one way or the other. When the situation is good and everything is stable, Kenya tourism attracts close to 42 chartered aircrafts landing in Mombasa every week. But this has started changing lately because the market is also changing. People no longer want to go on a package tour, they want to have a scheduled flight and that is why there are sentiments to the effect that: "we want open sky policy", where other international airlines are allowed to fly into Mombasa. That is why Mombasa has been receiving passengers on board major airlines such as Turkish Airline, Ethiopia Airlines and Qatar Airways. And that is very important for us. It signifies that we are moving forwards and that is the only way we are going to open up the entire Kenya coast anew as we emerge from the COVID-19 impacts.

Why include tourism in MSP

Tourism should be included in MSP for the following reasons:

1. **Economic sustenance:** Tourism is a major economic driver globally. After 2019, before the advent of COVID, we had close to 1.5 billion travellers around the world. There are many countries in Europe that will attract more visitors than their own population. A country like Switzerland attracts more people than its own population. France attracts numbers that are equal to the population. This is about 18 million visitors. Therefore, tourism is a key driver that can never be underrated.

2. **Environmental degradation:** Without a sustainable environment and focus on how this environmental degradation is approached, tourism will be seriously endangered. The tell-tale signs are visible from the destruction of mangrove, beach degradation and other impacts. The level of pollution and the bleaching of coral indicate that we need to deal with aspects that degrade the environment. We need to work together in order to comprehend what these divers are narrating

to us, and practice what marine biologists are advising us to do. What do we need to do in order to safe guard what God has given us, because if we maintain the "business-as-usual" attitude and continue doing the way we keep doing things, then in a couple of years down the line, there will not even be anything to show to our visitors.

3. **Fishing pressure:** The issue of fishing using the wrong type of gear needs to be addressed because ultimately, tourists come to Kenya to come to enjoy the sun, the sand and the beautiful weather. Importantly, they come to interact with the marine life in our ocean, either as divers, or for leisure through snorkeling. One challenge to the environment that is coming up rampantly now is harvesting of ornamental fish. Obtaining information regarding this issue is quite difficult and the level of transparency is very low. There is need for studies to guide and provide information on ornamental fish. Information on traders should be made public. For instance, anyone should be able to get into a portal and establish how many farms have actually been licensed to harvest ornamental fish along the coastline.

4. **Conservation focus:** The number of ornamental fish that has been harvested is so big. There is no difference between going to Tsavo Park and catching the elephants, the lions, the zebras and other animals. A time will reach when there will be nothing to show. The focus currently is on guarding against poaching of rhinos, elephants, but we are inadvertently forgetting to protect the marine life as well.

5. **Sand harvesting:** Another big challenge at the coast is sand harvesting. We want expansion of ports, and we want development projects in our country, but also our government and the relevant authorities must understand that we need to balance all these things. Port and highway development has been done around the world, and good examples to show case are in the Netherlands where humans have reclaimed land from the ocean so that they can extend arable/agricultural land. In doing so, they demonstrate how humans can develop the environment in sustainable ways. This is the approach we need to advocate for. We need to respect the existence of wetlands, the established level of the high watermark preserve what we have before it is too late to reclaim it.

6. **Plastic pollution:** There are positive effects due to the ban on plastic use. Divers are reporting a big difference in the oceans. Previously they saw more fish than plastics when they were diving and now they are seeing more plastic than fish. On the other hand, now that we have COVID, a new threat is emerging with the poor disposal of Personal Protective Equipment (PPE) which end up on beaches and in the sea. There is a clear need to ensure that what happens on land does not damage the ocean.

Benefits of a balanced Marine Spatial Planning

- Sustainable tourism industry
- Water sports in a major puller and driver
- Deep sea diving and snorkelling
- Sport fishing
- Ample fish and seafood supply for the market

If we wish to achieve a balanced MSP, and this is what we are all fighting for, the solution is sustainable tourism industry. As private sector we do not want to have a scenario where we are in business today, and everything becomes unviable a few years down the line because it is no longer sustainable. People will have no reason to come to Kenya, people will have no reason to come to the East African coast, and that will break our economies.

Water sport is a major puller - Kenya, and especially Mombasa, Diani and Malindi, are competing with 39 other destinations when it comes to beach holidays. Someone in Europe will wake up in the morning and decide that next week he/she is going on holiday and take a 10 days break. While doing that, they actually have no idea where they're going. They only know that they will be going for a beach destination, they can therefore end up in Sri Lanka, Thailand, the Caribbean, Zanzibar or Diani. So, the only place that is going to attract them is if the price and reviews are good. Would be travellers and potential travellers are now putting the matters of environment on the agenda. They want to know what you are doing when it comes to the environment. They keen on carbon footprints and whether a country's tourism is sustainable tourism. These are the questions we need to explore on their behalf. We need to embark on documentary evidence to demonstrate how we are taking care of the environment. It is no longer just about displaying the glossy catalogues to show available attractions and what we think is attractive in our eyes, but in the eyes of the tourist, we are doing nothing. Deep sea diving, snorkelling are big gains for us but without the marine life, there will be nothing to see.

Final thought

Tourism and more so sustainable tourism can help to catapult the economy of Kenya and Africa. This is because tourism is a very labour intensive industry since you cannot automate making beds, you cannot automate cooking, you cannot automate a tour driver's job the same way you can automate picking tea and automate a manufacturing plant. Countries like Thailand, Vietnam, even Cambodia were all war-torn 30 years ago. However today, Vietnam and Cambodia apart from light manufacturing; have embraced tourism big time and benefiting from this sector. As a country, we are attracting on average 2 million tourists internationally. There is no reason why we cannot go to 3 million and be able to enjoy tourism like anybody else out there.

Worldwide, we have 1.5 billion travellers. Africa gets hardly 4%. And out of the 4%, 70% of the tourists will go to Morocco, Algeria, Tunisia and Egypt, the Maghreb countries in the North while the rest is shared by Sub Saharan Africa. Can you imagine the untapped potential that exists in the entire Africa? We are at 55 million tourists out of the 1.5 billion and yet we are such a large continent.

Photo credit: Destination Connect

Mariculture needs in the Marine Spatial Planning process

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Photo credit: Mwaluma

Policies in place and progress made on MSP work in Kenya

The fisheries sector has adequately developed a number of policies and legal framework that guide aquaculture development in Kenya majorly the National Aquaculture Policy (2010), the National Oceans and Fisheries Policy (2008), the Fisheries Management and Development Act, 2016, National Aquaculture Strategy and Development Plan, 2010 - 2015. Under the Constitution of Kenya 2010, fisheries and aquaculture development falls under the County governments. Additionally, the competent government ministry enhances coordination, collaboration and linkages between the two levels of governments and with key institutions involved in aquaculture development. Some of the key clauses in the main national laws that guide aquaculture development in the country are hereby highlighted;

National aquaculture policy

The Policy appreciates that there are suitable sheltered creeks, bays, estuaries and shallow continental shelf for mariculture development. Among the strategies earmarked to guide and direct the aquaculture sector include the zoning of Aquaculture Resources under chapter 5.5 of the policy. This strategy states that the Government will identify, map and regulate zones of aquaculture practices in terms of systems, species, climatic and ecological diversities.

National oceans and fisheries policy, 2008

This policy provides for a coordinated framework for addressing the challenges facing the sector, its overall aim is to guide sustainable development of the fisheries sector in an effective and coordinated manner. Part 4 section 3.2 of the policy states that aquaculture will be developed through use of adaptive and environmentally sustainable technologies and best international practices. To further support such developments, one of the strategies pointed out in Part 5 section 3.5 states that the Government will identify and map zones of high aquaculture potential and promote investments in those areas.

The Fisheries Management and Development Act, 2016

This Act provides for the establishment of an appropriate institutional framework for the conservation, management and development of Kenya's fisheries resources and its related matters. Section 62 (3) of the Fisheries Management and Development Act, 2016 states that aquaculture development plan shall include;

Part 3 (d &f) "A description or identification of any area of water which is suitable for aquaculture and the type of aquaculture for which the area is suitable and suitable species of fish for aquaculture". Further under section 119 (2) the Act recognizes that aquaculture developments shall follow relevant environmental standards in accordance with the Environment Management and Co-ordination Act (1999).

MSP mariculture needs that require specific attention as Kenya embarks on an MSP journey

Aquaculture, including marine aquaculture (mariculture) plays an important role in supplying healthy and nutritious protein to an ever growing global demand for fish products and (FAO, 2018). Farmed fish also contribute towards the attainment of Sustainable Development Goals (SDGs) and Kenya Government developmental blueprint Vision 2030.

Kenya is now moving to harness the ocean lakes and coastal systems under the blue economy, as such MSP will be a critical component in plan-

ning. A key determinant of future production from mariculture is access to adequate areas for expansion. Increasing multiple users in coastal and offshore waters has birthed new and emerging conflicts between multiple users competing for space (Sanchez-Jerez et al., 2016).

Mariculture inclusion in MSP process will support efforts in promoting aquaculture development in the country, help reduce conflicts with other traditional activities of the coastal communities since mariculture is an introduced activity (perceived as "last kid in the block") further increasing mariculture social acceptance amongst the locals. Inclusion of mariculture in MSP will ensure spatial efficiency with different users accommodated and economic consideration will help minimize cost of production to potential investors.

Marine fish farming systems are diverse and can either be extensive or intensive in nature, closed or open systems and various species are farmed. Since not all types of marine spaces are suitable for mariculture, decision makers should be conversant with technological systems to ensure that aquaculture sites are suitably selected. The following steps are important towards successful site selection guided by biophysical, environmental, social, economic, governance and animal health needs.

Key steps

Scoping

The initial step into MSP is scoping where relevant stakeholders are identified and baseline information collected as per the overall criteria and objectives (Aguilar-Manjarrez et al., 2017). Scoping has been undertaken in Kenya in the past led by Kenya Marine and Fisheries Research Institute under the Kenya Coastal Development Project (Mwaluma et al., 2014) and will be supported by Kenya Marine Fisheries and Socio-Economic Development (KEMFSED) project. This step will be important as Kenya embarks on MSP process as it identifies prospects, constraints of different mariculture activities and furthers infers the impact that may arise and how to ensure sustainability.

Zoning

Basing on social, economic and environmental information, suitable mariculture zones can be allocated ahead of specific site selection. In tandem with scoping process, aspects of environmental monitoring & management plans (EMPs) must be incorporated at this step to ensure sustainable aquaculture development. Thus in MSP process zonation will be important in ensuring checks and balance are installed guided by existing regulations and legislations and potential negative interactions with other users and adverse environmental impacts (e.g. escapees, biosecurity, nutrients accumulation) are minimized or avoided. Zonation maps will guide prospecting developers on possible sites available for mariculture development and permitted production levels/carrying capacities. Since zonation indicates possible species and production systems, zoning is therefore guided majorly by bathymetry, currents/wave action, salinity, temperature, dissolved oxygen and nutrients and wave action (Aguilar-Manjarrez et al., 2017). The Ministry of Agriculture, Livestock and Fisheries (MoALF) and Food and Agriculture Organisation (FAO) under the project TCP/KEN/3502 in 2017 used satellite imagery to zone/map the coastal Counties. However, it should be noted that in depth ground survey and thorough stakeholder participation is needed (Saunders et al., (2017). Kenya has 4 four Counties with a coastline, only Lamu County has incorporated the territorial sea space as part of the County spatial plan (Philip & Kibugi 2020).

Table1. Environmental and animal health parameters defining the spatial limits of envisioned mariculture practices

Parameter	**Offshore fish cages** For e.g. Grouper, silver pompano, rabbitfish, tuna, some macro-algae and bivalves	**Why site consideration**
Depth	6 to 10 M is ideal condition to allow water exchange and renewal. Good depth ensures bottom substratum does not interference the fish environment.	• Fish Biology needs • e.g. Vertical swimming behaviour, swimming speed behaviour, • Scale of production e.g. commercial • Culture system e.g. intensive, fed mariculture system • Integrated Multitrophic Aquaculture (IMTA) capabilities in this space
Currents and tide	Allowable current velocity is 0.05 MS^{-1} and 1 MS^{-1} for minimal and maximal, respectively. This allows replenishment of oxygen and removal of waste metabolites. Excessive currents may damage and cages and interfere with cage volume	
Winds & wave (Exposure)	1 m wave height allowed as maximum for floating cages with wind velocity limit of 10 knots. This will be sufficient to facilitate water exchange and reduced wear and tear	
Temperature	Acceptable temperature range of 26-28˚C with no acute variations as fish are ectotherms	
Dissolved oxygen (DO)	Oxygen requirements vary with species and stage of development. Preferred DO level for marine culture is > 6 mgL^{-1}. General fish physiology is significantly affected with low DO.	
Salinity	Salinities between 15 to 30 ppt is admissible. Salinity controls osmotic pressure which greatly affects the ionic balance of fish	
Total suspended solids Transparency	Suspended solids in a suitable site for net cage culture should not exceed 2 mgL^{-1} in an extended culture period. Recommended for offshore mariculture is Secchi disk visibility of less than 5 m in an extended culture period.	
pH	Permissible pH for mariculture is 7.8 to 8.4. Adverse pH fluctuations damage gill epithelia, which is fatal to fish	
Nutrients	• Ammonia-nitrogen should stay less than 0.1 mgL^{-1} a major parameter affecting marine environment • Total inorganic phosphorus to stay < 0.015 mgL^{-1}- excess of this can be algal bloom precursor Preferred Chemical Oxygen Demand (COD) is < 3 mgL^{-1} Preferred Biological Oxygen Demand (BOD) is < 5 mgL-1	
Heavy metals	Sites receiving such pollutants are unacceptable	
Parameter	**Intertidal area/land-sea interface.** For e.g. milkfish, mullets, shrimps, *Artemia*	**Why site considerations**
Soil type	Soil is most important component in a pond culture system. Soil texture to be clay loamy texture the soil chemistry is equality key e.g. pH 7-8, Calcium carbonate >5% and electrical conductivity >4 mS/m	• Fish Biology needs e.g. brackish/physiology needs • Pre-existing adoption of technique e.g. intertidal pond farming method is well adopted in Kenya • Scale of production e.g. small scale to medium scale • Culture system e.g. extensive to semi-intensive fed systems • Management method e.g. polyculture, monoculture
Elevation & depth	Farm must have proper elevations in order to ensure adequate water supply and to affect drainage when necessary. Depth form 0.8 - 1 meter are recommended for extensive and semi-intensive production	
Tides	Tidal exchange should be experienced bi-weekly in the culture systems except semi-intensive system where additional pumping is undertaken	
Temperature	A Temperature of 20 - 30° C with no abrupt changes is considered	
Dissolved oxygen (DO)	DO level of 4.0– 5.0 ppm is acceptable for this culture systems & species	
Salinity	Salinities between optimal Salinity of 10 - 30 ppt is admissible for finfish and >40 PPT for *Artemia* production. Salinity controls osmotic pressure in finfish and higher salinities in *Artemia* ensure predator avoidance	
pH	The suitable pH is from 7.5 - 8.5	
Parameter	**Subtidal farms** e.g. seaweeds	**Why site considerations**
Depth	Minimum 0.5 meter at knee height at spring low tide	• Biology needs e.g. sunlight, nutrients uptake, plant physiology needs • Accessibility cum low production costs e.g. predominately undertaken by rural coastal woman • Preexisting adoption of technique e.g. subtidal seaweed off bottom farming method well adopted in Kenya
Light	Direct sunlight and wind cause plant damage	
Winds & wave (Exposure)	Full sunlight is key for growth of the plant	
Current	Preference given to moderate water movement, strong water current lead to plant loss due to breakage	
Substrate Type	Sandy, less rocky/coral with limited amount of natural seagrass and less predators	
Temperature	Between 29 - 34 °C	
Salinity	average salinity 32 ppt should be preferred	
pH	Permissible pH for mariculture is 7 to 9	
Quality of water	Water to be clear free of firewater run-off & pollutant free (agricultural, industrial and domestic. Nitrogen & phosphorus nutrients are key for growth, however chemical pollutants cause plant kills	

Site selection

While zoning depicts a wide general map of possible areas for farming, site selection shows a specific location in the zoned area with favorable characteristics (ecologically, socially and economically) for production of specific species. This stage specifies adverse environmental impacts (e.g. escapees, biosecurity, nutrients accumulation) through Environmental Impact Assessment (EIA) and documents specific mitigations to be undertaken with specific Environmental Management Plans (EMP). Further this stage defines specific carrying capacities keeping with acceptable social and environmental requirements. Rule of the thumb for mariculture sites selection is minimal conflict with the other preceding users of coastal waters, such as fishing grounds, protected & biodiversity hotspot zones, recreational zones, shipping, navigational routes & anchorage zones, cultural heritage zones, security/military zones, underwater outlets, river outlets, underwater cables, and mining sites. Technical parameters important to mariculture with a focus only on environment and animal health needs to be considered during the key steps of MSP are shown in Table 1.

Recommendations

1. Facilitate stakeholder engagement with a platform for dialogue.
2. Conduct biophysical, environmental, animal health needs and socio-economic studies to guide in the key steps.
3. Zone/map out coastal areas with high potential for fish farming along the coast, since not all types of marine spaces are suitable for mariculture.
4. Conduct suitability assessments of selected species in selected zoned areas
5. There is a need for the MSP process to empower locals to take part in the utilization of spaces that have otherwise been inaccessible to them e.g. offshore farming and fishing.
6. Marine spatial plan to consider creating spaces for research and development to build existing knowledge in different aspects of e.g. fish biology, ecology and marine biogeochemistry among others that may be needed in coming up with solutions to existing and emerging problems.

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The MIJI BORA Project

Dr. Majambo Gamoyo
The Coastal & Marine Resource Development (COMRED)

Photo credit: ©Bonita On Safari

Miji Bora is a three-year project funded by the Western Indian Ocean Marine Science Association (WIOMSA) though the Cities and Coasts Programme. The official title of the project is: *'Smart and sustainable transitioning for coastal cities in the face of global environmental change: Prototyping transdisciplinary networks for peer-to-peer learning for Mombasa (Kenya) and eThekwini/Durban (South Africa)'.* The project is premised on the concept that coastal cities within the Western Indian Ocean (WIO) region, among them Mombasa, are yet to adopt smart-sustainable growth to address the likely socio-ecological and economic consequences of global environmental change.

The broad objective of the Miji Bora is to examine city systems and co-design practical pathways towards a sustainable port city of Mombasa achieved by addressing three specific objectives namely: 1) to conduct a situational analysis of the key drivers of urban form, 2) to predict future trajectories based on business-as-usual scenarios and 3) to envision, prototype and mainstream smart and sustainable future pathways which can thereafter be replicated to other coastal cities. The project implementation process is shown where the 3 objectives and the concomitant major activities are integrated.

One of the areas that the project is addressing is an assessment and understanding of Mombasa city urban forms that will present the status quo of Mombasa, and then using the status to project the city towards a smart and sustainable status (Figure 1). To come-up with the desired future scenarios, the project core component is the peer-to-peer learning exchange between Mombasa and eThekwini municipality in Durban. Under this component, city officials from both Mombasa and eThekwini municipality are involved in reciprocal exchange visits,

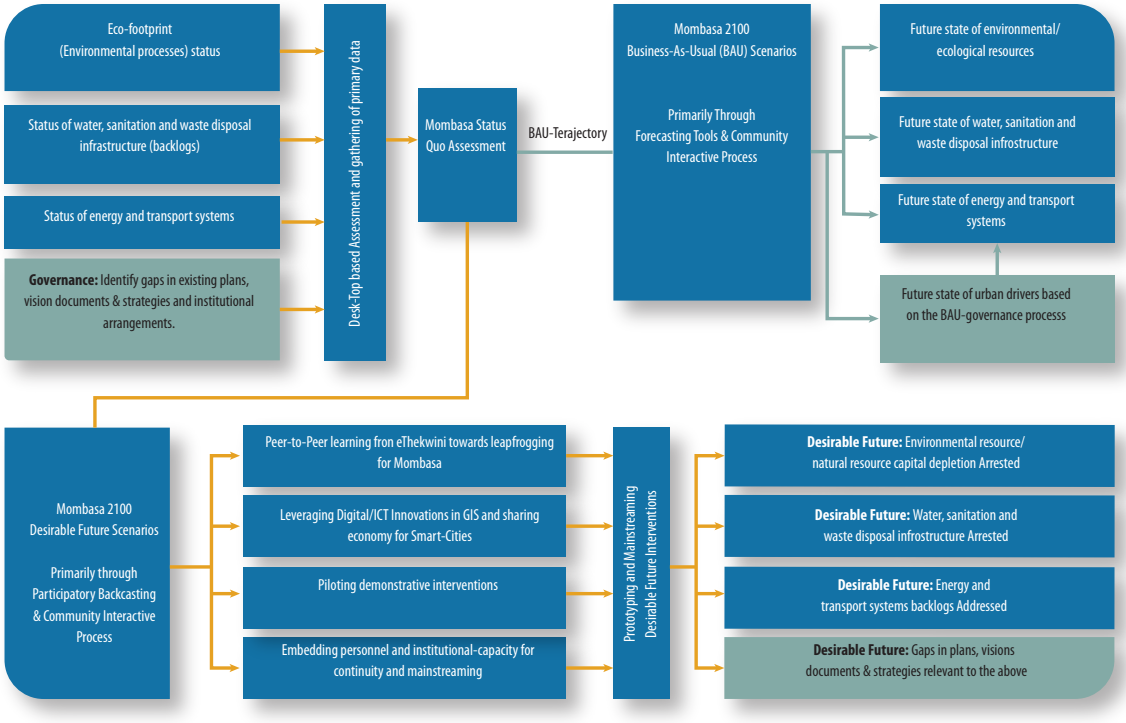


Figure 1: Schematic presentation of an analytical framework of the future states of Mombasa as a smart and sustainable city.

which not only enables knowledge exchange, but also provides opportunities for co-creation/co-designing of projects for the benefit of the two cities. Furthermore, since eThekwini is ahead of Mombasa in the area of sustainability planning and project implementation, the visits provide leapfrogging opportunities for sustainable project implementation in Mombasa. The learning exchange between the two cities has resulted in piloting some of the prototypes in Mombasa.

Some of the project activities that fit well for inclusion in the Marine Spatial Planning (MSP) process include natural capital assessment for mangrove forest. The mangrove situational analysis show that the peri urban mangrove forest of Mombasa is not pristine, with Tudor and Mwache creeks having lost 20% mangrove cover in the last 10 years as a result of over-exploitation of resources, habitat conversion, pollution and climate change. This basically puts into perspective existing linkages among mangroves within Mombasa County and what mechanisms can be put in place to protect and manage the mangrove ecosystem. The analysis gives perspective of land-ocean interactions in terms of trends of what is happening on land and in the ocean. And that is how engaging the stakeholders come in. Integrating those that are well informed on matters planning, come on board in the MSP process to create synergy between land and the ocean, and eventually incorporation into the MSP process.

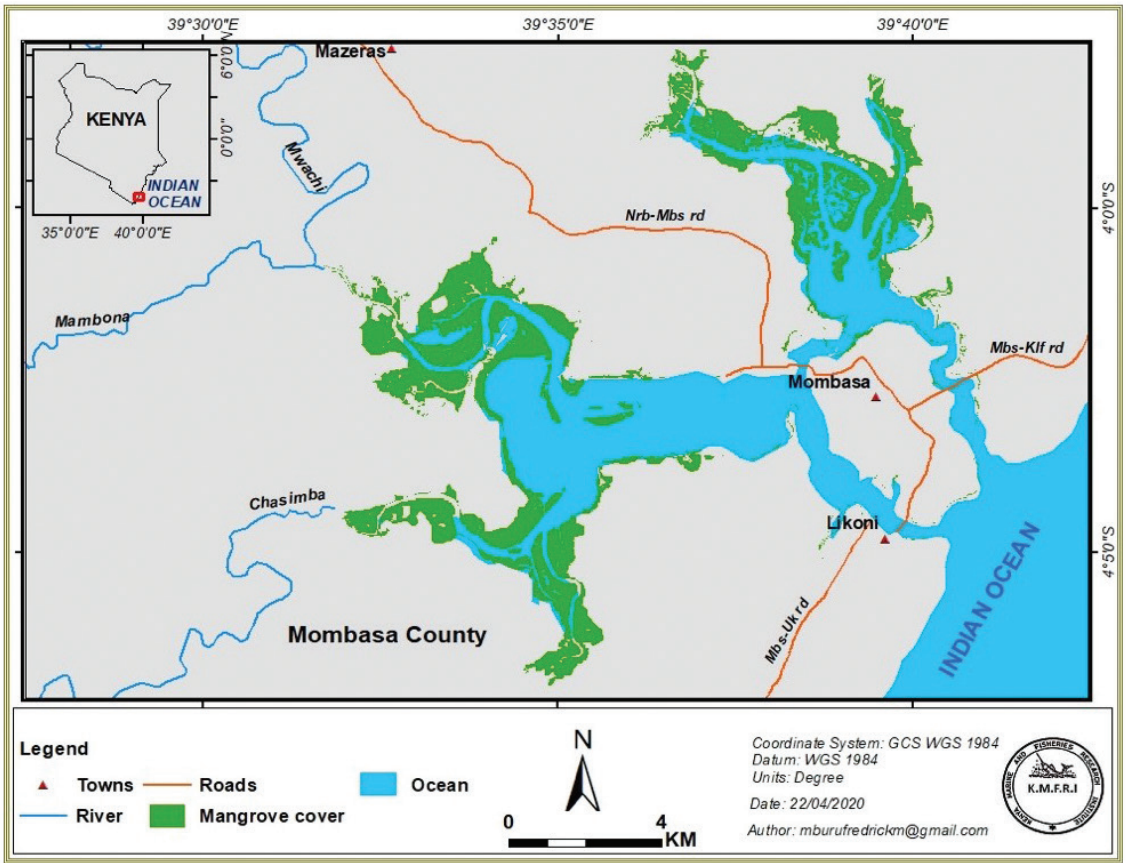


Figure 2: Map showing location of mangrove around Mombasa City.

The mangroves around Mombasa are dominated by the species known as *Rhizophorus mucronata*. The forests are young and seriously threatened while going through recovery from previous disturbances.

The second activity that fits well for inclusion in the MSP process is the Mtoponga Transformative River Management. The drains into the Indian Ocean through the Jomo Kenyatta public beach. Through the peer-to-peer learning exchange, the project through collaboration with the county government of Mombasa is seeking to understand what the issues are within the river channel. As planning the allocation of resource and areas in the marine space continues, Miji Bora is also investigating what is happening at the source i.e. inland, that will have an impact on whatever is being planned in the marine sector. The findings give a clear indication of the status of pollution which is exacerbated during heavy rains, where surface runoff drains unhindered into the ocean. There is therefore need to have proper engagement with all stakeholders in order to understand the holistic picture of how the systems works on land and in the ocean, leading to a more robust process of MSP.

Harnessing the potential of cities to benefit the economy including sustainable livelihood, suitable

River Mtopanga showing encroachment by human activities.

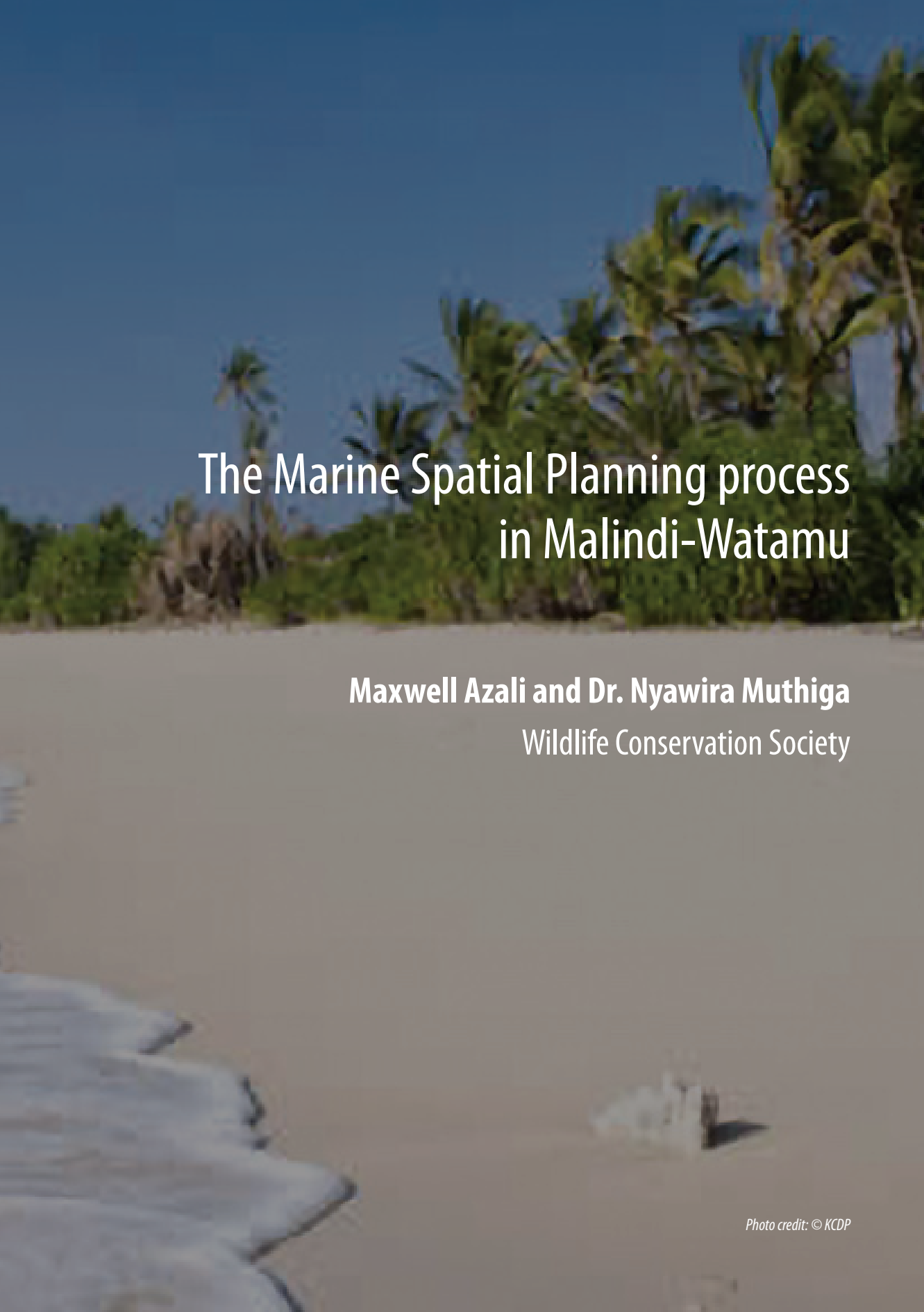
waste management, ecological protection and restoration should be at the forefront of the MSP dialogue. Integrating urban planning alongside MSP should be a priority, which must also include restoring and protecting coastal water ecosystems through the use of scientific research.

Mji Bora and the Mombasa County Government

Mombasa County Government is the key stakeholders in the policies involved in all aspects of that the project supports and outputs are expected to directly feed into the County Government policy development to manage the multiple environmental issues in Mombasa County.

Key highlights of the Miji Bora project

1. Policy analysis: To have coherent policies that catalyse actions towards a smart sustainable city.
2. Solid waste management: Use of technology to: (i) Monitor waste movement from generation to dumpsite; (ii) Inform recyclers at real time; (iii) Waste characterization (iv) Monitoring flow/ efficiency of collection.
3. Stakeholder analysis: Stakeholder values and knowledge are important in shaping a smart and sustainable Mombasa city. This analysis highlights the role, challenges and relationships of key stakeholders in addressing the main drivers of the urban form in Mombasa.
4. Smart future thinking: Steps to achieving a smart city status will inevitably involve a combination of technologies and innovations



The Marine Spatial Planning process in Malindi-Watamu

Maxwell Azali and Dr. Nyawira Muthiga
Wildlife Conservation Society

Photo credit: © KCDP

Introduction

Marine protected areas (MPAs) can provide critical economic, cultural, aesthetic and subsistence services for coastal communities. Kenya was one of the first African countries to establish MPAs with the establishment of the Malindi-Watamu marine parks and reserve in 1968. Despite establishing six more MPAs, the country has not met its Convention on Biological Diversity (CBD) Aichi 11 target of protecting 10% of marine areas by 2020. In 2016, the Wildlife Conservation Society (WCS) launched an MPA fund to support countries to increase marine area protection coverage by establishing or expanding MPAs. The WCS Kenya marine program took the opportunity to discuss the submission of a concept to the MPA fund. Endorsement after discussions with the Kenya Wildlife Service (KWS) and other key stakeholders led to the selection of the Malindi-Watamu MPA complex as the focal area for support from the fund.

The project was envisioned in two phases, the feasibility phase to provide baseline information, undertake stakeholder consultations and an institutional and legal assessment and recommendations to guide a second phase. The second phase will consist of a more comprehensive process of marine spatial planning (MSP) of the Malindi -Watamu seascape culminating in a spatial plan for Kenya's first offshore MPA. This case study outlines the process and summarises findings and lessons learned from the first phase of the project.

Phase 1 - Feasibility phase

The Malindi-Watamu seascape was selected as a pilot project site due to its high coastal and marine biodiversity, productive fisheries, and the potential economic and livelihood benefits that would be achieved through additional protection (Figure 1). The proposed project area encompassed the coastal and marine environments from Tezo north to Marereni and seaward to the 200m isobath. The total project area is 1173 km^2, including the Malindi and Watamu marine parks and Watamu marine reserve, and would increase Kenya's MPA coverage from 585km^2 to 1758km^2. The feasibility phase started in 2017 and the themes of science (1), policy (2) and outreach (3) were pursued during the implementation of the project.

The groundwork commenced with high-level meetings with KWS the lead agency with national conservation and CBD mandates, and other key stakeholders including the Kenya Fisheries Service (KeFS), amongst others. These were intended to introduce the project to the relevant national and county officials and receive high-level endorsement. A project core team was instituted to lead the feasibility evaluation and provide inputs to various stages of the project through a consultative process. The core team comprised of KWS, WCS, the Kilifi County Directorate of Fisheries and Watamu Marine Association (WMA). The boundaries for the proposed area were discussed amongst members of the core team, and a map was produced to facilitate broader discussions with other stakeholders (Figure 2). The team also discussed the process and agreed on the general framework of the IOC-UNESCO MSP guidelines (Ehler & Douvere, 2009).

1. Science - Baseline information collation

Collection and collation of baseline data on the biophysical features, human uses, the socio-economic, legal and institutional frameworks is important in guiding any spatial planning (MSP) process (Shucksmith & Kelly, 2014). Under the science theme of the project, we undertook a systematic review of available literature from scientific, government and other online sources

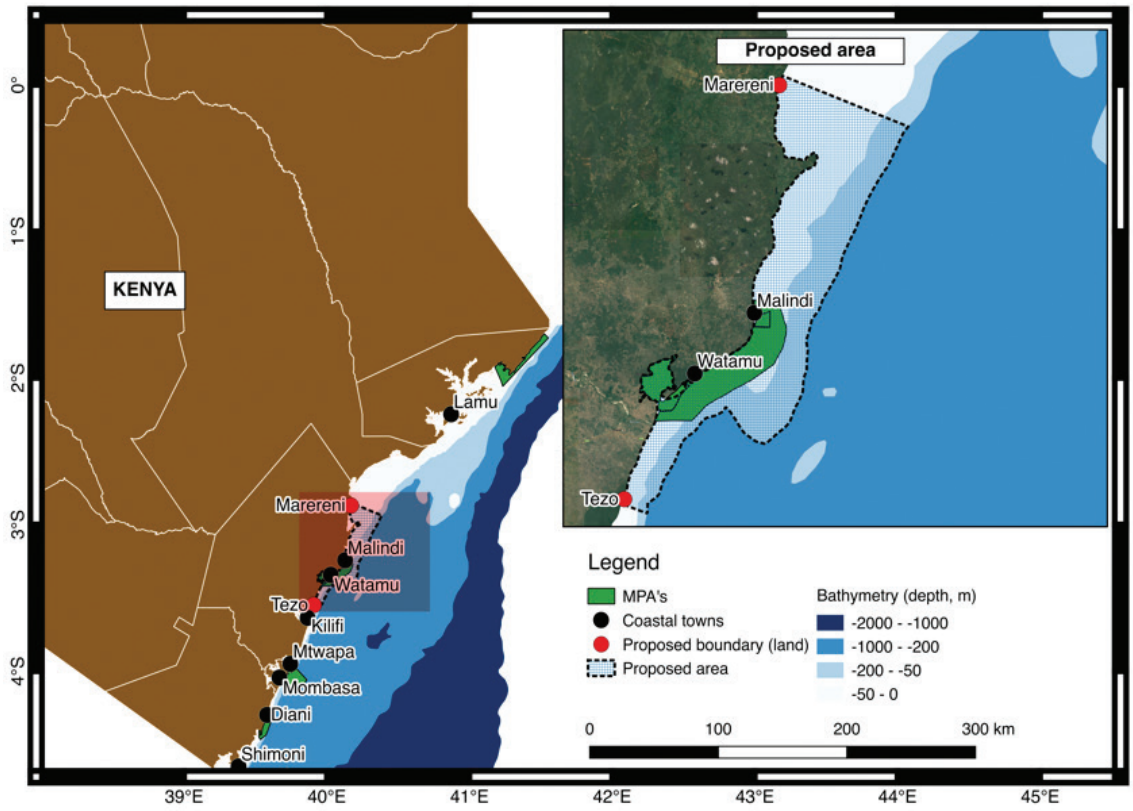


Figure 1: Map showing the proposed Marine Spatial Plan area and its boundaries.

and grey literature. The desktop review yielded information on the biophysical attributes of the proposed area, including key habitats, oceanographic conditions, hydrology, and key species. We collated socio-economic information related to population size, cultural practices, economic activities including agriculture, fisheries, and tourism as well as other human uses impacting the coastal and marine environment. A number of reports were drafted from this desktop review.

2. *Policy - Institutional and legal evaluation*

An institutional and stakeholder analysis was conducted to identify the key institutions and user groups working within the proposed area and their role and interests. About 50 institutions were identified, including government, non-government, and local user groups. These stakeholders were further engaged in the consultative meetings to evaluate the feasibility of MSP in the Malindi-Watamu seascape. The laws and policies relevant to the conservation and fisheries sectors were also identified and reports were compiled summarizing all this information. The information on the institutional and legal frameworks was used to develop terms of reference for a consultant to provide a more in-depth assessment of the institution and legal frameworks in relation to MSP. This was an important activity as Kenya did not have national MSP guidelines.

A National MSP committee has since been formed and the project made a presentation to the committee. The institutional analysis looked at the various stakeholders, their responsibilities

Table 1. Table showing roles, responsibilities and their interconnectedness of various maritime functions. A= Accountable, R= Responsibility, C= Consultation. See above for detailed definitions.

Roles	NEMA	KMA	SDF	CE - F	KWS	KPA	MP	CGK	SDP	NLC	KMFRI	SDT	KDF	CDA	KFS	SDP	WMA	LoT	NMK	KAHC	KESCOM	WCS	WWF	COMRED	AK	EAWLS	KASA	WABO	BMU	WBO	SDE
FISHERIES																															
Management planning	C	C	A	C	C		C	C			C			C				C				C	C	C		C					
Fish landing sites			A	A																									R		
Fisheries research			A		C						R											R	R	R		R			C		
Licensing			A	A																									C		
Fisheries development projects	C	C	R	R	C									C													C				
Sports fishing		C	R																												
CONSERVATION																															
MPA management			C	C	R						C						C					C	C	C		C			R	C	
LMMA management			R	R						C																			R		
Mangroves			R		R						C				A																
Turtles			A		A														C		C		C								
Marine Mammals , Birds					A																	C	C		C						
Research											A											R	R	R		R					
Conservation education	R	R	R	R	R																R	R	R	R	R	R					
MARITIME OPERATIONS																															
Port and jetties	R	R				A																									
Excavation and recovery of wrecks																			A												
Security					R	A							A																		
Dredging	R	R				A																									
Anchorage		R				A																									
Ports and navigation		R				A																									
Shipping, pilot services, tugs		R				A																									
Marine pollution from shipping	A	A																													
CULTURE & HERITAGE																															
Licensing of tourist facilities												A																			
Licensing water sports		R			C							A																			
Water sports		R										A																		C	
INDUSTRIAL																															
Salt mining	R							R																							
Oil exploration	R	R								R	R																				A
Bioprospecting	R							R																							

and interconnectedness in relation to the MSP thematic areas (including fisheries, conservation, maritime operations, cultural and heritage, and industry) (Table 1). The roles and responsibilities of institutions were classified as: accountable (A) - where an institution has a clear legal mandate to undertake the function, responsibility (R) - where an institution undertakes a role as an important part of their mandate but cannot be held responsible, and consultation (C) - where the institution can be consulted or not when a function is performed (Table 1). The findings indicated that there are many overlapping sectors, legislations and mandates that the MSP can help to harmonize and guide the integrated management of the area. A report on the institutional and legal analysis was compiled from the review.

3. Outreach - stakeholder consultations

Stakeholder engagement is a key component of MSP and occurs during the entire process (Gopnik et al., 2012; Pomeroy & Douvere, 2008). Involving stakeholders early in the MSP process promotes learning, includes diverse opinions, highlights potential conflicts and opportunities, and creates support for the MSP (Ehler & Douvere, 2009; Gopnik et al., 2012). We conducted one-on-one consultations with key institutions to raise awareness about the MSP process and create buy-in from stakeholders under our outreach theme. These included the KeFS, officials of Kilifi County including the County Executive Committee Member for water, forestry, environment and natural resources, the County Directors of fisheries, physical planning and tourism. These consultations set the stage for broader stakeholder engagement within the project area to gather opinions on the feasibility of MSP, and raise awareness.

Figure 2: Local community participants during one of the stakeholder consultative workshops.

We held three consultative workshops with stakeholders, including the local community, managers, county and national government institutions, decision-makers, private sector and civil society (Figure 2). A total of 141 participants were consulted during the one-on-one and stakeholder workshops. During these workshops, we presented the MSP concept, the findings from the information gathered on the biophysical and socio-economic status, and the legal and institutional frameworks of the proposed area based on the desktop study. We then deployed questionnaires designed to evaluate knowledge of MSP, perceptions on ocean health, management effectiveness, threats to ocean health, and possible future changes in management adapted from (Lester et al., 2017). Results of the questionnaires were presented at the end of each workshop to maintain openness and transparency of the process.

The questionnaire survey results indicated that less than 10% of the participants perceived the current ocean health to be good. In comparison, 52% ranked it to be average, and the ~ 40% ranked it to be poor to very poor. Current ocean management was perceived to be ineffective by 46% of participants, 29% ranked it somewhat effective, 22% were neutral, and only 3% ranked it very effective. The perception of future ocean health under business-as-usual scenario (i.e., without significant changes in ocean management) was ranked to deteriorate by 85% of respondents, 13% ranked that it would improve. We also evaluated the knowledge on MSP and only 25% of respondents were familiar with the concept, but 80% thought MSP is extremely useful to guide the management of the area. The need for a consultative decision-making forum for the Malindi-Watamu seascape was deemed

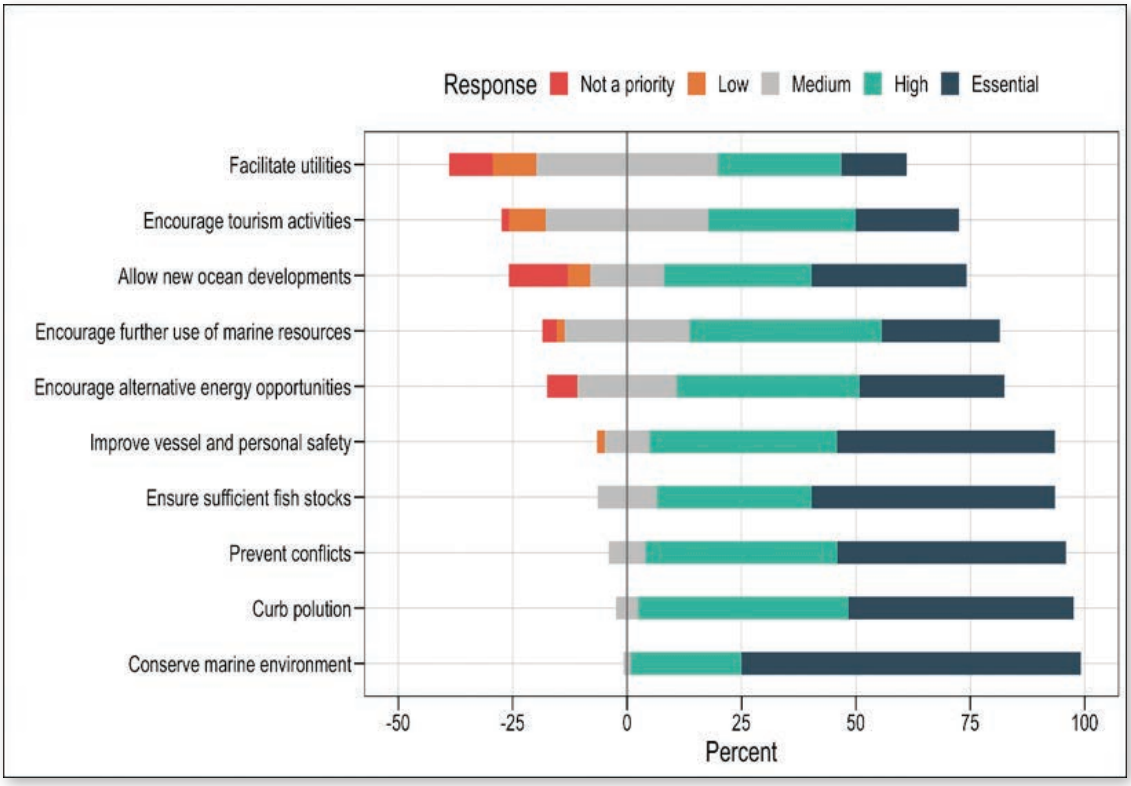


Figure 3: Ranking of issues to be prioritized in the MSP for the Malindi-Watamu seascape.

useful by 97% of the respondents. Participants also identified the issues to be prioritized in a marine spatial plan of the area, and the top five included conserving the marine environment, curbing pollution, conflict prevention, ensuring sufficient fish stocks and improving personal and vessel safety at sea (Figure 3).

Phase II - Marine Spatial Planning phase

The feasibility phase was satisfactorily completed in 2020 and a new proposal to the MPA Fund was approved for the MSP phase. During this phase the process will include; 1) fostering the partnerships and collaboration with relevant institutions and stakeholders built during the feasibility phase, 2) collection of spatial data, 3) undertaking an objectives setting exercise to develop the management objectives of the area, 4) developing a decision support tool to inform management, 5) undertaking outreach activities to raise awareness, and drafting a marine spatial plan and submitting it to the government for the process of gazettement of the Malindi-Watamu seascape.

Lessons learnt

This project was a feasibility phase and the beginning of a more comprehensive process of MSP for the Malindi-Watamu seascape. Nonetheless, the key elements of conservation planning – consultations, data gathering, raising awareness were conducted. The following are the key lessons learned during the project:

- The stakeholders of Malindi-Watamu have a long and collaborative partnership with the KWS. As the key lead partner in the project, KWS helped facilitate and host workshops and meetings providing an atmosphere of trust and ownership of the project;
- We undertook disaggregated polling to evaluate knowledge of MSP, perceptions on ocean health, management effectiveness etc., early in the process. This provided useful information about the different segments of stakeholders. The results provided the confidence that the Malindi-Watamu stakeholders were supportive of the expansion of the Malindi-Watamu seascape as the local communities viewed MSP as potentially leading to improvements in the resources they depend upon;
- We also consulted broadly with a range of stakeholders, which created wider buy-in and support for MSP even where familiarity with the concept was low;
- The long-term partnership of the lead conservation agency (KWS) and stakeholders that had fostered a participatory, collaborative and cohesive atmosphere over many years allowed respectful and productive discussions about the expansion of the MPA, a subject that is sometimes challenging for stakeholders who depend on the resources of the area; and
- The Malindi-Watamu seascape project provided opportunities to create awareness at all levels of governance in Kenya, thus contributing to the growing interest and need for knowledge on MSP in Kenya and the Western Indian Ocean region.

Conclusion

This is a timely moment for the management and protection of the oceans globally. Negotiations are currently underway to increase the CBD marine target to 30% by 2030 (the 30 x 30). In addition, high-level attention for MSP and ocean governance has also evolved in Kenya driven by the

Presidential endorsement of the Blue economy and Kenya's membership in the high-level panel for a Sustainable Ocean Economy. There is now a formal National MSP committee. All these are crucial for furthering the development and future endorsement of a Malindi-Watamu seascape marine spatial plan.

Acknowledgements

We would like to thank all the individuals, institutions, and communities that participated and supported this process, including the Core Team members, national and county government institutions, NGOs, and local communities. Special thanks go to KWS for hosting all the workshops and actively participating in all aspects of the project and WCS MPA Fund and the Vibrant Oceans Initiative for funding the project.

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Towards sustainable blue economy through Marine Spatial Planning:

WWF Kenya experiences and lessons in Coastal Kenya

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World Wide Fund for Nature

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Integrated ocean management and Blue economy

Pressure on the use of the sea and its services has intensified over the past few decades. The ocean economy is receiving more attention, and with this shifts the need to use oceans and water resources in a more sustainable manner. The role of the oceans in sustaining the well-being of human life need not to be overemphasized while the threats facing the oceans are enormous. Some of these threats are over-fishing, oil and gas extraction, shipping, tourism, pollution from land-based sources and the negative effects of climate change (WWF, 2013). For over 50 years, WWF has been working closely with other partners to ensure that marine ecosystems are healthy and provide sustainable benefits to people. Despite the progress made, the oceans continue to experience a myriad of challenges with serious implications to nature and people. Loss of marine biodiversity, degradation of marine ecosystem and productivity coupled with over-exploitation and negative impacts of climate change, presents a real threat to the health and livelihood of millions of Kenyans who depend on the marine-based economy.

In order to bring about transformational change and provide innovative solutions to improve ocean governance across the world, WWF developed its Global Marine Programme Strategy (2013 – 2020). The strategy underscores the importance of Marine Spatial Planning (MSP) as an integral tool for Integrated Ocean Management (IOM). Sustainable management of our oceans among others require the adoption of an ecosystem-based and holistic approach with acceptable compromise between uses and users while maintaining some space for nature. Marine Spatial Planning (MSP) as a tool presents an excellent opportunity to allocate resources and uses therein in the marine space as appropriate to minimize resource use conflicts and competing interests for the marine environment (WWF, 2013). The MSP approach incorporates networks of Marine Protected Areas (MPAs), Marine Managed Areas (MMAs), Locally Managed Marine Areas (LMMA) and all other forms of management and socio-economic activities in the ocean space. Kenya is making good progress towards harnessing the potential for the sustainable ocean economy and the MSP approach would significantly contribute to an all-inclusive and comprehensive sustainable blue economy strategy for the country. WWF is actively involved and engaged in advancing sustainable ocean economy and MSP in Kenya. This work is aligned to WWF Kenya 2020 – 2030 Strategic Plan and Coastal Kenya Conservation Action Plan (CAP) as well as the WWF SWIO Marine Programme (2017 – 2020) and the Global Ocean Practice.

Importance of coastal and marine biodiversity in Kenya

Coastal geology, climatology, oceanography, and biodiversity

The Kenyan coastline is about 650 km long, traversing from the northern extreme of the tropical East African coast from Kenya-Somalia border at Ishakani , to further south to the Kenya - Tanzania border at Vanga (GoK, 2017).

Kenya is endowed with rich and diverse coastal and marine habitats and ecosystems, including coral reefs, estuaries, mangroves, seagrass bed and open seas (GoK, 2017). Rocky shores and intertidal reef platforms are common in southern Kenya and north of Lamu. These comprise fossil

Pleistocene reef rock formations, which inundate twice a day through tidal flushing, trapping various marine biodiversity, including fish, echinoderms, and crustaceans, and holothurians (Obura, 2001; Richmond, 2011).

The estuarine systems in Kenya are dominated by mangroves, found along creeks and open shores. These cover about 61,271 ha of the Kenyan coast, with approximately 59% occurring in Lamu County. There are nine species of mangrove in Kenya, with *Rhizophora mucronata* and *Ceriops tagal* being the most dominant (GoK, 2017). These ecosystems provide habitat for a range of species, including the lucrative giant mud crab,, *Scylla serrata*. Additionally, mangroves have been documented as breeding and feeding grounds for fish (Owuor et al., 2019) in addition to mitigating harsh wave actions.

The coral reefs in Kenya can be subdivided into the long, continuous, fringing reef found south of Malindi, and the patchy reef system found north of Tana towards Lamu. The extent, size and diversity of coral reef ecosystems has been shown to decrease northwards. This is owing to poorer conditions in the north coast of Kenya, facilitated by the riverine influence of Athi and Tana systems, as well as effects of the cooler Somali current system (Obura, 2001). Common coral genres identified include *Acropora, Mantipora, Porites*, and *Echinopora* (Karisa et al., 2020).

Kenya's shallow, coastal waters host twelve seagrass species, with a lush richness and diversity of fauna. Seagrass cover has been 317.1±27.2 km^2 (Harcourt et al., 2018) with the most common species being *Thallasondendron ciliatum*. This species has been documented to provide a habitat canopy for small and juvenile fishes and invertebrates, serving as a key link in coral reef diversity (UNEP, 2001; Harcourt et al., 2018).

Coastal and marine based economy:

Marine Fisheries - marin fisheries are highly dominated by inshore small scale-fisheries, supporting about 14,000 fishers employing some 3,000 artisanal fishing craft along the coast. The crafts used include wooden dugout canoes, sailboats, and outriggers. Less than 10% of these are motorized. The offshore fisheries support 3-4 shallow water trawlers, 30-40 purse seines, and 4-9 longliners. These have been licensed to fish within the Kenyan EEZ. Collectively, total marine landings per year amounts to some 24,709 mt, valued at KES 4.6 billion. The potential estimated landings per year amount to 150,000 - 300,000 mt worth KES 21-42 billion (Kimani et al., 2020).

Tourism – Tourism is a major revenue generator in Kenya, earning Ksh. 163.6 billion in 2019 with up to 42.6% of this being accounted for by coastal tourism (GoK, 2020). Attractions in the marine sector include, but not limited to, diving and snorkelling in Marine National Parks/Reserves, sandy beaches, kite surfing, mangrove dhow tours, and jet skiing.

Shipping – The transport industry is the tertiary sector of Kenya's economy, with maritime transport accounting for over 90% of trade routes (Omondi, 2019). Along with Tanzania, Kenya serves as a major trade entry point to the rest of East Africa. Its major port is currently in Mombasa County. The Lamu port is under construction and plans are underway to construct a new port at Shimoni in Kwale County..

Marine aquaculture – The major mariculture activities along the coast of Kenya include Seaweed farming in Kwale county. Milkfish farming activities are also ongoing in the counties of Kwale, Mombasa, and Kilifi (Mirera, 2019). Additionally, crab farming is ongoing in Kilifi County (Mwaluma, 2002; Magondu et al., 2018). These initiatives are new, being established with the aim of boosting food security and generating livelihoods in the country.

Key threats and impacts to coastal and marine ecosystems and response

The challenges and threats to the fisheries sector include climate change, habitat degradation, invasive species, overfishing, declining stocks and high postharvest loss (Kimani et al., 2018). Management and policy response to address these include among others promoting co-management approaches in fisheries management using the Beach Management Units (BMUs) and the Community Conservation Areas (CCAs), formulation and implementation of the national oceans and fisheries policy and fishery specific management plans at local and national level (Kimani et al., 2018; GoK, 2017)

Mangroves are facing various threats and pressures including over-harvesting, habitat conversion for salt works, pollution and infrastructure development as well as negative impacts of climate change. It is reported that an average of 17.8% of mangroves in Kenya coast were lost between 1985 and 2009 (Kirui et al., 2012)

There are a number of community and government led initiatives supported by partners to help conserve mangroves in Kenya. A mangrove management plan for 2017 - 2027 was developed, through the support of the Kenya Coastal Development Project, with emphasis on participatory and community-based approaches to mangrove conservation. Mangrove restoration and blue carbon projects have been initiated in Gazi and Vanga.

The seagrass ecosystem is being impacted negatively by destructive fishing practices such as trawling and beach seining.

WWF interventions

WWF has been active in the coastal region for almost 20 years working on the conservation and sustainable use of coastal resources. During this period, WWF has supported the establishment and management of protected areas; facilitated co-management systems for fisheries and mangrove forests, developed and implemented management plans for resources and specific sites; contributed to improved livelihoods and supported policy development. Specifically, WWF has been working in the following key areas that are considered integral to sustainable coastal resource use.

Promotion of sustainable fisheries through support for improved fisheries data collection to ensure a robust, improved and real time artisanal fisheries landing data collection system that can easily be analysed to compute fishing effort, landings and catch per unit effort (CPUE), informing and supporting policy and decision making for improved management and governance of fisheries resources in Kenya and the South West Indian Ocean (SWIO) region; Education and awareness on sustainable fishing practices; Lobster fisheries improvement towards Marine Stewardship Council (MSC) certification to ensure sustainability and improved income for fishers; Strengthening policy and legal frameworks for sustainable fisheries and strengthening community based fisheries management; Enhanced collaborative sea turtle conservation: Protection of sea nesting turtles, and reduction of turtle poaching. Harmonization of sea turtle conservation in coastal Kenya (harmonized data collection forms, creation of a central database and piloting the use of mobile turtle data collection); Enhancing coastal livelihoods; support for Village Savings and Loans Associations as a way to diversify income streams, reduce over reliance on marine resources and engage the community in conservation issues; Support for installation of cold storage facilities to reduce post-harvest losses and increase income for fisherfolk; Civil Society empowerment: Support for formation and capacity building of CSOs/CSO alliances. The CSOs have been able to lobby and advocate for sustainable marine resources as well as fundraise for marine conservation projects.

The importance of the mangrove forests to both the marine and terrestrial ecosystems has necessitated that mangrove forest health is given a priority. Through support from the German Government, an International Climate Initiative (IKI) project supports the restoration of mangrove forests in three (3) localities (Vanga, Gazi and Mwache) by way of mangrove tree planting, KFS support to ensure natural regeneration, and developing restoration and management plans in liaison with the Community Forest Associations (CFAs). For this activity, there is a target of 2000 Ha of mangrove to be restored.

Marine Spatial Planning as a tool for integrated ocean management

As provided for by Article 260 of the Constitution, land in Kenya is defined as the surface of the earth and the subsurface rock, any body of water on or under the surface, marine waters in the territorial sea and exclusive economic zones, natural resources completely contained on or under the surface and the airspace above the surface. It represents an important resource for the economic life of a majority of people in Kenya. The way people handle, and use land resource is decisive for their social and economic well-being as well as for the sustained quality of land resources.

The promulgation of the new constitution in Kenya in 2010 emphasized the need for marine/land use planning in Kenya to ensure sustainable exploitation of natural resources in Kenya. The new dispensation clearly stipulated roles of planning to the National Government and the new devolved units, the County Governments. The National Government was required to develop a macro-level National Spatial Plan while the County Governments were to develop a 10-year plan within their geographical scope.

WWF-Ke supported formulation of the following plans and policies in collaboration with the Ministry of Land and Physical Planning, National Land Commission, Ministry of Environment and Forestry among other Government institutions and stakeholders: -

1) National Spatial Plan (2015-2045)

The National Spatial Plan, is a long term Plan of thirty years (30) from 2015-2045 and its aimed to address land use (both terrestrial and marine), socio-economic and environmental issues to achieve balanced and sustainable spatial development and optimal land use across the country. The Plan provides comprehensive strategies and policy guidelines to deal with issues of rural and urban development, modernizing agriculture, infrastructure, energy production, mining and industry, and sustainable human settlements. It also provides a spatial framework for anchoring Vision 2030 flagship projects. The Plan is also a coordinating framework for various sectors involved in spatial planning and implementation.

2) Sessional paper no. 1 of 2017 on National Land Use Policy

The overall goal of the national land use policy is to provide legal, administrative, institutional and technological framework for optimal utilization and productivity of land related resources (both terrestrial and marine as defined in the Kenyan Constitution) in a sustainable and desirable manner at national, county and community levels. The policy is premised on the philosophy of economic productivity, social responsibility, environmental sustainability and cultural conservation. Key principles informing it include efficiency, access to land use information, equity, elimination of discrimination and public benefit sharing. The policy is cognizant of numerous factors that affect land use in Kenya which include geographic and ecological features, population distribution, social, historical, cultural and economic factors. Other key factors are administrative, institutional and policy instruments, investment, urbanization and land tenure. So as to ensure efficient, productive and sustainable use of land, key measures shall be taken by the government (both national and county).

3) Coastal Kenya County spatial plans

County spatial planning is concerned with the agency of territorial spaces as integrating and facilitative frames for all developmental initiatives. The represents an attempt to structure the jurisdictional territorial space of a County, in such a way as to enhance its instrumentality relative to the County people's collective vision and its associated sectoral programme of actions. In addition, therefore, to influencing the distribution of people and activities across the county territory, the plan seeks to achieve distributional justice with respect to the county's shared resources and enhance the derivative gain of human activities in space, and the efficacy of infrastructural endowments thereof, and all the while guaranteeing the sustainability of outcomes.

i) Lamu

Lamu County is destined to be one of the new growth frontiers with a number of large-scale economic development and infrastructure investments. The Lamu Port, South Sudan and Ethiopia Transport (LAPSSET) corridor project among other projects that are expected to change the economic landscape of the County and thus the need for a spatial framework to provide a basis for planned investments.

The Lamu County Spatial Plan (2016-2026) seeks to address the aforesaid challenges in order to improve the standards of living of the people in Lamu through employment creation, protection and management of critical natural resources, reduction of poverty, and creation of wealth as well guide sustainable development.

ii) Kilifi

Kilifi county prides itself from its rich natural and socio-cultural capital. Proximity to the Indian Ocean means that Fishing is a major economic activity. The presence of extensive sandy beaches, pristine mangrove ecosystems, wildlife sanctuaries and famous historical sites has supported a vibrant and viable tourism industry. Opportunities exist in agriculture, thanks to availability of vast amounts of arable land, fertile soils and a good weather pattern. The County is also known for its sisal, cashew nut, and dairy products.

Kilifi county spatial plan is being formulated through the guidance of the stakeholders' plan vision which states; *A globally competitive County that embraces innovative and sustainable technologies in exploring, enhancing and optimal utilization of resources for equitable development by the year 2025*. Three alternatives have been identified as possible pathways that would lead the County to attain the stated vision. These alternatives include industrialization, tourism, conservation of natural resources, trade, and commerce respectively.

(iii) Kwale

The Kwale county spatial structure plan purposes to accommodate competing land uses and to promote the use of land with the aim of achieving prosperity, efficiency, equity and sustainable development in the county. The county spatial structure responds to the vision of the people of Kwale by rationalizing the use of land, distribution of people and activities and integration of thematic policies and programs.

The plan aims at: enhancing agricultural productivity in the county by providing ample space and assigning agricultural zones based on agro potential and prevailing agricultural activities; promoting environmental conservation and sustainable development by zoning out environmental significant areas; promoting investment in tourism, industrialization, trade and commerce by indicating potential investment areas and sites optimizing the potential of available marine resources; managing human settlements and urban development by creating a system for livable human settlements; Enhancing service delivery by allocating land for social and physical

infrastructure development projects as well as strengthening inter-linkages through transport and infrastructure development.

To ensure conservation priorities are incorporated into the spatial planning process, the process involved designation of the specific county according to land-use 'zones' (including 12-nautical miles of the marine zone) with clearly defined acceptable and unacceptable land uses and activities for each. Planning of zones should follow the established mitigation hierarchy (i.e. avoid, mitigate, offset and/or compensate for impacts, and aim to enhance the asset base overall.

Through stakeholder engagement processes, some areas were designated for conservation (i.e. as off limits to development). This included existing and planned protected areas, as well as other areas containing important and intact natural assets (e.g. such as forest, mangroves, coral reefs, seagrass and water resources). Restoration of some areas where biodiversity has been lost was also proposed with the primary aim of natural assets recovery.

Whilst the expected developments could generate substantial economic and social benefits, they also pose significant environmental and social risks. There is a likelihood that the developments could lead to irreversible damage to the County's most important natural assets such as forests, mangroves, water sources, beaches, seagrass beds, coral reefs and fisheries.

WWF-Ke has been actively engaged in advocacy for sustainable oil and gas activities in the awarded blocks. Through the Oil for Development program and engagement in County Spatial Planning processes,WWF-Ke have undertaken rapid risk assessments on such blocks and advised relevant stakeholders on areas to avoid and or to mitigate impact to critical biodiversity spots and ecologically sensitive areas. and ecologically sensitive areas.

Challenges

The development of spatial plans in Kenya is a practice which has been happening for a long time under various legal dispensations which have changed over time. Spatial planning being multi-sectoral and involving various stakeholders required a lot of resources to produce robust results. This was a challenge in the country and resulted in the planning process taking quite a long time to finalize against the National Land Commission's time period of at most 18 months.

Majority of planners seem to have immense experience developing plans on terrestrial land but very few have had an opportunity to plan marine 'land'. This resulted in marine zoning not being done well in Kilifi, Lamu and Kwale county spatial plans.

Opportunities

As a signatory to the Convention on Biological Diversity's (CBD) Aichi Targets, Kenya is mandated to have at least 10% of its waters under MPA cover. However, with the advent of Locally Managed Marine Areas (LMMAs) in local communities, and legal support of Co-Management Area (CMA) establishment by the Fisheries BMU regulations of 2007, a leeway now exists to increase the ocean cover under community-supported MPAs. With a National Spatial Plan already signed off by the Kenya Government, there is a very good opportunity to undertake a review of the plan to develop a robust Ecosystem Based MSP on Kenyan marine waters. This should adopt an integrated approach where all the players interested in sustainable development of the Blue economy are engaged.

Lessons learnt

The process of developing the National and Coastal County Spatial Plans adopted an integrated approach where key stakeholders brought forward

ideas on what should go into the land use plans. WWF-Ke played a key role in mobilizing stakeholders to be involved in the process. We lobbied the National and County Governments in allocating adequate resources to support the planning process as well providing technical expertise where required especially on the technical aspects of the process such as geospatial data collection, capacity building the Geographical Information System and the entire planning process.

Adequate technical expertise especially on planning for the marine space was a shortcoming. Majority of Kenyan Planners are well versed and experienced on terrestrial land use planning and this resulted in falling short on the Marine aspects. With very good marine planners within the WWF network, there is a good opportunity to engage them when undertaking the development of the National Marine Spatial Plan.

Key message

Our marine space is increasingly getting busy with a myriad of activities/uses such as port construction, industrial fishing, oil and gas exploration, ecotourism including land-sea interface uses. An integrated MSP approach is an important planning framework to foster an environmentally sound development of ocean-based activities.

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Capacity requirements for the Marine Spatial Planning in Kenya

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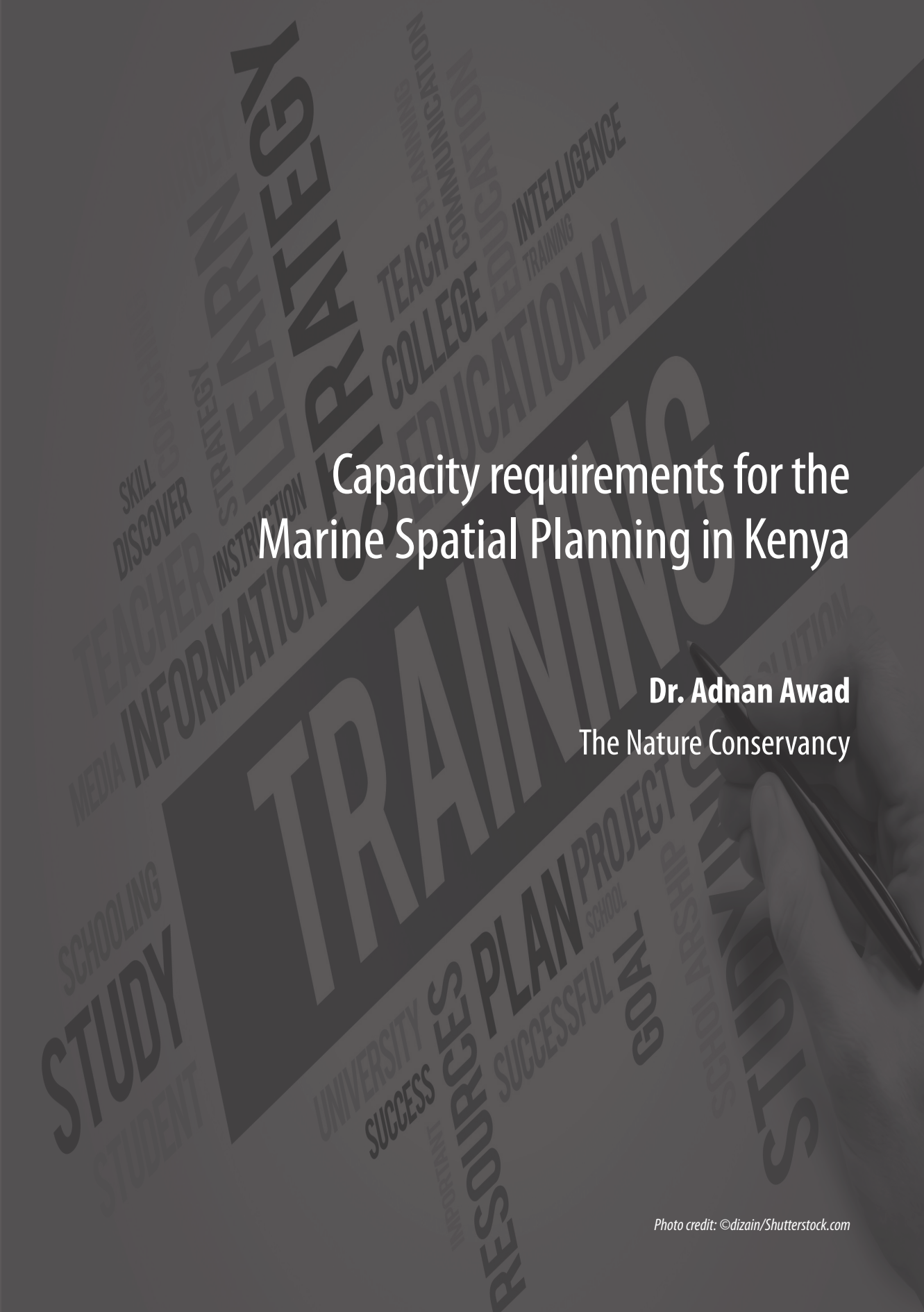

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Introduction

The Intergovernmental Oceanographic Commission of the United Nations Education, Scientific and Cultural Organization (IOC-UNESCO) developed a step-by-step approach for marine spatial planning that can be useful in guiding the process for different regions. As Kenya develops its MSP, this guide can be explored and adapted accordingly to fit within the Kenyan context, and should be seen as a resource in the early preplanning stages. The key steps in the guide include identifying needs and establishing an authority, obtaining financial support, organising the MSP process through pre-planning, engaging stakeholders, analysing existing and future conditions, developing, and implementing the plan, evaluating performance, and adapting the process ((Ehler and Douvere, 2009). Each step represents a structured phase in the process and may require deliberate attention to capacity needs.

Key capacities

The key capacities required for the MSP are process design and approach, science, data, and tools, facilitation, policy and government relations, project management, finance and funding, and stakeholder engagement (Figure 1). In view of the needed capacities, it is essential to ensure that capacity extends to the stakeholders themselves.

Every planning process is different, and MSP in Kenya would involve utilising capacity within all or some key marine sectors. These sectors may include but are not limited to aquaculture, biotechnology, conservation, enforcement, fisheries, maritime infrastructure, non-renewable resources, recreation, renewable energy, and tourism.

Enabling conditions for MSP

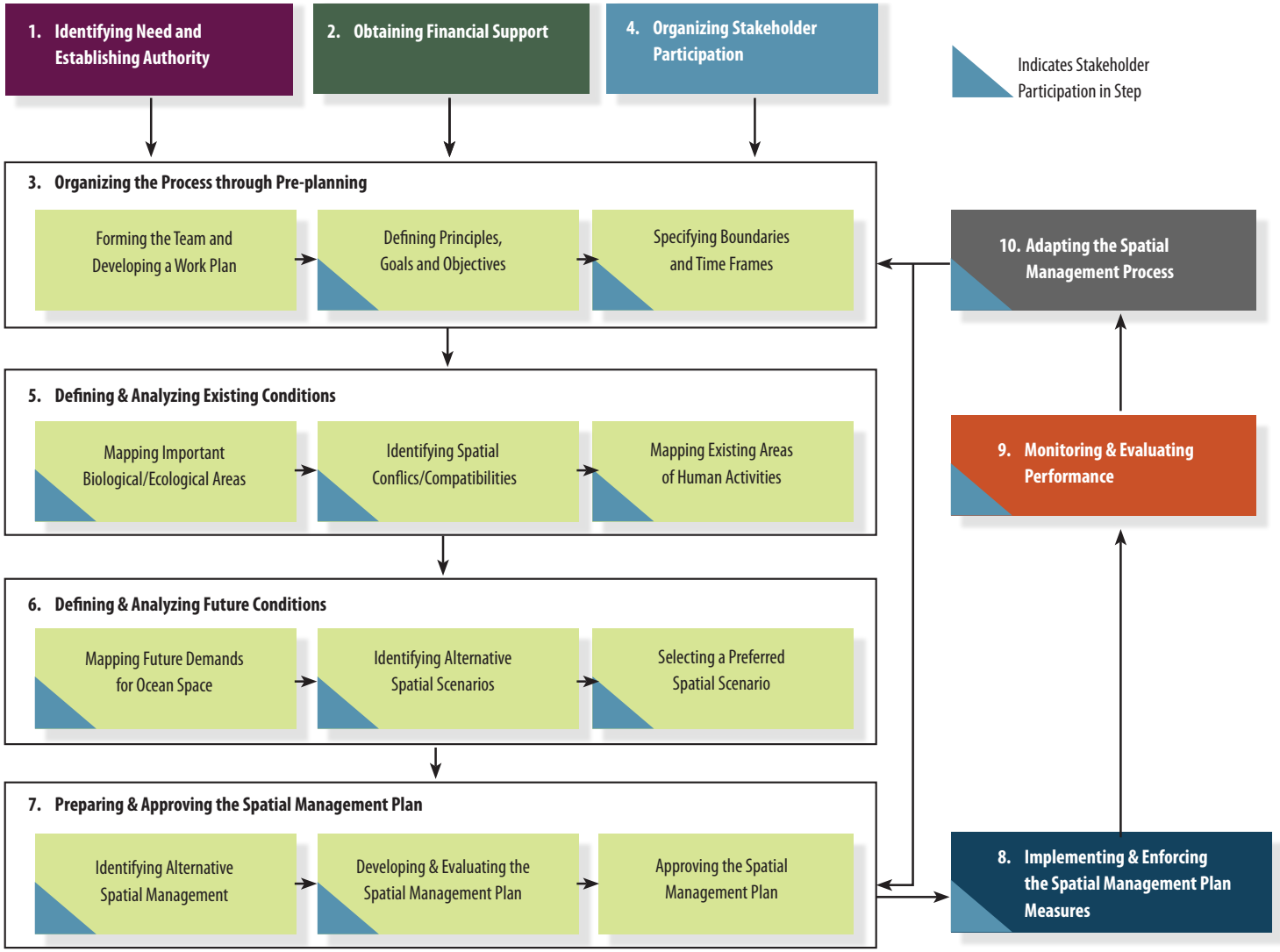
The enabling conditions for MSP should be considered as part of the capacity assessment, such that the MSP can develop in an optimal manner. The conditions for MSP include having the authority to plan, a champion for MSP, a driver or reason to plan, financial resources, information, data, and knowledge, leadership for the process, legal instruments, proponents and opponents, staff capacity, and stakeholder engagement capacity.

Human resource needs for MSP

There are several human resource needs that are integral to driving the MSP process. For process management, there are requirements for process lead, committee chairs, project managers, administrators, and financial and legal teams. In the science and planning capacity, it is necessary to have a science director or lead, a technical planner, and a GIS spatial analyst and mapping expert. For stakeholder engagement, having a community engagement lead and facilitator will prove useful. Having strong communications for the MSP process is essential and requires getting input from a communications lead, media relations, a webmaster for a website, and management for social media and other public outreach. Consultancies may also prove useful to provide specialised input into the MSP process.

Implementation plans

It is important to develop an implementation plan for the final marine spatial plan, which should include sustainable financing arrangements. The plan should include governance arrangements, implementation options, financing components and costs, monitoring, control and surveillance, long-term sustainable financing options, legislation, or regulations to legally adopt the plan. In addition, the implementation plans should incor-



Source (Ehler and Douvere, 2009)

porate research and monitoring, plan evaluation indicators, and criteria and management plans. Following the development of these plans, it is crucial to monitor and evaluate MSP implementation in time.

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PART III:

ASSESSING CAPACITY TO UNDERTAKE MARINE SPATIAL PLANNING (MSP) IN KENYA

Capacity needs assessment of institutions and stakeholders involved in the Marine Spatial Planning process for the Kenyan EEZ and nearshore waters

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IOC-UNESCO

Photo credit: ©IUCN ESARO

Introduction

At the request of the Principal Secretary, State Department of Fisheries, Aquaculture and Blue economy within the Ministry of Livestock, Agriculture, Fisheries and Cooperatives, the Intergovernmental Oceanographic Commission of the United Nations Education, Scientific and Cultural Organization, conducted a capacity needs assessment for the Marine Spatial Planning (MSP) process in Kenya. In keeping with the global requirement to accelerate national MSP initiatives, this is in congruence with the framework of the IOC-UNESCO project *2020 Regional and global development actions in support of ocean literacy for all in the joint roadmap for MSP processes worldwide in the context of the UN decade of ocean science for sustainable development*. The capacity assessment was informed by best practices and lessons learnt from MSP processes in different parts of the world, in addition to the existing institutional and stakeholder capacity in Kenya. The Government of Kenya (GoK) as a party to both the Nairobi Convention and the Convention on Biological Diversity (CBD) is keen to advance its delivery of a marine spatial plan for its marine areas. This is a necessity as the country plans to improve coherence and harmonization of its existing marine spaces as it advances in developing the Blue economy. Within the 4 pillars of Kenya's Big 4 Agenda, Blue economy plays a central role that has full alignment with this program.

The Government of Kenya on May 2, 2016 established a clear commitment through the Executive Order No.1/2016 as regards a new approach, the Blue economy, taking into consideration the importance of the sector in driving the country's economic growth with the creation of a State Department of Fisheries and Blue economy. Support for the Marine Spatial Plan will be from the World Bank to support the Kenya Marine and Fisheries Socio-Economic Development Project (KEMFSED) and The Nature Conservancy.

At the onset of the MSP process, there is need for a scoping of the existing capacities to evaluate the status of marine spatial planning (MSP) in Kenya's nearshore and offshore waters for effective fisheries management and other competitive uses of marine resources for blue growth.

Significance of a capacity needs assessment for the Marine Spatial Planning Process

A capacity needs assessment is identified as a development process that analyses the desired capacities against existing ones to create an understanding of the relevant capacity assets and need requirements that can best yield input to construct a response. The intended development response addresses these capacities to make robust and optimize existing ones. The tool further serves as a foundation for continuous monitoring and evaluation of progress against related indicators to help strengthen the basis for long-term sustainable results, planning and program implementation. The capacity assessment can be done at different points of planning or a programme cycle. In this case, the assessment was done within the process of accelerating MSP work presently being done in Kenya. Collected data and information on surveys from different stakeholders and sectors players was vital in compilation of this report.

The present governance of Kenya's marine waters falls under different institutions and actors mandated with different roles enumerated within the Kenyan constitution. MSP being a cross sectoral issue brings in collaborative partnerships between different institutions that work together to achieve an integrated marine spatial plan. In the country's interagency MSP working group are a number of institutions that deal with marine issues: State department of Fisheries, Aquaculture and Blue economy, State Department of Shipping and Maritime Affairs, State Department of Transportation, National Environment Management Authority, Kenya Marine and Fisheries Research Institute and


Photo credit: ©IUCN ESARO

the State Department of Planning to mention but a few. The successful development and implementation of MSP in Kenya depends on the ability of these relevant institutions to provide expertise and resources necessary for MSP activities.

The scope of this capacity assessment was to access the existing institutional and stakeholder capacity as relates to marine spatial planning in Kenya and identify their capacity needs and existing scopes, the gaps and policy requirements to ensure sustainable management of marine spaces. This is with a view to build the requisite capacity of these institutions to support the development and long-term MSP implementation in Kenya. The assessment drew guidance from the information given by stakeholders, their expertise, knowledge, and resources that they can offer to the process. The focus was on institutions whose mandates are related to MSP and those that partner with the GoK to support sustainable management of coastal and marine resources. The assessment had the overall aim of guiding the identification of institutional capacity gaps that need development considering the implementation of MSP.

The findings from this assessment were streamlined from certain objectives that guided the process. A gap analysis of the institutions was done as relates to their mandate in doing MSP within the Kenyan EEZ and nearshore waters, the capability of their personnel to participate in and implement MSP related activities inclusive of their work with partner institutions and stakeholders. Furthermore, an evaluation of the existing institutional equipment critical to support the MSP process was also done. The assessment was moreover informed by a gap analysis of the individual organization funding structures relevant to the effective implementation and sustainability of MSP. The data gathered from the assessment was utilized to provide long and short-term feasible recommendations for capacity development plans aimed at mainstreaming the implementation and development of the Kenyan MSP. The assessment also aimed to encourage synergistic collaborative partnerships between institutions best suited to provide capacity to contribute to the Kenyan MSP technical working groups.

Assessing the need for capacity for MSP in Kenya: Methodology

To set precedence for the capacity needs assessments a selection of relevant stakeholders and institutions involved in the MSP process in Kenya was done, and these were drawn from the MSP Interagency working group. The main tasks of this working group is to play a leading role in refining the roadmap for MSP, compile data and relevant sector information needed, identify key stakeholders whilst ensuring their participation when necessary and documentation of MSP proceedings. Additional stakeholders for the survey were drawn from the participants who attended the country's marine spatial planning workshop organized by IOC-UNESCO in October 2020. The respondents received the survey after the conclusion of the national MSP workshop held virtually in Kenya on the 20th and the 21st of October 2020. Additional respondents were drawn from scientists listed on Ocean Expert. A total of 250 surveys were sent out from which 40 responses were received. The responses were a biased estimate of what was needed for the assessment due to limited numbers, however, the data was used as representative of the Kenya MSP scenario. After the receipt of the survey, a comprehensive data analysis was done to make sense of the information gathered.

Findings on the capacity needs assessment

Existing institutional frameworks

From the survey and responses received, the represented organizations were: World Wildlife Fund, Survey Institute of Kenya, Kenya Marine and Fisheries Research Institute, Ministry of Lands and Physical Planning, Ministry of Tourism and Wildlife, State Department of Shipping and Maritime, the National Museums of Kenya, the Kenya Meteorological Department, the Technical University of Mombasa, Technical University of Kenya, Pwani University, the University of Nairobi, the Nature Conservancy, Kilifi County Government, Conservation International and the Kwale Natural Resources Network. Other institutions are the National Disasters Operation Centre, Kenya Fisheries Service, Coastal Oceans Research and Development Indian Ocean, the Local Ocean Conservation Trust, the United Nations Environment Programme, and the International Union for Conservation of Nature.

In terms of representation, 47% of these institutions were from the public sector, 25% non-governmental organizations, 20% academia, and the rest from the civil society, intergovernmental organizations, private sector and the local county government. Our findings show that different stakeholders are involved in capacity building, knowledge sharing, research and policy making with implementation as relates to their institutional mandates (Figure 1). Unfortunately, during this assessment, there were no representations from major industries such as the oil and gas sector to be able to make further comparisons.

Skill gap analysis and priority training areas

Of the premise on whether the staff at the surveyed institutions have knowledge, skills and expertise on MSP topics, 72% of the respondents said yes, 10% responded with a negative answer and the remaining 18% did not provide an appropriate answer and responded with a maybe. This indicates that within the institutions surveyed, majority of the experts are familiar with the Marine Spatial Planning concept. Additionally, 72% of the institutional personnel can participate and implement MSP related activities within their institutional mandates, 6% cannot and the remaining 22% see this as a possibility. Majority of the institutions have about 1-10 experts who are involved in the Marine Spatial Planning processes.

All respondents to the survey responded posi-

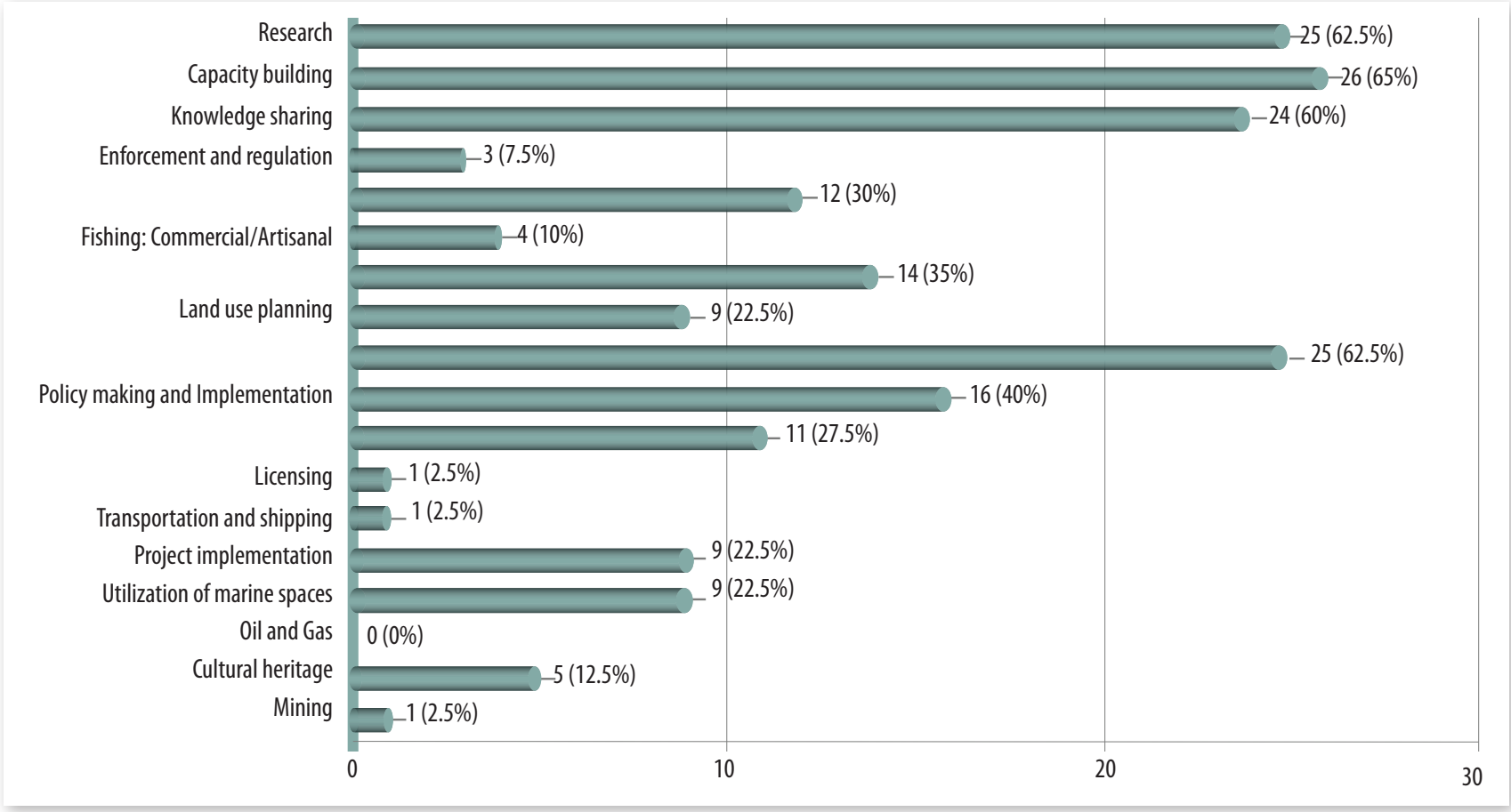

Figure 1: Focus of different stakeholders within their institutional mandates as relates to MSP.

tively to the question on having interest to receive training and technical assistance for their staff/individual selves within their organizations on a needs capacity basis on the following MSP related topics: Geographical Information Systems software, mangrove restoration and rehabilitation, community resources management, conservation, mapping and zoning, sustainable management of marine natural resources, building of collaborative partnerships in MSP, data collection and dissemination in addition to ecosystems resource management. There were very few to near nil respondents who were not ready to receive training on the related MSP assigned topics. Thus, it is objective to say there is clear interest within institutions in Kenya to build their staff capacity on marine spatial planning thematic areas to steer the country's process. In relation to this, there were proponents on additional topics of interest that institutional staff maybe curious to receive further training on. These were: data sharing platforms, developing modules in MSP, InSAR training, stakeholder engagement, training on marine hydrography nearshore and offshore, use of GIS as a spatial tool to aid in development of spatial plans, institutional and policy analysis, data analysis, policy development on forest restoration strategies, advocacy, communication and social campaigns, transboundary marine resources management, remote sensing and satellite imagery as well as resource mobilization in undertaking marine conservation work.

The assessment further evaluated the knowledge institutional staff had in selected thematic areas. The response to this question varied in scope with the rank of answers ranging from high to very low as relates to knowledge areas by staff in the selected thematic areas. Conclusively, the comprehension by staff within the surveyed institutions on a rating scale indicates that there exists understanding of certain thematic areas at a high expense to a low rate of certain subject areas. For example, geographic information systems is well understood by staff in certain organizations, while in others it is a new field of inquiry giving a low rating.

Status of institutions involved in MSP implementation

On the assumption that the institutions had the equipment and facilities vital to support the marine spatial planning process, from the 40 responses received, the balance of feedback was equal with 50% responding positively and the remaining 50% giving a negative response. Furthermore, as relates to this, the respondents were asked what equipment their institutions had and what additional facilities they may require. Of this, only 30 responses were received from which it was cited that some institutions had GIS software, survey equipment for land and water such as the Geodetic GPS sets, single beam echo sounder, tide gauges, topographical maps, aerial photos, navigational charts and installed stations which can be used for long time data collection and zoning. Other equipment and facilities available were large format printers and plotters, multibeam echosounders, side scan sonners, lidar equipment and analytical laboratories. In response to this question, some representative institutions needed the following equipment: hydrographic survey software, satellite imageries, unmanned air and underwater survey equipment, survey boat with fully equipped hydrographic and seismic survey equipment, lidar equipment, multibeam echosounders and side scan sonners. Additionally, others needed: vessels for offshore laboratory work and research, modelling units, satellite communication centres, additional ocean observation networks or buoys, analytical laboratories, diving equipment, satellite coordination and communication centre in addition to more technical and financial capacity. From this statistic, it was evident that some facilities were present in certain institutions and absent in others.

Figure 2: Participants in group discussion during ICZM training Photo credit: KCDP.

The last question for the assessment focussed on the existing funding structures within institutions that are present and relevant to the effective implementation and sustainability of MSP. From this question, 38 collective responses were received. Key funding to drive the MSP process for Kenya was mentioned to have been from the government which also has given a budgetary allocation to the Ministry of Lands and Physical Planning. Other funding structures come from a diverse pool of donors, fundraising, policy levers for blue carbon, private partnerships, research funds, institutional financing, resource mobilization strategies and plans, grants in addition to county integrated development plans. It is of importance to note that some surveyed institutions currently lack available funding structures in place to drive their participation in implementing the marine spatial process for the country.

Recommendations

An online survey was used as an informative tool to guide the capacity needs assessment on MSP in Kenya and this served as a means to help identify the existing gaps in capacity whilst guiding the engagement of different stakeholders. However, other tools such as in person meetings would have been more substantial to yield more output from stakeholders for the assessment, but this was limited by sanitary conditions of the COVID -19 pandemic. Continuous engagement of this assessment to gauge more participatory action would further be an instrumental tool to inform the MSP capacity needs evaluation further. Additionally, as the capacity needs valuation done is only representative of the entire marine spatial planning process for the country, it is paramount to continuously create a means to update the assessment presently done while actively allowing stakeholders to take part in

the implementation process of rectify identified gaps that arise as the MSP process continues. Furthermore, cross sectoral institutional capacity should be encouraged amongst organizations mandated with marine governance in Kenya by providing a means to share access of resources between the institutions that have equipment to run an MSP and those that do not. Conclusively, the Government needs to consider increasing its funding scope to institutions that would run the MSP process for the country to provide an opportunity to facilitate the purchase of the necessary equipment to drive the undertaking and also hire the needed human resource.

PART IV:

LESSONS LEARNED FROM THE MARINE SPATIAL PLANNING WORKSHOPS

Lessons learned from the Marine Spatial Planning workshops

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Photo credit: ©KMFRI

Introduction

The Government of Kenya has taken up Marine Spatial Planning (MSP) as part of the implementation of Vision 2030 and the Third Medium Term Plan (MTP III). MSP forms a component of the wider National Maritime Spatial Plan, which is intended to cover inland water bodies. The Government has received support from the World Bank towards the development of MSP as part of the wider Kenya Marine Fisheries and Socioeconomic Development (KEMFSED) Project. The Nature Conservancy (TNC) is one of the Technical Partners in this process.

The implementing agency of the KEMFSED project is the State Department for Fisheries & the Blue Economy (SDF-ABE) on behalf of the Government of Kenya. A National Multi-agency Steering Committee, which has been active in the past, will be operationalized under the project to guide the process. The Secretariat for the MSP process is based at the Kenya Marine and Fisheries Research Institute (KMFRI).

The key objectives of the MSP component under the KEMFSED project are as follows:

1. To develop and implement an integrated MSP for Kenya; and
2. To develop capacity, both human and technical, to sustain MSP as a core function of managing the Blue Economy space.

The Kenyan process is currently in the pre-planning stage of MSP and the key activities to be undertaken include establishment of a formal management structure for MSP implementation; development of frameworks for the MSP process, which include both stakeholder and legal frameworks and undertaking a Strategic Environmental and Social Assessment (SESA) that includes identification of marine and social activities and risk assessments. The next steps of the MSP process involve data needs assessments and identification of data gaps for the (Exclusive Economic Zone (EEZ) and nearshore areas. Stakeholder inputs and data validation are key aspects of the next phases of this journey. Capacity building is a central component and the capacity assessment report supported by IOC-UNESCO is a first step to understanding both the technical and infrastructural needs of the MSP process in Kenya. An understanding of economic impacts of future scenarios is also a much needed part of the Kenyan MSP and this will be built into the process.

Lessons from the workshop on environmental pressures

Key recommendations from the Environmental Pressures session for consideration in the MSP process for Kenya are as follows:

- Habitat connectivity is important and we need to look within and beyond the marine ecosystems (corals, seagrasses and mangroves) and integrate the atmosphere, EEZ, inland forests, land based agriculture and riverine impacts into the MSP work;
- There is need to re-design MPAs to include habitats with high resistance to environmental pressures such as bleaching and high recovery potential as these could be potential sources of larvae to impacted reefs;
- Biodiversity information for the MSP process needs to go beyond the ecosystem to the species level. An example of this is that different mangrove and seagrass species exhibit different responses/vulnerabilities to pressures (e.g. *Aviciennia marina* in Mida Creek and its response to trampling; the seagrass *Thalassodendron ciliatum* and its vulnerability to sea urchin herbivory);
- Natural disasters along the marine /coastal areas have implications on ecosystems and people so there is need to have a risk

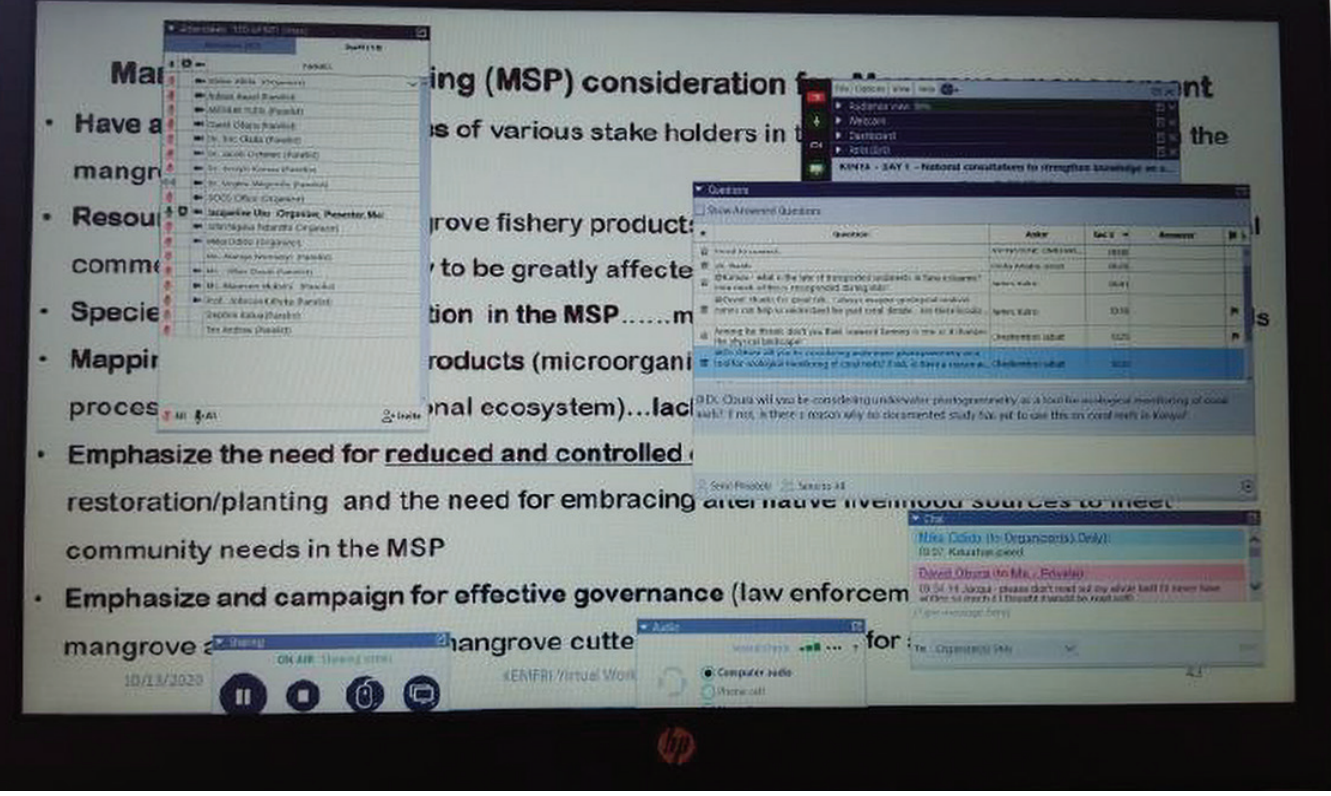
assessment for the marine and coastal regions of Kenya that would cater for both flora and fauna as well as communities;

- Detailed mapping of points and areas of entry and dispersion of land-based sources of pollution should be integrated into the process to inform the allocation of marine space for various compatible/incompatible uses;
- Small Scale Fisheries need to be considered to ensure that key fishing areas and coastal livelihoods are preserved;
- In the case of aquaculture investments, there is need to analyse future conditions with an understanding of sector plans for the development of areas selected for aquaculture and other intended uses or allocations for other development (e.g. infrastructural) to avoid user conflicts;
- In the development Payment for Ecosystem Services schemes, such as the *Mikoko Pamoja* initiative, there is usually a process of long-term collection of time series, baseline economic and ecological data. This data supports ecosystem service identification and valuation. Such long term data sets are valuable for the MSP process in Kenya;
- Capacity building, benefit sharing and co-designing of projects that integrate culture and traditions with communities, and inclusion of women and youth are important considerations for the MSP process;
- MSP planning lies in the hands of statutory agencies, therefore it is important that Community Based Organizations are enlightened on the MSP process, through an elaborate communication and outreach programme to ensure their engagement in the process;
- Other policies such as Integrated Coastal Zone Management (ICZM) should be used to compliment MSP activities. A strong ICZM process can play a significant complementary role for MSP by making provisions for management of coastal land based activities that impact the ocean;
- For transboundary areas, MSP provides an opportunity for innovative management regimes based on shared goals between countries which consider the diversity of stakeholders and governance regimes;
- As UN member states negotiate a legally binding instrument governing the Areas Beyond National Jurisdiction (ABNJ) it is important that provisions for future management regimes are informed by potential impacts on territorial waters within the WIO region.

Lessons from the MSP workshop sessions

MSP can help Kenya achieve the different sectoral needs, international obligations and trigger the sustainable development of the nation's marine waters through the following recommendations from the sessions:

1. Kenya has had a history of multi-agency cooperation for ocean management. The development of ICZM demonstrates the multi-sector cooperation that should be replicated in the MSP process to deal with inter-sectoral overlaps in institutional mandates;
2. From an environmental perspective, in developing MSP, boundary planning should take the connectivity of ecologically and biologically significant areas and ensure that there is representation of all ecological features;
3. In the MSP process it is important to develop a capacity and equipment catalogue to aid in synergies and identification of gaps and opportunities to share information and expertise;



4. It is important to take into account factors that influence the opinions of various stakeholders and modes of engagement as well as development of strategies to promote stakeholder support and management of opposing opinions;

5. Enhancement of the contribution of urban planners is important in the MSP process and this involves diversification of training curricula to include MSP;

6. Inclusion of Underwater Cultural Heritage/ Underwater Archaeological sites is important in the MSP process to enhance the protection of these sites;

7. Tourism relies heavily on sustainably managed ecosystems therefore, the MSP process should include aspects of carbon footprints and sustainable tourism on the agenda. There is need to provide documentary evidence that demonstrates how Kenya is safeguarding the environment. It is no longer just about displaying glossy catalogues to show available attractions but the inclusion of stories of sustainable environmental management are important.

8. The MSP process and the outputs will help Kenya meet multiple international obligations. For ease of implementation and enforcement, consideration may be made to ensure that the MSP regulations are placed within each sector's legislative framework.

As the MSP process provides a way to balance the demands and conflicts that emerge from development and needs for environmental conservation of the ocean space, the lessons learnt from the workshops on environmental pressures and MSP will contribute towards improved management of near shore waters by using the various recommendations made.

This report on **Marine Spatial Planning and the Blue Economy** in Kenya highlights the discussions held during a 4 day virtual national workshop series held on 14th - 15th October 2020 and 21st - 22nd October 2020. The first workshop in the series provided insights on environmental pressures, cumulative impacts and tools to support decision-making in Kenya for the marine spatial plan. Panelists in the second workshop discussed key concepts and requirements for Marine Spatial Planning in Kenya.

Support for the workshops came from Government of Kenya through the State Department for Fisheries, Aquaculture and The Blue Economy as well as the Kenya Marine and Fisheries Research Institute. The event was co-financed by the Kingdom of Sweden and the European Fund for Maritime Affairs and Fisheries of the European Union in support of the Joint Roadmap to accelerate Marine Spatial Planning (MSP) worldwide.