AN ASSESSMENT OF THE STATUS OF BLUE ECONOMY SECTORS IN KENYA

A Synthesis Report

Presented by

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To

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LIST OF ACRONYMS

ACCOSCA	African Confederation of Co-operative Savings and Credit Associations
AFA	Agriculture and Food Authority
ASALs	Arid and Semi-arid Lands
AUC-NEPAD	Africa Union Commission/New Partnership for Africa's Development
AU-IBAR	Africa Union-Interafrican Bureau for Animal Resources
CFS	Container Freight Station
COP	Conference of Parties
EAC	East African Community
EEZ	Exclusive Economic Zone
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
FOA	Fiber Optic Association
GDP	Gross Domestic Product
GoK	Government of Kenya
ICA	International Cooperative Alliance
ICD	Inland Container Depot
ICMS	Integrated Customs Management System
ICT	Information and Communication Technology
ICZM	Integrated coastal zone management
IFAD	International Fund for Agricultural Development
IOE	Office International des Epizooties
KMA	Kenya Maritime Authority
KMFRI	Kenya Marine and Fisheries Research Institute
KNBS	Kenya National Bureau of Statistics
KNSL	Kenya National Shipping Line
KPA	Kenya Ports Authority
KWATOS	Kilindini Waterfront Automated Terminal Operations System
LAPPSET	Lamu Port-South Sudan-Ethiopia-Transport Corridor
NOCK	National Oil Corporation of Kenya
OECD	Organization for Economic Co-operation and Development
REDD+	Reducing emissions from deforestation and forest degradation
SACCO	Savings and Credit Cooperative Society
TEU	Twenty-foot equivalent unit
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme

UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNWTO	World Tourism Organization is the United Nations
USAID	United States Agency for International Development
WB	The World Bank
WIOMSA	Western Indian Ocean Marine Science Association
WOCCU	World Council of Credit Unions
WTTC	World Travel & Tourism Council

CHAPTER 1
INTRODUCTION

1.1 Background and Context

The Nairobi Convention Contracting Parties adopted decision CP9/10.1 at the Ninth Conference of Parties (COP 9) held in Kenya in August 2018 and agreed to advance blue economy approaches in the context of Sustainable Development Goal 14 as pathways for sustained incomes and economic benefits from natural blue capital including fisheries, tourism, oil and gas development, renewable energy, and other maritime activities[1]. Further to COP 9, the Government of Kenya hosted the Sustainable Blue Economy Conference (SBEC) in November 2018. In the Nairobi Statement of Intent on Advancing the Global Sustainable Blue Economy, the outcome document of the SBEC, countries charted a new paradigm for an economically vibrant, socially inclusive and environmentally resilient blue economy. One of the commitments made by Kenya was the establishment at the University of Nairobi of an Institute for Blue Economy and Ocean Studies (IBEOS) (The Maritime Centre/Fishforce Academy). 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.

In this context, the Nairobi Convention Secretariat has partnered with the Maritime Centre of the University of Nairobi to assess the current status of sectors that contribute to the blue economy in Kenya. The objective of the assessment is to provide an overview on the contribution, values and potential of the various maritime sectors of the blue economy, and ultimately provide a baseline report and other outputs to support the development of Kenya's national blue economy strategy. Further, the overview will provide recommendations and policy options on the sectors with the highest potential, together with criteria for prioritisation both in the short and long-term, for the Government of Kenya to pursue in the development of its strategy for a blue economy. The process leading up to this assessment report has been collaborative with input from key sector experts under the overall guidance and coordination of the Maritime Centre of the University of Nairobi and the Nairobi Convention Secretariat. In addition to the expected benefits to the Government of Kenya, the process followed in this assessment will provide guidance to other countries of the Western Indian Ocean (WIO) region that wish to undertake a similar exercise. The process may also provide valuable guidance to Regional Economic Communities (RECs) that also wish to further the development of the blue economy among their

member states.

1.2 Oceans and the Blue Economy

The global oceans and seas cover more than seventy-two percent of the earth's surfaces and are responsible for providing food, jobs, and recreation for a large portion of the world's population; and have become significant drivers of global gross domestic product (GDP)(World Bank, 2017). Oceans provide a substantial portion of the global population with food and livelihoods and are the means of transport for 80% of global trade (UNCTAD, 2012). Worldwide, the economies of coastal communities and their resilience highly depend on the ecosystem services that coastal zones provide. The Kenyan coast, for example, is endowed with rich natural resources that support the local and national economy. Some of these resources include mangrove forests, coral reefs, terrestrial forests, sandy beaches and seagrass beds. Coral reefs, mangroves, salt marshes, seagrass beds and deep- sea habitats generate high biodiversity and productive waters which in turn support economies and livelihoods (Samoilys *et al.* 2015). The world's oceans and seas hold the promise of immense resource wealth. Further, they are increasingly recognized as indispensable for addressing many of the global challenges facing the planet in the decades to come, from world food security and climate change to the provision of energy, natural resources and environment[2]. The last few years have seen a spectacular increase in attention devoted to the need to protect the world's oceans and seas. At the same time, interest has been growing in the huge potential offered by the future development of ocean-based industries. The importance of oceans for sustainable development has been recognized from the beginning of the UNCED process, Agenda 21, the 2012 Johannesburg Plan, implementation and reaffirmation of which has been documented in the Rio+20 Conference.

However, ongoing trends of exploitation and therefore the degradation of marine and coastal ecosystems show that endeavours to date to ensure sustainable development of oceans have been insufficient (UN, 2014). This is because development activities have seriously taxed the resilience of the marine and coastal resource base. FAO data on fisheries, for instance, indicates that close to 90% of global fish stocks are fully or over exploited and in 2018, the total global capture fisheries production reached the highest level ever recorded at 96.4 million tonnes --an increase of 5.4 percent from the average of the previous three years (FAO, 2020). For example, the WIO region has rich world-class ocean ecosystems which are under threat from both direct and indirect pressures through resource exploitation and human-induced habitat degradation. The mangrove coverage is diminishing in most countries in the region – Kenya and Tanzania lost about 18 per

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cent of their mangroves over 25 years, and Mozambique lost 27 per cent over a shorter timeframe (Bosire 2015). Other challenges include increasing pollution and unsustainable coastal development which have further contributed to the loss of biodiversity, ecological function and the decline in provision of environmental services. Climate change also threatens to compromise the very foundations of broad swathes of coastal development, whilst rising atmospheric CO2 levels are undermining fundamental aspects of many marine ecosystems through ocean acidification, changing ocean chemistry at a speed faster than at any time in the last 300 million years. The potential of the oceans to meet sustainable development needs is enormous; but only if they can be maintained in and/or restored to a healthy, and productive state.

This calls for the Blue Economy(BE) approach which conceptualizes oceans as "Development Spaces" where spatial planning integrates conservation, sustainable use, oil and mineral wealth extraction, bioprospecting, sustainable energy production and marine transport. It sums all the economic activities of ocean-based industries, together with the assets, goods and services of marine ecosystems; and espouses the same desired outcome as the Rio +20 Green Economy initiative namely: improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, 2013) and endorses the same principles of low carbon, resource efficiency and social inclusion. The Blue Economy breaks the mould of the business as usual "brown" development model where the oceans have been perceived as a means of free resource extraction and waste dumping; with costs externalised from economic calculations. At the core of the Blue Economy concept is the dissociating of socio-economic development from environmental degradation. To achieve this, the BE approach is founded upon the assessment and incorporation of the real value of the natural (blue) capital into all aspects of economic activity. It incorporates ocean values and services into economic modelling and decision-making processes and constitutes a sustainable development framework for developing countries addressing equity in access to, development of and the sharing of benefits from marine resources; offering scope for re-investment in human development and the alleviation of crippling national debt burdens. Globally, the European Commission estimates that the Blue Economy represents over 5 million jobs and contributes €500 Billion per year (Malshini, 2019).

In Kenya, maritime sectors have long played an important role in the Kenyan economy. For example, the port of Mombasa connects the interior to international shipping routes, the country's waters are rich in fish, and coastal tourism is an important source of foreign exchange (Benkenstein, 2018). These sectors have largely been managed as distinct economic domains, but

recent years have seen a shift in approach with the renaming of the Department of Fisheries as the Department of Fisheries and Blue Economy in June 2016 and the establishment of aBlue Economy Implementation Committee in January 2017. While maritime sectors feature prominently in the national debate on the development of the Blue Economy, the economic potential of inland water bodies has also received attention. This reflects an approach to the Blue Economy outlined in 2050 Africa's Integrated Maritime Strategy (2050 AIM Strategy) that includes inland lakes and waterways as an integral component of the continental Blue Economy.

Blue economy in the country was given pre-eminence in the President's speech on December 3, 2020 during the national launch of the New Ocean Action Agenda. The President reiterated that the ocean economy is a smart investment that can deliver social, economic, and environmental benefits to our people, and that Kenya is keen to fully realize the potential of its Exclusive Economic Zone (EEZ) to enhance development and productivity while protecting the marine resources. He also lauded the coastal County Governments through the coastal economic bloc, '*Jumuiya ya Kaunti za Pwani* (JKP)', comprising of Mombasa, Kwale, Kilifi, Tana River, Lamu and Taita Taveta for identifying the ocean and blue economy as one of three value chains to prioritize in their county development plans. Although Kenya has a relatively short coastline of about 640km, the total exclusive economic zone covers 142,400 square km, with a further 13,600 square km of inland lakes. The Lake Region Economic Bloc is also making strides in developing the inland blue economy in the region and has prioritized the blue economy as a key economic pillar. Some of the developments highlighted by the President in achieving and promoting sustainable utilization of Kenya's ocean resources include; implementation of policies aimed at tackling the challenge of ocean pollution especially from plastic waste, reconstruction of the Liwatoni Fisheries Complex, training of 1,000 fishermen, setting up of Bandari Maritime Academy, and the launch of the Kenya Coast Guard Service. In addition, the Government had banned the use of polythene carrier bags, banned single use plastics in all protected areas including beaches and national parks. The Government is also working with communities in conservation efforts e.g. restoration of the mangrove forests, conservation parks as some of the efforts being made to advance blue economy. Despite the significant potential for the country's Blue Economy, there are challenges related to environmental sustainability, maritime security and inclusive development.

1.3 Objective and Scope

Given the foregoing discussion, the Maritime Centre of the University of Nairobi with supportfrom the Nairobi Convention designed a study to:

1) Appraise the current contribution of different blue economy (ocean and inland) sectors to Kenya's GDP;
2) Assess the values of these sectors and potentials for further development and investment;
3) Identify the policy and governance gaps in each sector;
4) Make recommendations on the policy tools that can support the development of a sustainable blue economy in Kenya.

This study will cover both ocean and inland blue economy sectors. The aim is to have a comprehensive understanding on the current value of blue economy to Kenya's economy and determine what needs to be done to further develop the sector.

1.4 Approach

In developing this synthesis report, primary and secondary data were collected. Primary data were collected through key informant interviews (KIIs) and field visits. KIIs were done with several players in the different blue economy sectors considered in this study. In the marine and coastal sectors, the KIIs were mainly done through phone calls to people with information on the sectors. For the inland blue economy sectors, site or field visits were done to Lake Naivasha, Elmentaita, Nakuru, Baringo, Bogoria, and Victoria. Observations on the developments around these Lakes were beefed up with KIIs from KMFRI, Lake Bogoria National Reserve managers, and other institutions in charge of the lakes. This was supported by interviews from BMU members along the Lakes. Secondary data were collected through literature review from several past and current documents. These included research publications, conference papers, UN reports, concept papers published by various independent organizations as well as non-governmental organizations, and policy documents.

CHAPTER 2

CONTRIBUTION OF OCEAN SECTORS TO KENYA'S GDP

2.1 Deep-sea fisheries, mariculture and aquaculture

Kenya is endowed with rich blue economy resources that encompass a range of productive sectors including capture fisheries, freshwater aquaculture, mariculture, and non-fisheries maritime sectors. Production from freshwater aquaculture and mariculture has been propelled by dwindling capture fisheries. Kenya's Gross Domestic Product at current prices in 2019 was estimated at Ksh.9.74 trillion (US$ 97.4 billion) with the highest sectoral contribution being from Agriculture, Forestry and Fisheries sector accounting for over a third of the GDP with 3.33 trillion (US$ 33.3 billion). It is, however, apparent that the fisheries sub-sector made a relatively low contribution of Ksh. 48.82 billion which translates to 0.05 percent of the GDP (KNBS, 2020). Overtime, the contribution of fishing and aquaculture has grown steadily from Ksh. 34.9 billion in 2016 to Ksh. 48.82 billion in 2019. Catches from the marine waters increased during the period resulting in corresponding increase in earnings. The per capita seafood consumption in Kenya is estimated to be 3.4 kg. Even though landing statistics under-represent the actual fish landings from the marine waters (Ochiewo et al., 2018), production from marine fisheries is much lower than production from freshwater bodies in Kenya.

Marine fisheries, aquaculture and mariculture are an important source of livelihood to the coastal communities that depend on it for food and income. The main actors in the primary fishing activities are mainly men while women play a key role in the processing and marketing of fish (Ochiewo, 2004). Women are also involved in gleaning in the intertidal areas during the low spring tides for octopus. In addition, they catch shrimps and small fishes using mosquito nets close to the shore. The middlemen usually own fishing gear or vessels, which they rent to the fishers at a pre-determined revenue sharing agreement, which divides the revenue in to three equal portions: one for middleman, one for boat and gear maintenance, and one for all fishers on the boat regardless of their number. There are about 27,000 people who are engaged in fishing and related activities. This number includes over 13,400 small-scale fishers who depend on the marine fisheries for their livelihood and income. The number also consists of middlemen and traders who play a key role in the small-scale fishery by providing opportunities for fishermenwho are not able to purchase their own fishing gears and vessels (Ochiewo *et al*., 2010). Marine fisheries in Kenya are is either artisanal, semi-industrial or industrial. Besides primary fishing, other important fisheries related economic activities include fish trading, processing and distribution of fish

catches to the local markets along the coast. These activities are carried out by both men and women, with women doing most of the trading at the fish markets, where they also play the important role in the processing and distribution chain (Ochiewo, 2004).

Mariculture, which is the cultivation of aquatic animals and plants in marine and estuarine (brackish) waters, was introduced to address the widespread poverty and livelihood needs of coastal communities and bring about development in the rural coastal areas (Ochiewo *et al*., 2020; Mirera and Ngugi 2009). It employs mainly women (Odhiambo *et al*., 2020) and therefore contributes to empowering women as owners of farms or as important actors in fisheries value chain and marketing; thus participating in societal decision making (Hetch *et al*., 2006; Wakibia *et al*., 2011). The seaweed farming in Kwale County and mud crab (*Scylla serrata*) farming at Dabaso and Che Shale in Kilifi County are classic cases of successful mariculture initiatives that provide livelihood and income to the local communities. The seaweed farming has attracted a number of new villages and the farmers use the income from seaweed farming to pay for their children's school fees, acquire household assets, build houses and supplement their family's budget. Apart from the seaweed farming and mud crab farming, most mariculture initiatives have stagnated at pilot phase over the past 4 decades reducing mariculture's contribution to livelihoods and national economy.

It is expected that with the opening up of the commercial offshore tuna fisheries through the Blue Economy development interventions, the contribution of fisheries, mariculture and aquaculture to the GDP will tremendously increase. It is however worth noting that the spread of COVID-19 pandemic is expected to impact negatively on economic growth generally, including the Blue Economy.

Table 1: Kenya's GDP (current prices Ksh. Millions) with contribution from fisheries

Year	2015	2016	2017	2018	2019
Total GDP	6,284,185	7,022,963	8,165,842	8,892,111	9,740,360
Agriculture, Forestry and Fishing	1,897,347	2,182,198	2,844,263	3,032,085	3,326,299
Fishing and Aquaculture	40,300	34,909	36,608	43,580	48,815
Fisheries proportion of GDP	0.06	0.05	0.05	0.05	0.05

Source: Adapted from Kenya National Bureau of Statistics, 2020

2.2 Coastal and marine tourism

The tourism industry is among the significant contributors to Kenya's economic development and most economies in the world, both developed and emerging. In Kenya, the sector is a crucial driver of economic growth and development, accounting for 8.2 % of total GDP in 2019 (WTTC, 2020). The sector also contributes to a total employment of about 1.1 million people (GoK-Ministry of Tourism & Wildlife, 2018), besides creating forward and backward linkages with other sectors of the economy, adding its contribution to about 1.6 million jobs, or 8.5% of total employment (WTTC, 2020). As the third-highest contributor to GDP, Kenya's tourism is being promoted by the government as a source of economic growth and poverty alleviation. It is alsoa cornerstone of the country's Vision 2030. Achieving the country's vision for the sector will involve protecting natural and wildlife assets against degradation: development of dynamic product offerings; streamlining the enabling and regulatory environment; improving the institutional framework, and attending to capacity-building needs (World Bank 2010).

Kenya's tourism offers memorable products in its three major product lines of safari, coastal, and business and conference travel. Cultural heritage tourism activities cut across each of these product lines and, in particular, offer potential to develop further as the next distinct product line. Safari tourism is dependent on natural and wildlife assets, which are typically remote and often difficult to access, and is highly seasonal with peaks and valleys tied to animal migration patterns. It has limited capacity given the fragility of ecosystems and the sensitivities of the animal population (World Bank, 2010).

The ocean economy is approximated to account for only 4% of Kenya's national total GDP. Moreover, among the subsectors of the blue economy, coastal tourism is the largest contributor to the ocean economy accounting for about 65% of blue economy contribution, followed by marine tourism with around 28%. Most of the other subsectors' contribution are way less than 1%. Kenya's coastal tourism offering ranges from the mass-packaged tourism of Mombasa's large coastal resorts to sleepy and culturally rich destinations, such as Lamu Island, appreciated by more independent tourists. It also offers the allure of a relaxed beach experience with the potential for day trips to nearby animal parks and cultural sites

Coastal tourism is dominated by mass tourism involving the movement of large numbers of international tourists to often all-inclusive enclave beach resorts. This form of tourism is inimical to inclusive development; as local entrepreneurs are typically excluded from the tourism value chain's benefits. By contrast, other forms of coastal tourism have firmer and more secure entry points that enable local people (including marginalized groups such as women and youth) to

participate in the industry.

Coastal and marine tourism has been a thriving exotic beach destination that matured into a popular mass tourism destination. Over time, due to the slow innovation pace, the sector has been offering outdated products, unable to compete with new destinations offering stylish tourism experiences at a reasonable price or value. The sector, however, holds much potential and requires a change of tact. The creeping economic giant could be made vibrant again by designing and offering a demand-driven mix of established and innovative coastal tourism options for mass, mid-scale, and boutique segments, drawing niche and special interest segments such as cultural heritage and adventure (World Bank 2010).

Although many people converge at the country's coastal and marine sites, they have different tastes and preferences as diverse as the countries of their origins, culture, lifestyles, values, and needs. This drives the tourism market segmentation based on different characteristics to satisfy diverse needs. Different criteria have been used to segment the tourism market:

- *Geographic*- This segmentation considers factors such as tourists' place of origin as different people with different origins have different cultures and beliefs; *Demographic*- The segmentation looks at tourists' gender, age, marital status, ethnicity, occupation, religion, income, education, and family members;
- *Psychographic*- This segment looks at people's interests, attitudes, way of living life, opinions, social class, values, and overall personality; and
- *Behavioral* - Grouping tourists based on their past actions, like spending habits, browsing habits, and brand engagements.

Demographic and geographic criteria are the most commonly used methods. A reason for the popularity is the possible correlation between demographic characteristics such as a consumer's income and occupation and psychographic factors such as lifestyle.

Marine tourism covers a wide range of activities in the deep oceans, the most predominant being cruising and sailing (Diakomihalis, 2007; Honey and Krantz, 2007). Other leisure water-based activities and nautical sports (often carried out in coastal waters) are scuba diving, underwater fishing, water skiing, windsurfing, tours to maritime parks, wildlife mammal watching, etc. (European Commission, 2014; Diakomihalis, 2007). Coastal tourism is also a form of tourism in which the water/sea element is predominant and is considered the main asset and advantage. According to Hall (2001), coastal tourism is very closely related to marine (maritime) tourism

(since it covers activities taking place at the coastal waters too), although it also covers beach- based tourism and recreational activities, such as swimming and sunbathing, coastal beach walks, etc. (European Commission, 2014; Diakomihalis, 2007). As several scholars (see Honey and Krantz, 2007; Hall and Müller, 2004 and others) argue, the most important and extended type of coastal tourism is the one related to second homes (second home tourism), organized either as part of urban development projects (second home developments), or within tourism resorts (i.e., along with hotel facilities, etc.), or autonomously (without previous planning). In Kenya, the following types of coastal and marine tourism are identified:

- *Cruising and sailing*: Although cruising and sailing have been popular at the Mediterranean and the Caribbean islands, the WIO coastal destinations have been seen as an alternative option to ease competition and crowding. Kenya has been receiving increased cruise ship traffic in the recent past. To tap this market, the Government, in collaboration with other stakeholders, has constructed a fully equipped cruise ship terminal in Mombasa that can handle 2,000 passengers at a time.

- *Water sea sports*: A diverse range of sports activities have already been established in Kenya (Mombasa, Malindi, and Diani). The most popular ones are scuba diving, speed boat riding, water skiing, windsurfing, swimming, sunbathing and coastal beach walk. The Kenyan coast is particularly favorable for water sport activities as it is protected

  by a continental shelf that makes it relatively safer for such activities. There is potential for other deep-sea sports activities (deep sea fishing which is already being done in Mombasa, Kilifi, Shimoni, and Watamu but on a small scale, etc.) but their exploitation is limited due to lack of proper equipment and skill gaps.

- *Marine wildlife tourism*: Kenya is home to some of the richest marine ecosystems with diverse sea flora and fauna; Malindi, Watamu, Kisite Mpunguti, and Mombasa marine parks. These are popular attractions to most coastal tourists.

- *Heritage and cultural tourism*: Kenya's coast has a rich history with several cultural and heritage attraction sites such as Fort Jesus, the Gede ruins, Kaya Kinondo sacred forests, etc. This segment has many potentials when blended with other attractions to bolster coastal and marine tourism. For instance, The Lamu annual cultural festival week attracts a vast number of tourists from diverse backgrounds/ origins to come and experience the rich cultural heritage of coastal people. Under such events gastronomy could flourish. Heritage and cultural tourism are especially important because they rely on sharing the indigenous

peoples' traditional knowledge and practices. Therefore, this offering is a unique experience of the region that is highly inclusive of the people. Heritage and cultural tourism add a unique dimension to Kenya's overall tourism offering while protecting and preserving the social, cultural, economic, and political identity of the people.

The above coastal and marine tourism segments are the most common attraction on the Kenyan coast. However, other segments are either being practiced at a very small scale or not practiced at all but possess a huge potential for development. Some of these are complementary activities like conferencing, thematic itineraries, ecotourism, health and spa, underwater hotels, and sea- floor floating resorts, among others.

Coastal and marine tourism is widely regarded as one of the fastest-growing areas of contemporary tourism. It's development has been spatially focused on the beach for much of the past decades, as witnessed, for example, in the slogan of the three 'S' of tourism sun, sand, and surf. The ocean and the marine environment as a whole have become one of the new frontiers and fastest-growing areas of the world's tourism sector. The full economic potential of marine resources has not been exploited. With a maritime territory of 230,000 square kilometres anda distance of 200 nautical miles offshore, Kenya's coastal and marine tourism could make a much larger contribution to the economy. The sector is however subject to seasonal fluctuations and multiple external factors, such as changes in foreign exchange rates, health and security concerns, and catastrophic events. It is perishable, competes in a global marketplace, and is susceptible to consumer trends.

2.3 Ports, harbours and maritime transport

There has been a remarkable performance in total revenues from ports, habours and marine transport which increased from Ksh. 29.9 billion in the 2013/14 financial year Ksh. 43.6 billion in 2017/18 representing an average 8% annual change over the entire period. Profit before tax registered an average increase of 16.6% over the entire period reaching kshs 10.3 billionin the 2017/18 financial year. Operating revenues showed a similar trend over the review period and registered an overall annual change of 8%. The laudable increment is attributed toincreases in throughput and investments in hard and soft port infrastructure including improvements in modal transport. The percentage share of total port revenue to sub-sector GDP has stabilized at around 12% with a high of 12.4% in 2015/16 financial year. On the otherhand, the share of total port revenue to overall GDP is about 1% on average. These two results are significant and

call for measures geared towards promotion of exports and imports on theone hand, and port development, efficiency and logistics enhancement on the other. Hinterland multimodal infrastructural development coupled with stakeholder integration in port and port related activities will go a long way into increasing port revenues.

Over the same period, the general cargo traffic also increased by 9.3% on average with dry cargo imports increasing by 14.3% and liquid bulk imports by 4.8%. The total imports handled through the port increased by 8.2% over the review period. Imports handled grew at an average rate of 6%, exports at an average rate of 5% with total throughput growing at an average rate of 6%[3]. On the other hand, and in tandem with the global increase in containerization, container traffic increased from a total of 436.7 thousand TEU[4] in 2005 to about 1,076.1 thousand TEUs in 2015, an increase of 12.6% on average. Our analysis also shows that containerized imports increased by 9.8% of the traffic while containerized exports increased by 10.1% of the traffic on average. This increase in port throughput translated into significant increases in port revenue.

Ports across the globe have been seen to positively influence the creation of employment opportunities, as a result of increased volumes and throughput. In one of such studies[5], it was found that an increase of one million tonnes of port throughput is associated with an increase in employment in the port region of 300 persons per million, which could increase to 7,500 persons per million in the long run. It was also found out that liquid bulk has lower employment impacts compared to other cargo categories, and excluding liquid bulk in estimation results in doubling employment in the port region to 600 persons per million. This finding confirms the fact that only a few jobs are needed to handle liquid bulk as the loading and unloading of a large part of this bulk is by pipelines. It was also found that private ports have the largest employment impacts in regions with one million additional tonnes of port throughput creating 1000 jobs. In the local context, increased throughput not only necessitated the direct injection of capital to facilitate port expansion of new terminals, but also the advent of inland container deports (ICDs) and container freight stations (CFSs), which were seen as a stopgap measure in containing the congestion that was brought about by increased container throughput. The ports and CFSs are responsible for around 10,000 direct and indirect employment opportunities in the country. Other indirect benefits included employment opportunities created in port related entities such as banks, insurance companies, freight forwarding, transport, etc. On asset creation, data showsthat

the share of the book value of Kenya Ports Authority (KPA) assets in sub-sector GDP has increased over time from 4.4% in the 2013/14, to 4.5% in the 2014/15 and attained a high of 5% in the 2017/18. With respect to overall GDP, this share stabilized around 2% over the review period.

Growing globalization, and outsourcing of production and manufacturing functions of organizations, have seen increase in concepts of Export Processing Zones (EPZs) and more lately, Special Economic Zones (SEZs). These have led to development of hinterland infrastructural development that connect the port of Mombasa, to the hinterland. One major project is the standard gauge railway (SGR) that connects the Port of Mombasa to Nairobi, and Suswa, where the Naivasha Inland Container Depot (ICD) is located. The ICDs serve as an extension of the port, bringing the services of the port closer to the hinterland, with manufacturers and producers able to collect or deliver their cargo for onwards delivery, at minimal costs, greatly reducing thcost of transport, and other incidental costs. Cases of cargo dumping, theft and pilferage have also greatly reduced with improved security and control of cargo, being delivered at the doorstep of consignees. The expansion of the Port of Mombasa has contributed greatly in theinfrastructure development along the Central and Northern Corridors, with expansion of highways to neighboring countries, with Mombasa directly benefitting through the Mombasa port area road development project, set to improve the road network around the port of Mombasa, and its environs, thereby greatly improving accessibility of the port, and reducing traffic congestion, and related costs significantly.

The port activities have also created a vibrant local economy: This is in the form of: a) *increased consumer spending and tax remittances* to the county exchequer; b) t*ourism promotion through* operationalization of SGR which reduced cost of commuting and high passenger capacity trains to and from Mombasa. As a result, it was envisaged that there will be some positive impetus on this sector on both local and international tourism activities; c) d*econgesting Mombasa City:* Thereis notable decrease in the number of trucks carrying containers to and from the port of Mombasa. The reduced number of trucks accessing the port through Changamwe, Port-Reitz, Docks, and Shimanzi has resulted into a gradual reduction in congestion and traffic snarl-ups in the town and improved the flow of traffic. This will also increase safety on the roads due to reduced traffic; d) e*nvironmental protection:* This huge reduction in road traffic will reduce distillate consumption, potentially augmenting climate change management initiatives. A reduction of

60 – 80 trucks off the road will lead to reduce green gas emission reduction and contribute towards the country's Paris Agreement commitments.

Customs duty collected by KRA does not go to KPA coffers but is utilized in the entire economy and can be considered as an indirect benefit. In this regard, KRA collected customs duty increased from Ksh. 502.63 billion in the 2015/16 FY to Ksh. 686.31 billion in the 2018/19 and Ksh. 656.93 billion in the 2019/20. Figure 1, presents customs duty as a percent of GDP. Note the upward trend safe for the 2019/2020 FY when it declined to 13.0% from 14.3% in the 2018/19.
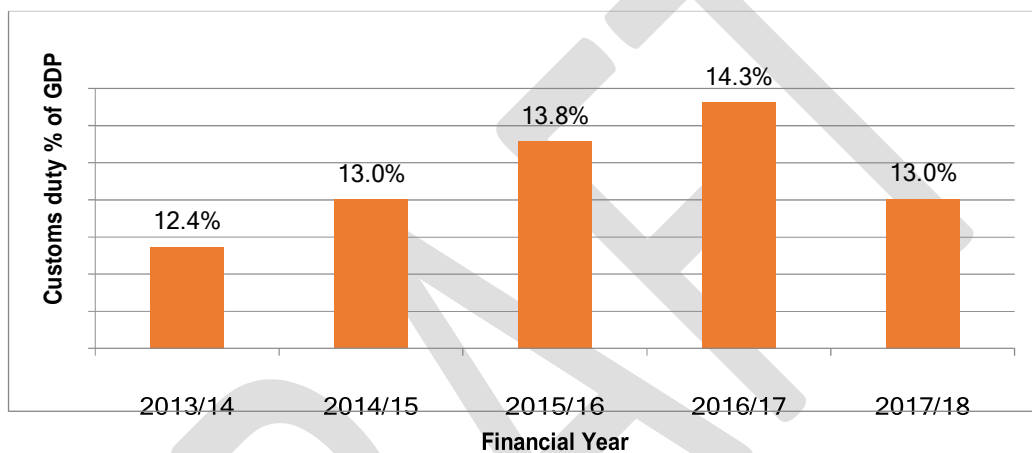
Figure 1: Customs duty as a percent of GDP

2.4 Coastal and offshore oil and gas and renewable energy

It is estimated that the offshore oil and gas potential can yield several billion barrels of oil and trillions cubic feet of gas on a gross, un-risked, best-estimate basis. The offshore potential has attracted considerable investment from companies looking to survey and explore the Lamu basin for oil and gas (NOCK, 2012). A study of the Lamu basin was initiated by National Oil Corporation of Kenya (NOCK) in 1991 as part of a long-term strategy to re-examine the existing geological, geophysical and geochemical data relating to the sedimentary basin. The study was completed in 1995 and its results were used to sub-divide the Lamu basin into smaller exploration blocks with each block having its unique characteristics. Thereafter, there were enhanced exploration efforts that generated fresh interests in the offshore Lamu basin and resulted in the signing of seven (7) production sharing agreements between 2000 and 2002.

Based on initial studies, the Government of Kenya has through a Gazette Notice Number 3344

of 13th May 2016, constituted sixty-three (63) petroleum exploration blocks, of which thirty-seven (37) are located in the Lamu basin. The Lamu basin is the largest basin and extends offshore. All the offshore exploration blocks have been defined by their longitudes and latitudes, their sizes and block maps. Offshore oil and gas exploration has been on-going with mixed results, though successful drilling and findings on land have been made in the Turkana Basin (Deloitte, 2013). A recent exploration well which was drilled offshore, close to the Exclusive Economic Zone border with Tanzania has met an oil column; the first ever oil discovered off the East African coast, with high prospects for finding commercial quantities of oil in the area particularly in the Lamu Basin (UNEP and WIOMSA, 2015). If the identified oil and gas reserves continue to yield even a small portion of the expected outcome, then Kenya will gain from income earnings and savings on fuel imports that will significantly change the national economy and contribute to poverty alleviation among the local residents.

Renewable energy too has the potential to contribute to the economy and wellbeing of communities in coastal Kenya. The main sources of renewable energy in the region are solar, wind, tidal and wave. The tidal energy potential exists along the Kenyan coast due to an approximate 4 metres spring tidal range, which creates the necessary water velocities needed to operate the submerged turbines that require water currents of 1.0 to 2.5 m/s (UNEP and WIOMSA, 2015). This energy has so far not been tapped. Wave energy has also not been tapped but there is potential for it in Kenya.

Solar power is increasingly becoming important along the coast of Kenya. Kenya has an average of 5-7 peak sunshine hours, part of which is convertible into electricity due to the dispersion and conversion efficiency of photovoltaic (PV) modules. The total potential for photovoltaic installations is estimated at 23,046 TWh/year. Solar power is a viable option for rural electrification and decentralized applications. The government has for some time subsidized the photovoltaic stand-alone systems for households and public institutions. As part of the medium to long term plan to tap on this potential, the government aims to install 500 MW and 300,000 domestic solar systems by the year 2030. Already, the use of solar power has been taken up by a number of households in the coast of Kenya and it is also increasingly becoming important in the commercial and industrial establishments. Kenya also has promising wind power potential. The Kenyan coast, however, has lower but promising wind speeds of about 5-7m/s at 50 metres with a few installations in the Tana Delta and Lamu.

2.5 Coastal agriculture

Agricultural activities along the Kenyan coast produce both food and non-food products for subsistence and commerce. However, traditional shifting cultivation and slash and burn farming practices are widespread. According to Waaijenberg (2000), 25% of the coastal land is non-agricultural, 50% is suitable for ranching and 25% is suitable for crop farming. Irrigation farming contributes a high percentage of the coastal agriculture with main cash crops being sugarcane and rice. Most of the farming is rainfed implying that crop production is seasonal and characterized by abundance of food during the rainy season and scarcity during the dry season. Livestock production contributes significantly to the Kenyan coastal economy. It is mainly concentrated on the marginal lands of the coastal region, which accounts for some 69 percent of the total coastal area. For example, the pastoral communities in Tana River County graze large herds of cattle in the lower ridges of the Tana River basin. There are 85 ranches within the coastal region, with 25 being operational.

The main food crops grown on the Kenyan coast include cassava, sweet potatoes, maize, coconut, cowpeas and rice, which are grown in irrigated areas, marshes and floodplains. Vegetables and tropical fruits such as citrus, mangoes, bananas, pineapples and watermelons are grown for both subsistence and export. Other crops grown mainly for export include cashews, bixa and sisal. The average farm size on the Kenyan coast is between 6 and 8 ha, and tree crops (cashews, coconuts, citrus and mangoes) occupy about 50 percent of the coastal arable land. Coastal agriculture is usually undertaken in low-lying and saline-prone soils where spatial competition with urban growth is an increasing problem. This land is usually sandwiched between land and sea. Coastal agriculture is thus more susceptible to climate change and anthropogenic disturbance such as temperature changes, erratic rainfall, sea-level rise, salinity, tidal processes, water stresses, waterlogging and land use changes such as increased population and pollution, compared to inland farming system. According to USAID (2018), a sea level rise of 30 cm is estimated to threaten 17 percent (4,600 hectares) of Mombasa with inundation. This would greatly affect the available limited agricultural land for the coastal residents.

The coastal region is unable to produce enough food to feed its population and has to import food from upcountry, thus poverty levels in the coastal counties are way above the Kenyan average poverty level of 12.2%. Just like in other ASAL areas of Kenya, irrigation plays a key role in agriculture in the coastal areas. The main source of irrigation water are the rivers that pass through these areas. Irrigation of crops such as sugarcane and rice in the coastal areas have contributed construction of a sugarcane factory in Kwale County and a rice miller in Tana Delta area, respectively. The main source of water for these irrigation activities are the surface water bodies such as rivers, shallow wells, springs, water pans, dams, boreholes etc. This is because, despite the closeness to the ocean which can provide large volumes of irrigation water, it is salty and there are only a few desalination projects e.g., in Kizingitini Island and a clinic in Mombasa.

In Lamu County, the agricultural sector contributes 90% of the total household income. The main crops grown here are maize, cowpeas, dolichos, cassava, pigeon peas, and green grams. For commercial purposes, the main crops are mangoes, coconut, cotton, bixa, and simsim. According to Lamu County Integrated Development Plan (CIDP), 2018, the County is the largest producer of cotton (40%), simsim (50%) and bixa (40%) of all production in the country. Livestock accounts for 30% of all agricultural production in the county, and the main animals kept are cattle, sheep, goat and poultry (GoK, 2017). Land tenure issues in the County have significantly contributed to lack of access to agricultural credit, as only 20 percent of the farmers in the County have title deeds for their land. This reduction on credit access partly explains why the poverty level in the County is about 31.6%, according to KNBS report of 2019.

In Kwale County, agriculture as a source of income accounts for 80.6% of all household incomes. The sector employs about 62,681 in the county[6].

Kilifi County is classified as an arid and semi-arid area and 65% of Kilifi faces seasonal water shortage. Residents of those areas opt for rain water harvesting or depend on pans for regular supply of water for domestic and livestock use. The water pans however often dry up during the dry spells. The County has four main livelihoods zones including 44% of the population engaged in Marginal Mixed Farming (MMF), 22% cash cropping/dairy, 11% Mixed Farming and 2 % ranching. Other livelihood zones include 3% fishing and mangrove, 14% formal employment and 2% forest/tourism and casual labour. The main food crops grown in Kilifi include cassava, maize, cow peas, rice, and green grams. Fruits such as mangoes and bananas

are also grown as are horticultural crops including cashew nuts and coconuts (Kilifi County, 2017).

Taita Taveta County has the largest ASAL area of all coastal Counties, with only 12% (205,500 ha) constituting arable land, which is equivalent to 3.7% of the national arable land. This arable area experiences high human population pressure as the largest part of the County (62%) is covered by Tsavo National Park thus further restricting settlements due to potential human- wildlife conflicts. The poverty level of the County is at 57% and food poverty stands at 48% thus the County is not food self-sufficient. Land in the County is communally owned with approximately 35% of the population having title deeds (Taita Taveta, 2017).

2.6 Coastal and marine forestry

The Kenyan coast is endowed with rich coastal and marine forestry resources that support the local and national economy. Some of these resources include mangrove forests, coral reefs, terrestrial forests, sandy beaches and seagrass beds. These ecosystems support high biodiversity which in turn support economies and livelihoods (Samoilys *et al.* 2015). Coastal forests in Kenya are composed of mangrove forests, eastern arc mountain forests, and the lowlands terrestrial forests. The forests cover the coastal counties, including Lamu, Kilifi, Athi River, Kwale and parts of Taita Taveta and Garissa. The Kenyan coastal forests are part of the eastern coastal forests and are known for the high number of endemic fauna and flora. The forests extend from Somalia to Mozambique and are biodiversity hotspots with more than 4500 species from 1050 genera and are referred to as the 'Swahili center of endemism' (Burgess and Clarke, 2000; Luke, 2005; Fungomeli *et al.*, 2019). Apart from being habitat for the flora and fauna, these forests are also significant reservoirs of carbon. However, 90% of these forests have been lost due to threats they are facing of increased anthropogenic activists due to the growing population and development and climate change (Burgess and Clarke, 2000; Fungomeli *et al.*, 2019; Ngumbau, 2020). This forests cover about 3,170 km^2 with Kenya having approximately 20% (787 km^2) (Burgess *et al.* 2003). Some of the forests gazetted as conservation areas include Shimba Hills, Arabuko-Sokoke and Tana River Forests, managed jointly by Kenya Forest Service (KFS) and Kenya Wildlife Service (KWS), while Kaya forests are managed by the National Museums of Kenya for their cultural significance (Table 2).

Table 2: Coverage and legal status of terrestrial forests in coastal counties of Kenya

County	Forest	Area (ha)	Legal Status
Kilifi	Arabuko Sokoke	42,000	Forest reserve
	Madunguni	1000	Forest reserve
	Mwangea Hill	2,000	Trust land/ private
	Nzovuni	500	Trust land/ private
	Dakatcha woodlands	32,000	Trust land
Kwale	Shimba Hills	19,242	Forest reserve
	Mkongani	2,479	Forest reserve
	Mwaluganje	1,414	Forest reserve
	Mwache	417	Forest reserve
	Buda complex, Mrima, Dzombo, Marenje, Gonja.	5,080	Forest reserve
	Kilibasi	500	Trust land
Tana river	Wayu	42,512	Forest reserve
	Kokani	61,495	Forest reserve
	Bangali	119,373	Forest reserve
	Mbalambala, Hewani ,Mwina	10,298	Forest reserve
	Kipini	22,016	Provisional forest
Lamu	Witu Lamu	4,676	Forest reserve
	Boni/ Lungi	39,925	Forest reserve
	Panda Nguo	41,316	Forest reserve
	RasTenawi	2,000	Trust land
Taita Taveta	Forest Reserve (incl. Fururu, Mwandogo, Ngangao etc.)	1108	Forest reserve
	Trust Land (incl. Kasigau, Kalangu,Mwarang'u etc.)	5275	Forest reserve
All counties	Kaya (over 50 sites)	2,840	National monuments

Sourced from KFS, 2015, Samoilys *et al*., 2015

These Kaya forests are essentially residual forest patches (average 0.1- 2km^2) of lowland forests that were once broad and wide-ranging. In Kenya, Kaya forests usually occur in the plains and hilly coastal regions. These Kayas are highly diverse, harbouring more than half of the rare plants in the Kenyan coast (Younge, 2002). In the beginning, Kayas survived due to the culture and religion of the coastal Mijikenda ethnic groups. Over time, a decline in knowledge and respect for traditional values resulted in the degradation and loss of many of the small Kaya forests. The loss was worsened by rising demand for forest products and land for agriculture, mining and other activities due to increased population. To date, there exist almost 50 gazetted Kaya forest patches in the coastal region most of which are protected under the National Museums' Coastal Forest Conservation Unit with support from the World Wide Fund for Nature WWF (Polidor, 2004).

The Eastern Arc Mountains stretch for some 900 km from the Makambako Gap, southwest of the Udzungwa Mountains in southern Tanzania to the Taita Hills in south-coastal Kenya. They comprise a chain of 12 main mountain blocks: from south to north, Mahenge, Udzungwa, Rubeho, Uluguru, Ukaguru, North and South Nguru, Nguu, East Usambara, West Usambara, North Pare, South Pare and Taita Hills. The total Taita Hills is approximately 600 ha, mostly in fragmented form with a closed canopy forest of about 200 ha. In addition, 120 ha of land in Taita Hills are protected as a forest reserve. Their proximity to the Indian Ocean ensures high rainfall of about 3,000 mm/year on the eastern slopes of the Ulugurus, falling to about 600 mm/year in the western rain shadow. Mangrove forests are also a common feature in protected bays, creeks and tidal estuaries extending between high and low water marks of the spring tides. These forests are estimated to cover an area of 61, 271 ha, translating to about 3.0% of the national forest cover. Lamu County has the largest coverage of mangrove forests (61%) while Mombasa and Tana River Counties have the least coverage.

Forestry and logging industry contributed about US$ 1.2 million to Kenya's GDP in 2019. While recent figures on economic valuations on coastal forests are lacking, as of 2008, the 660 square kilometres of coastal forests were valued at US$ 133 million while the 500 square kilometres of mangroves were valued at US$ 500 million (UNEP, 2009). It is estimated that the formal forest sector in the country employs 18,000-50,000 people directly and 300,000-600,000 people indirectly making it a major source of employment particularly in the rural areas (MENR, 2016). However, the contribution of coastal forests to Kenya's GDP remains under-reported due to

the omission of value addition of forest products by the manufacturing sector, the omission of the provision of wood and non-wood forest products to the subsistence economy as well as the omission of the provision of ecosystem services.

Mangrove forests in Kenya provide timber products for construction, furniture and boat building. Mangrove species such as *Rhizophora mucronata* and *Ceriops tagal* are preferred due to their excellent wood quality and resistance to termites. *Sonneratia alba* is used to make the ribs of boats while large trunks of *Avicennia marina* are used to make dug-out canoes. About 96,739 scores of mangrove poles (1 score = 20 poles) were harvested across the Kenyan coast in 2014. Many communities living adjacent to the forests also depend on coastal forests for fuelwood, either as firewood or charcoal. It is estimated that up to 90% of rural household energy requirements are met by coastal forests (Githitho, 2004). The forests also provide opportunities for wood carving that generate between US$ 20-25 million annually in export revenues. The mahogany tree from the Arabuko-Sokoke forest is one of the main trees exploited for wood carving, making it a vital element in the coastal tourism sector. Mangrove forests also play an important role in shoreline protection. They diminish the energy of incoming waves, lessening the risk of flooding to the communities living behind the mangroves. The alternative to mangrove forests would be the construction of sea walls which are expensive to construct and maintain considering the sea wall at Vanga was constructed at a cost of US$ 952 per metre with 1% of the total cost required annually for its maintenance (Huxham et al., 2015). Currently, the value of mangroves to shoreline protection in Kenya has been estimated at US$ 1,200 per hectare annually (Kairo *et al.,* 2008; GoK, 2017). The mangroves support the sustenance of fish populations by providing habitats for fish to breed, spawn, hatch and feed. It is estimated that 70% of commercial fishery species depend on mangroves as breeding and fishing habitats. The value of mangroves fisheries in Kenya has been estimated at US$ 95 per hectare annually (Kairo *et al*., 2008), and more than 85% of fishing activities along the coast are carried out by artisanal fishermen in the shallow inshore areas within and adjacent to the mangroves. This sector directly employs more than 20,000 fishers.

Other than wood products, communities also extract other non-wood products from the forests such as medicines, tannins and honey. The coastal forests provide 70-80% of the medicine usedby the poor local communities. Communities around the Arabuko-Sokoke forest earned approximately US$ 37,000 in 2001 from beekeeping and butterfly farming. Wild animals hunted for game meat also contribute a valuable resource provided by coastal forests to the

local communities (Matiku, 2004). Coastal forests are also rich in minerals, mainly titanium and lead. Silica sand used for glass manufacture has been harvested in Arabuko-Sokoke forest, but this has since stopped, with the old sand quarries becoming a distinctive biodiversity site within the forest. Extensive salt works have been established in Ngomeni, Kurawa and Gongoni which has led to the destruction of the mangrove habitats within these areas.

The coastal forests are important tourist destination areas, with Shimba hills and Arabuko-Sokoke being famous for nature trails and camping. The boardwalks at Gazi, Wasini and Mida Creek mangrove forests generate incomes for the local communities, with the Wasini boardwalk generating more than US$ 25,000 annually through mangrove tourism. The mangrove forests along the coast also offer excellent opportunities for bird-watching such as those of Mida Creek, Ramisi and Kipini. Local communities in Shimba hills have earned incomes from tourism through the development of lodges within the Mwaluganje elephant conservancy. Coastal forests arealso key research fronts for international researchers. In addition to this, the coastal forests ofKenya have unique biodiversity values with more than 554 endemic plants (40% of the total endemic plants in the forests of Kenya) and 53 endemic animals. The area is therefore considered a major global conservation priority due to the high level of endemism and severedegree of threat. The Arabuko-Sokoke forest is ranked the second most important forest for conservation of bird species in Africa, with over 230 bird species recorded in the area, including six globally threatened species. The high endemism in the area supports tourism activities as well as research activities which contribute to the country's GDP.

Coastal forests indirectly contribute to the country's GDP through regulating services such as coastal protection and carbon sequestration, as well as supporting other activities such as fisheries and tourism. Coastal tourism in Kenya contributes about $1.5 billion annually which is about 4% contribution to the country's GDP (GoK, 2020). The indirect economic contributions of coastal forests may, in some cases, exceed the direct contributions to GDP. For instance, the mangroves in the South coast of Kenya are valued at US$ 6.5 million with 59% of the value on average derived from regulating services (Huxham *et al.*, 2015).

Coastal forests also play an important role in the context of climate change, by acting as carbon sinks. Mangrove forests are critical ecosystems because these ecosystems are capable of storing 10 times as much carbon as their terrestrial forests. Consequently, the degradation and conversions of these habitats has the potential of large-scale carbon emissions. The carbon captures by these ecosystems could be accounted for and sold in international carbon markets. The Mikoko

Pamoja community group in Gazi bay, Kwale County, has successfully been able to trade mangrove carbon credits in the voluntary carbon market generating an annual income of US$24,000. Activities of Mikoko Pamoja have been replicated in Vanga Blue Forest, in Vanga; where the community are receiving double the income in Gazi through sale of mangrove carbon credits. Despite the importance of coastal forest resources, the richness of the region's world- class ocean ecosystems is under threat from both direct and indirect pressures through resource exploitation and human-induced habitat degradation. For example, mangrove coverage is diminishing in most countries in the WIO region. For instance, Kenya and Tanzania lost about 18per cent of their mangroves over 25 years, and Mozambique lost 27 per cent over a shorter timeframe (Bosire 2015).

2.7 Inland, coastal and offshore mining and extractives

Mining currently contributes slightly less than 1% of Kenya's GDP. It is the aim of the government to push this contribution to at least 10% contribution by the year 2030. Despite the low contribution to GDP, mining and quarrying were estimated to employ more than 296,700 Kenyans in the private sector and 700 in the public sector (KNBS. 2020). The major minerals produced in Kenya are fluorspar and soda ash. Gold is produced in small quantities by artisanal mining although gold exploration by mining companies indicates that there is great potential in this mineral. Cement is produced in large quantities, although it does not meet the current demand in the construction industry. Kenya is also a gemstone producer with deposits of ruby, pink sapphire, and tsavorite (green garnet).

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. However, these activities need to be assessed further in terms of their status, potential, values, and governance regimes. The value of exports for the coastal minerals was Ksh. 0.77billion for stone, sand and gravel; Ksh. 3.87 billion for salt; and Ksh. 13.85 billion for titaniumores and concentrates (KNBS, 2020). There are also vast titanium reserves in the Magarini sand belts that are currently being mined in Kwale district (Matiku, 2004; UNEP, 2009). Titanium mining in Kenya generated earnings of $115.7m in 2019/20 financial year which is 65% of Kenya's total mineral output value. Direct taxes, royalties and VAT in the last financial year from titanium mining amounted to $32.5m (Base Titanium, 2021).

Mining is an important component of Kenya's exports. Exports from the coastal Kenya include

products from Kaysalt, a salt manufacturing company which exports to Tanzania, Uganda, Rwanda, Burundi, DR Congo, North Malawi and South Sudan. Table 3 gives a brief summary of some of estimated export value for some mineral found at the Kenya Coast. The value of exports for the coastal minerals was Ksh. 0.77 billion for stone, sand and gravel; Ksh. 3.87 billion for salt; and Ksh. 13.85 billion for titanium ores and concentrates (KNBS, 2020). These figures largely cover the coastal and offshore mining and extractives, with limited coverage on the inland blue economy, associated with major lakes and rivers, which only has scanty information on mining and extractives.

Table 3: Export values of minerals from Kenya Coastal area

Mineral	Value of Exports Ksh Millions (2019)
Stone, sand and gravel	769.60
Salt	3,870.70
Titanium ores and concentrates	13,852.50

Source; KNBS Economic Survey, 2020

In employment creation, the Malindi Public inquiry Audit report of 2006 reported that local communities had received direct employment from companies and organisations involved in this sub-sector. Being a key sector to Kilifi's economy, the salt industry employs over 1,100 workers directly from the community thereby reducing the levels of unemployment among the locals. Increased employment implies increased cash flow as well as improved purchasing power of products in the mining locality. The mining companies also generate revenue to their counties. An example is Tana River County which collected revenue from gypsum related operations amounting to Ksh. 3.607 million, in the year 2016 (Tana River CFSP, 2016). Through licensing and other forms of taxation, the national Government has also benefited from this additional source of National revenue. Mining companies are taxed at 30% unless they are a branch of a foreign company in which case the tax rate is 37.5% (Deloitte, 2018). This means that foreign mining companies at the coast like Base titanium are taxed higher compared to local mining companies therefore contributing more to Kenya's tax revenue. Gemstones and other precious metals (such as gold and silver) are subject to royalties at 5% (Stevens, 2017). According to the Ministry of Mining and Petroleum, the royalties made by the government for some of the minerals mined at the coast of Kenya were based on the following 2013 rates; Titanium – 10%, Gemstones – 5%, Industrial minerals – 1%, Cement mineral levy Ksh. 140 per tonne.

Through exploration or exploitation of minerals and extractives, coastal communities have

immensely benefited from infrastructural development especially the electricity, road and rail transport and telecommunication, particularly in the areas adjacent to the mining areas. Increased coastal mining has also significantly contributed to the increase in the manufacturing sector in Kenya. Most of the salt manufacturing companies are situated in the Kenyan north coast include: Kensalt Ltd, Kurawa Industries Ltd, Malindi Salt Works, Krystalline Salt Ltd and Kemu Salt Packers Production Ltd. The country's production meets domestic demand with the excess being exported to neighbouring countries (Rasowo *et al.*, 2020). Some of the companies that are involved in mining at the coast are of foreign such as Base titanium from Australia, which improve foreign exchange to the economy.

Mining and extractives has also led to formation of community support initiatives, which include SACCOs such as Nyumba Sacco limited which financially empowers employees of Mombasa Cement Company located in Vipingo, Kilifi County among other companies. This has empowered members by offering credit to employees for entrepreneurship, investments and their further development which indirectly contributes to the GDP. There have also been community and environmental programs. For instance, Base Titanium *c*orporate social responsibility (CSR) fund, has partnered with other organizations such as 'Cotton on Group' from Australia and 'Businessfor development' to promote the agricultural sector in the community. The platform was formed as a result is the 'Business Partnerships Platform' whose aim is to promote cotton and potato growing in Kwale by equipping farmers with skills and training for cotton farming. This has enabled farmers to transition from subsistence cotton farming to more sustainable cotton growingpractices. According to Cotton on Group, the program involved over 2,500 farmers in 2018 which saw roughly 1,600 tonnes of raw cotton harvested and assisted many of those farmers in doubling their income, indirectly contributing to the GDP. Another notable contribution by Base Titanium is the contribution towards county health infrastructure through construction of a blood bank centre in Msambweni in 2018 (Kwale County Fiscal Paper 2019). Kensalt Company also provides education scholarships to local students.

Increased manufacturing in the Country: Increase in coastal mining has significantly contributed to the increase in the manufacturing sector in Kenya. Most of the salt manufacturing companies are situated in the Kenyan north coast namely: Kensalt Ltd, Kurawa Industries Ltd, Malindi Salt Works, Krystalline Salt Ltd and Kemu Salt Packers Production Ltd. The country's production meets domestic demand with the excess being exported to neighbouring countries (Rasowo *et al*., 2020).\

The sector contributes the following to the country's GDP.

Exports: Mining is a good contributor of Kenya's Exports. Examples of exports from the coast of Kenya include products from Kaysalt, a salt manufacturing company which exports to Tanzania, Uganda, Rwanda, Burundi, DR Congo, North Malawi and South Sudan.

Employment creation: According to the Malindi Public inquiry Audit report of 2006, Local communities have received direct employment from companies and organisations involved in this sub-sector. Being a key sector to Kilifi's economy, the salt industry employs over 1,100 workers directly from the community thereby reducing the levels of unemployment among the locals. Increased employment implies increased cash flow as well as improved purchasing power of products in the mining locality.

Revenue to Coastal Counties: Mining companies also generate revenue to their counties. An example is Tana River County which collected revenue from gypsum related operations amounting to Ksh. 3.607 million, in the year 2016 (Tana River CFSP, 2016). Through licensing and other forms of taxation, the national Government has also benefited from this additional source of National revenue.

Infrastructure development: Through exploration or exploitation of minerals and extractives, coastal communities have immensely benefited from infrastructural development especially the electricity, road and rail transport and telecommunication, particularly in the areas adjacent to the mining areas.

Tax contribution: Mining companies are taxed at 30% unless they are a branch of a foreign company in which case the tax rate is 37.5% (Deloitte, 2018). This means that foreign mining companies at the coast like Base Titanium are taxed more compared to local mining companies therefore contributing more to Kenya's tax revenue. Gemstones and other precious metals (such as gold and silver) are subject to royalties at 5%. (Stevens, 2017

CHAPTER 3

POTENTIALS FOR FURTHER DEVELOPMENT OF BLUE ECONOMY SECTORS

3.1 Potential for development of deep-sea fisheries, mariculture and aquaculture

The coastal and deep-sea fisheries consist of the small-scale, semi-industrial, industrial, aquariumand recreational fisheries. It contributes over 10% of the total annual national fishery production in Kenya, which is estimated to be about 146,500 MT. Production from the coastal and deep-sea fisheries declined during the 1990s and stabilized at about 9,000 MT annually, with a value of KSh.1.8 billion. The decrease in production was associated with declines in fish stock abundance particularly in the nearshore fishing grounds (Kimani et al., 2018) where small-scale fishers operate. The same trend continued after the 1990s up to more recently when the figures were revised.

The annual production estimate from the coastal and deep-sea fisheries was recently revised based on scientific Catch Assessment Surveys to approximately 23,000 MT, and can still be revised upwards since the catches from the Exclusive Economic Zone (EEZ) by the Distant Water Fishing Nations (DWFN) are often under-reported (Kimani et al., 2018). The catches fluctuate significantly between months with the highest catches each year occurring between January and March when fishing for deeper water stocks take place (Ndegwa and Geehan, 2017). Approximately 80% of production is landed by small-scale fishers who are generally referred to in Kenya as artisanal fishers. The rest of the fish and other fishery products are landed by semi-industrial and industrial fishers. Demersal reef fish contribute approximately 50% to the coastal and deep-sea fisheries production. The other groups include pelagic species (35%), molluscs (9%), crustaceans (3%), and the rest consist of sea cucumbers, cephalopods (octopus and squids), elasmobrachs (sharks and rays) and unclassified species.

Finfish landings have been fluctuating over the last 40 years with the lowest landings of 1,476 MT recorded in 1995. The demersal landings remained fairly constant since 2007 with an average of 4100 MT. Scientific estimation of total production placed the landings at 13,302 MT and 10,135 MT in the years 2014 and 2015 respectively (Kimani et al., 2018). The small-scale reef finfish fishery has experienced overfishing that has resulted in declining yields, dwindling sizes of fish landed, decreasing species richness and changes in species composition (Kimani et al., 2018; Samoilys et al., 2016; Tuda et al., 2016; Kaunda-Arara et al., 2004; Hicks and McClanahan, 2012), which is evident in changes from a dominance of top predators

particularly groupers and snappers to lower trophic level species. Most of the catches landed by the artisanal fishers consist of a high proportion of up to 60% of juvenile fish which suggest a high probability of growth overfishing. In addition, the three most abundant species in demersal catches namely *Lethrinus lentjan, Siganus sutor*, and *Leptoscarus vaigiensis* have shown evidence of recruitment overfishing.

The tuna and large pelagic species have experienced overfishing for a few species while the stock status of most species has remained largely unknown with large variations in catches across years (Kimani et al., 2018). The small and medium pelagic are experiencing overfishing with large temporal variations. Shallow water prawn has remained uncertain and it is expected that environmental factors may impact on the fishery (Munga et al., 2013). The marine aquarium fishery is characterized by overfishing of some species with high spatial variations influenced by recruitment patterns (Okemwa et al., 2016). The sea cucumber is overfished and needs regulation to recover (Muthiga et al., 2010). On the other hand, shallow water lobster, mud crab (*Scylla serrata*) and octopus are optimally exploited.

The Catch Per Unit Effort (CPUE) which is used as an index for measuring relative abundance, based on the assumption that it is proportional to the size of the fish stock and that the allocation of the fishing effort is random, has been fluctuating. The CPUE at the south coast of Kenya revealed that the average catch per trip declined 4 fold from 13.7 kg per fisher per day in the 1980s to about 3.2 kg per fisher per trip in the 1990s and remained stable (Samoilys et al., 2016). Further, a decline of 1-2 kg per fisher per trip has occurred among the commonly used fishing gears from the year 2008 (Table 4) (Kimani *et al.*, 2018).

Table 4: Composition of mean CPUE of common fishing gears at the south coast of Kenya

Gear type	CPUE (Kilogrammes per fisher per trip)		
	2003/2004	2008/2009	2014/2015
Small gill nets	3.7±0.5	5.2±0.3	4.2±0.9
Basket traps	4.4±0.1	5.5±0.6	4.6±0.5
Handlines	5.1±0.1	4.5±0.1	3.6±0.4
Spear guns	6.1±1.1	6.2±0.7	4.0±0.4
Beach seines	7.9±3.7	2.6±0.4	2.5±0.2

Source: Kimani *et al.,* 2018

Management of capture fisheries is expected to improve tremendously with the support of the new World Bank funded project, the Kenya Marine Fisheries and Socioeconomic Development Project (KEMFSEDP) which aims to support efforts to leverage emerging opportunities in the Blue Economy with the objective of improving management of priority fisheries and mariculture and increasing access to complementary livelihood activities in coastal communities. The project will strengthen the management of priority fisheries to secure stocks at sustainable levels of harvesting thereby enhancing coastal livelihoods.

Kenya has inadequate infrastructure, trained manpower and scientific skills to fully assess her marine resources. Further, there is inadequate data to support full description of the fisheries particularly in the Exclusive Economic Zone (EEZ) although much progress has been made by the Kenya Marine and Fisheries Research Institute (KMFRI). Basic information on commercial fisheries species is incomplete, and more information is required to describe their biological characteristics and reference points, distribution patterns, fishing pressure and stock status. A few commercial fisheries species have effective management plans while most are at risk of overexploitation by a growing human population in the coastal areas. The pressure of environmental changes on fish stocks and ecosystem functioning are not adequately understood. The environmental changes have been worsened by global climate change with the associated changes in temperature, pH, and sea level. Kenya adopted the Ecosystem Approach to Fisheries management (EAF) as move towards sustainable utilization of fish stocks and enhancing ecosystem functioning. The positive offshoots of EAF management will need to be demonstrated to stakeholders, especially in the artisanal fisheries, to encourage its acceptance and support at community level.

Globally, dwindling catches from capture fisheries has necessitated the development of aquaculture to increase the supply of fish to meet the rising demand from growing human population (Pauly *et al.,* 2002). Consequently, aquaculture has grown quite fast globally with an annual growth of 5.8 percent during the period 2001-2016 (FAO, 2018). The contribution of aquaculture to global fisheries production has risen from 25.7 percent in the year 2000 to 46.8 percent in the year 2016 (FAO, 2018). It provides opportunities for sustainable food production, livelihoods and income of local communities (Phillips, 2019). In Kenya, there is a great potential in aquaculture due to diverse water resources ranging from brackish to fresh and marine waters which can be harnessed for aquaculture development. Kenya is also

endowed with a 640 km coastline, a territorial sea extending 12 nautical miles and an Exclusive Economic Zone that spans 350 nautical miles. The large expanses of brackish water at the River Tana delta and Athi-Sabaki River estuary, other rivers and small water bodies can also be utilized for coastal aquaculture. The potential can be tapped as part of Blue Economy development, which recognizes the productivity of healthy freshwater and maritime based economies, and promotes the conservation, sustainable use, and management of associated marine resources (UNECA, 2016).

Development of mariculture in many developing countries, particularly in Africa, has remained low and has not been able to realize sustainable increases in production (Brummett and Williams, 2000) because of high cost of production and other constraints. Mariculture involves the culture of milk fish, mullets, mud crabs, seaweeds, oyster and prawns (Mwaluma, 2002; Wakibia *et al.*, 2011; Mirera, 2011; 2014), Artemia and maine tilapia, with the mariculture projects involving production systems operated by self-help groups that consist mainly of female farmers (Odhiambo *et al*., 2020; Mirera and Ngugi, 2009). This practice has made some progress over the past decades, through application of simple innovative technologies, such as construction of less expensive ponds, pens and cages. Prawn culture began in the mid1980s with large scale demonstration ponds established at Ngomeni in Kilifi County (formerly Kilifi District) through funding from the Food and Agriculture Organization of the United Nations (Ronnback *et al.,* 2002; Balarin, 1985; Mirera, 2011; Munguti *et al.,* 2014; UNEP, 1998). The Ngomeni Prawn Farm produced significant quantities of prawns and gave technical support for the advancement of two satellite farms, Wampare's Prawn Farm and Kwetu training centre prawn farm, before it collapsed after donor funds were withdrawn. Thereafter, mud crab fattening was introduced in the coast of Kenya in the late 1990s to support mangrove conservation and provide food and income to the local communities (Primavera *et al*., 2000; Mirera, 2014). It began by crab fishers collecting juvenile and sub-adult crabs from the intertidal areas and selling to farmers at lower rates than the market size crabs. Mud crab farming farming has however stagnated at the pilot stage for many years (Odhiambo *et al,* 2020; Mirera, 2011). Presently, there is a private company, Crab Alive, which has established a commercial production of mud crab using modern technology at Che Shale, north of Malindi town. The mud crab from this private business enterprise is for export.

Oyster culture was carried out at Gazi Bay and Mtwapa creek in the 1990s and resulted in the production of 10 million oysters (*Crassostrea cucullata*). Oyster was produced for the tourist

hotels but the violence that occurred in the coast in 1997 disrupted tourism hence the project was discontinued because of lack of market for the product. Seaweed farming was initiated in the south coast of Kenya on an experimental scale in the late 1990s with the main commercial species farmed being *Eucheuma denticulatum* and *Kappaphycus alvarezii*. It has grown to become an important livelihood activity in the south coast where it is mainly carried out by women and employs 100-400 farmers (Odhiambo *et al*., 2020; Wakibia *et al*., 2011). Production of dry seaweed has increased from less than one ton in 2008 to more than 45 tons in 2017. More recently, seaweed farming has attracted new farmers with more villages that initially did not participate in seaweed farming joining it. Presently, there is focus on upscaling production to other areas, increasing production per unit area and value addition under the support of KMFRI, the Ocean and Blue Economy Office, Kwale County Government, Brand Kenya, Kenya Industrial Research and Development Institute, FAO, and C-Weed Corporation Kenya Limited (the company that buys seaweed).

Despite mariculture registering some growth, it has not realized its financial viability and ecological potential because of several reasons: challenges of inadequate or seasonal availability of seed and feed, inadequate extension services, ineffective monitoring and evaluation planning and execution embedded in their operations to keep project activities on track, donor syndrome that has been created among project beneficiaries by establishment of small-scale projects that do not have full ownership, impact of donor driven conservation projects, lack of capital investments, lack of or inadequate access to market and limited technological capacity, and small scale operations that do not allow economies of scale. In the year 2009, an Economic Stimulus Programme was initiated by the Government of Kenya to establish a vibrant aquaculture industry but the Programme did not support mariculture since it mainly focussed on freshwater aquaculture (Odhiambo *et al*., 2020; Munguti *et al*., 2014).

3.2 Potential for development of coastal and marine tourism

Coastal and marine tourism has been a thriving exotic beach destination that matured into a popular mass tourism destination. Over time, due to the slow innovation pace, the sector has been offering outdated products, unable to compete with new destinations offering stylish tourism experiences at a reasonable price or value. The sector, however, holds much potential and requires a change of tact. The creeping economic giant could be made vibrant again by designing and offering a demand-driven mix of established and innovative coastal tourism options for mass, mid-scale, and boutique segments, drawing niche and special interest segments such as cultural heritage and adventure (World Bank 2010). The realization of the coastal and marine potential is foreseeable and achievable. Some potential priority areas of investment are hereunder.

3.2.1 Priority areas for improvement of coastal and marine tourism

Cruise ship tourism: Kenya has the edge over other countries on the Indian ocean coast and is ideal for cruise ship tourism destinations. This type of tourism attracts high net worth tourists, with industry experts pointing out that 400 cruise tourists are equivalent to 4000 air travel tourists. Kenya Ships Agent's Association notes that with only 40 cruise ships calling at the Kenya coastal destination, the country could earn up to 20 million US dollars. The development of cruise ship tourism infrastructure is vital in promoting and popularizing Kenyan coastal and marine tourism. In this regard, the construction of the cruise ship terminal at the Mombasa port has been completed. The terminal contains restaurants, duty-free shops, conference facilities, offices,

baggage conveyor belts, migration, and health facilities. The terminal is well equipped to handle 2000 cruise ships' passengers at a time. This terminal is however under-exploited currently as it is not occupied all the time. The country can use this facility to start port tourism.

Investors can take opportunity to offer trips for tourists arriving at the terminal, from Mombasa to other places like Zanzibar, Pemba etc. The proximity of the port of Mombasa to Moi international airport makes it ideal for cruise-fly services. There are also well-developed hotels and beaches of international standard. The seaport is also close to some of Kenya's iconic game reserves and national parks which also makes it possible to have cruise-safari.

Water sports tourism: Kenya has great potential for water-based tourism activities. The country has extensive beaches and coastal lines protected by the continental shelf, making it relatively safe for water sports tourism. Some of the activities that are taking place include Skydiving atDiani Beach, snorkeling at Malindi, windsurfing, Kite surfing, and jet skiing, among others. Although these activities exist, their potential has not been fully exploited due to a lack of equipment and skilled human resources. The coastal counties can partner with the national government and market Kenyan coast as one destination and organize annual events like sky diving. This will be quite inviting, attracting tourists from across the globe to participate or witness an annual sporting event. This could serve the hugely youthful regional and domestic population. It will also help reduce the seasonal effects of coastal and marine tourism in Kenya.

Deep-sea Sport fishing, sea safari, and mountain trips: Sport fishing is attracting more tourists, both domestic and international. Although this is existing, the current methods are unsustainable as local fishers are fishing along the shores and fish resources are slowly depleting. There isneed to build capacities of local fishers through training to fish in the deep seas. Moreover, investing in right boats to enable fishers go into the deep seas is imperative as many fisherscurrently use canoes. With adequate investment in the right fishing equipment and capacity building through training, there will be potential for sport tourism where stakeholders can organize and market fishing expeditions. The tourists will be accompanied by competent fishermen into the deep seas for fishing. The Kenyan ocean waters including Exclusive EconomicZone (EEZ), are rich in fish species. For example, it is only in Malindi where one can catch five different types of billfish in a day; broadbill, swordfish, black, blue, and striped marlin, and sailfish. Such a spectacular deep-sea fishing sport can be an attraction for both domestic andinternational deep-sea fishing enthusiasts.

Cultural Tourism /Heritage tourism: The Kenyan coast has a long and exotic history. Cultural heritage resources include historical sites and monuments, ethnographic resources, arts and crafts religious centres, traditions and festivals. The Kenyan coast is home of Swahili culture and the monuments at Fort Jesus and ruins of ancient settlements exhibit a rich cultural heritage. There are endemic coastal forests such as the Arabuko Sokoke and Shimba Hills Reserve, and Kayas which are forested areas of spiritual and cultural significance to the Mijikenda people in the Kenyan coast. The Kayas are fortified settlements whose cultural spaces are indispensable for the enactment of living traditions that underscore the identity, continuity and cohesion of the Mijikenda communities. To promote cultural tourism, the coastal county governments can work with local communities and organize events that allow local people to show case their cultures. Harnessing the opportunity presented by the established Beach Management Units (BMUs) will enhance achievement of this.

Thematic Itineraries: Diversification and integration of coastal and inland attractors, including cultural, religious, or ancient trade routes. The Kenyan Coast is among the oldest trade ports where early explorers, missionaries, merchants, and sailors docked for supplies and rest as they continued with their missions at sea and inland. For those tourists intending to revisit these old trade routes, for example, Mombasa and Malindi's coastal town will be ideal and promote coastal tourism. This could target both domestic and international tourists. There is need to market the country as an ideal destination for such activities.

Health and Spa: Health and spa facilities are expanding along coasts, including alleged medicinal and therapeutic qualities of the sands and clays and thermal waters. Upgrading the facilities to ensure international standards could help attract more tourists to the coast. Domestic tourists also are increasingly demanding for such facilities as the growing middle class and high net worth individual's value for leisure increases.

Complimentary Activities: By expanding activities such as wine-tasting, gastronomy (food and culture), conferencing, special events, festivals, health, and well-being. Enriching and diversifying the tourism products can reduce seasonality in many coastal and marine destinations. Although most of these activities have been compromised by the Covid-19 pandemic, this area could prove vital for the sector recovery once the world returns to normalcy.

Underwater hotels and sea-floor/floating resorts: are being developed in many parts of the world. The Kenyan tourism industry can learn from advances in construction know-how

developed by other emerging ocean industries. This is an area that the country can build on to diversify and enrich coastal and marine tourism. There are no underwater hotels or sea flow resorts on the Kenyan coast and areas, and that could be exploited to target both international and domestic high net worth clients.

Deep-sea tourist expeditions: Locations range from shipwrecks to hydrothermal vents and other beautiful deep-ocean ecosystems. Kenya is host to the Malindi marine national park with exciting sea flora and fauna. Embracing technology to open access to these parks without disturbing the ecosystems can enrich coastal and marine tourism. Deep-sea expeditions are not common on the Kenyan coast. With the increasing popularity of deep-sea expeditions, Kenyan coastal and marine tourism could take advantage of the rich ocean resources and design and starting offering it to attract more tourists.

Marine Ecotourism: Marine Parks, underwater archaeological parks, coral reefs, and other locations with archaeological, ecological, or historical value can be exploited sustainably. Kenya is host to such resources that remain unexploited. This can be an attraction to academia, researchers, and explorers, both domestic and international.

Recreational boating and Yacht Tourism: brings particularly high-value, low-impact tourism to coastal regions, stimulating the local hospitality, transport, construction, and supporting trades.It also offers a particularly valuable opportunity to retain or revive the economies of smaller ports and port communities at risk of being bypassed due to changes in commercial marine and fishing traffic. This could be ideal for Lamu, which now has a major new port, and other smaller islands.

3.2.2 Additional Support for the development of Coastal and marine tourism
The identified potential areas for development need to be supported through:

Capacity Building, Education and Training: The coastal and marine tourism sector has often had difficulties attracting or maintaining enough skilled personnel to work in its various sectors due to both seasonality and lack of career opportunities. This can lead to problems in service quality and erode destination competitiveness. A better developed marine tourism sector will attract and keep staff with the requisite skills.

Improved level of innovation: Changing consumer values have increased the demand for attractive and sustainable products that provide unique and customized experiences. The current outdated products are unable to compete with new destinations offering stylish tourism

experiences at an appropriate price or value (WB, 2010). The lack of a culture of innovation constrains entrepreneurship and the creation of new product development, hindering the competitive advantage required to secure a more significant market share. It is important to offer demand-driven mix of established and innovative coastal tourism products for mass, midscale and boutique segments drawing niche and special interest segments (that is, cultural heritage, adventure, etc.)

Streamline licensing, regulations and taxation: There are many different legislative instruments that regulate the tourism sector, including coastal and marine tourism; which are further complicated by the overlapping functions of many public organizations regulating the sector, associations and civil societies representing different markets. The many bureaucratic procedures and controls including policing of licenses can undermine the competitiveness of coastal and marine tourism operators in Kenya. In addition, heavy taxes on essential inputs necessary for improving their quality of service also compromises growth and profitability of the sector. This needs to be streamlined to increase competitiveness of the sector. The sector needs a one stop shop where investors can process all the licensing documents and procedures they need.

Collection and management of information/data: Reporting of marine and coastal statistics is not easy, and neither is it a standardized task (Miller, 1993 and Orams, 1999). There is substantial uncertainty concerning the data needed for public policy formulation and private sector decision-making regarding coastal and marine tourism. Information is often incomplete, outdated, or inconsistent, which makes country comparisons challenging. There is a need to identify and address the data gaps to improve planning and destination management. In particular, tourism statistics are critical for policymakers and businesses to understand tourism sector performance and emerging trends. Data on tourist values and needs allows a destination to adapt to changing market conditions through its marketing and product development strategies (Dwyer et al., 2009). A lack of specific and sectorial information restricts networking opportunities in coastal and marine tourism, particularly for SMEs. Gaps in crucial data adversely affect investment and increase the risks of project failure. An improved collection and management of coastal and marine tourism data will help in decision making.

Tackling climate change: Rising sea levels associated with climate change will cause coastal erosion, loss of beach area, higher costs to protect and maintain waterfront tourism facilities. Rises in sea surface temperature cause coral bleaching, marine resource degradation, and

species extinction, reducing destination attractiveness. Changes in weather patterns will severely damage or destroy tourism attractions. The Government enacted a Climate Change Act, 2016, but more needs to be done to mitigate the impacts of climate change on coastal tourism.

Reduce financial constraints: Constraints on investment funding impede the potential growth of coastal and marine tourism (Gossling, 2006). There is limited or no access to credit to support investments and innovation. Banks often lack the knowledge required to assess business plans and make risk assessments in various tourism market segments. Greater attention must be paid to the Public-Private Partnerships (P3) to support coastal and marine tourism (UNDP, 2012).

Reduce leakages and offshoring: A key requirement for sustainable coastal and marine tourism development is for the local communities to benefit from the industry, thereby alleviating poverty, improving livelihoods, and encouraging better management and conservation practices by the local communities. However, high leakages of tourist expenditure occur through the high import content of tourists' consumption bundle as a result of a narrow production base in many coastal and marine destinations (Gossling, 2006). Measures will be required to reduce the amount of expenditure that is leaking out of the system.

Manage pollution: According to several studies, yachts and cruises represent the largest marine tourism segment responsible for high levels of water and air pollution. Water pollution is due to waste disposal practices such as oil spills, while air pollution is mainly due to gas emissions of cruise ships (Copeland, 2008; Brida and Zapata, 2010). These cause environmental decline in the coastal and marine resources. Other sources of pollution include plastic bags and single use plastics. The Government has banned the use of plastic bags including on beaches and other areas. More will be required to control other forms of marine pollution.

Improve safety and security: Tourism development depends on safety and security. Tourists avoid insecure destinations (Sharifina, 2014). In the past, Kenya's tourism sector suffered from incidents of insecurity. Some of the major sources of this insecurity are terrorism, political instability in the region, and crime which led to increasing cross-border traffic in small arms. Other sources of insecurity include cattle rustling, income inequalities, and unemployment. This calls for strengthening of the Tourist Police Unit (TPU).

Strengthen tourism marketing: Promotional and marketing weaknesses undermine tourism

development. Having numerous international promotional campaigns and marketing representatives would attract more tourists and improve their perception of the tourist destination. There is also need for integrated and coordinated campaigns to inform potential tourists about Kenya's attractions and facilities, including those in the coastal zone. Several efforts have been made by the Government but more needs to be done to market the country.

Reduce language barriers: The shortage of tourist guides who speak a foreign language is a significant problem as many tourists expect assistance during travel. Therefore, to influence tourist experience, good communication skills could significantly enhance tourist development. Training on languages needs to be included in the curricula of students taking tourism courses.

Reduce coastal land alteration: Resource extraction such as hydrocarbon and energy infrastructure (pipelines) cause increased environmental impacts and pressures to the coastal and marine ecosystem. The potential for offshore and other forms of mining in the coastal zoneis likely to create environmental pressures on the different coastal and marine ecosystems supporting tourism. Marine spatial planning is critical in ensuring that specific areas for certain economic activities are demarcated to reduce excessive coastal land degradation.

Manage global communicable diseases: Covid-19 is one of the greatest challenges facing the world today. Among the measures economies put forward was to ban international travel hence threatening the achievements made in the travel and tourism industry. The tourism industry is the hardest hit by Covid-19. Lessons learnt from Covid-19 could be used by the country to prepare for potential future pandemic which might impact the sector.

Improve coastal infrastructure: The government has continually improved infrastructure in the coastal areas by constructing new roads and bridges to improve connectivity. Electricity supply has also improved although hotels are supplementing this with solar generated power. Telephone connectivity has also improved over the years. The main challenge is in marine tourism because of limited port infrastructure, which restricts cruise tourism by limiting the number and size of vessels that can visit. Other gaps include lack of a clear cruise homeport in the region;poor roads leading from ports to crucial tourism attractions, limited opportunities for local businesses to offer services to cruise passengers; inadequate visa and immigration processing services in port areas; and a lack of environmental regulations for cruise ships (UNWTO, 2013). Gaps in any of the cruise destinations hinder the entire region's ability to attract more cruise ships. These are

areas of potential improvement in building a stronger coastal and marine tourism sector for the future.

Upgrade water and sanitation services: Hotels and lodges in coastal Kenya and elsewhere in the country have historically suffered from poor drinking water service and most hoteliers and lodge operators have developed backup sources, knowing the generally poor quality of public service. On sanitation, remote lodges and camps certainly do not have access to sewerage but can provide adequate sanitation services through septic tanks (such as Imhoff tanks). Thorough and proper sewage treatment continues to be a challenge especially along the coast with immediate to long-term negative consequences if not addressed. The issue of safe drinking water and sanitation especially in the coast are to be addressed in coastal and marine tourism is to thrive.

Improve hospitality and other related services: The hospitality and other related services include accommodation, food, and beverages, entertainment, etc. The unavailability of accommodation facilities and few luxury hotels (less than 20% being 4-5 star) distort tourist expectations. To increase competitiveness, there is need to expand product choice and improve on quality of facilities and services. There is also need to address the unexploited and underdeveloped products. With the increase in visitor arrivals, the bed occupancy levels during the peak season are close to full capacity and the reverse occurs during the low season. As a result, the country has to grapple with the rapid growth in demand, principally due to limited investment in tourist accommodation. It would be imperative to substantially increase investment in accommodation in order to meet the ever-increasing demand for the Kenyan products.

Reduce pressures on resources: The coastal population is growing at a rate of 3.7% annually and exerts significant pressure on fisheries resources. High dependence on natural resources is an essential factor that increases the demand for fisheries resources as well. Population increase and high dependence levels on coastal and marine fisheries constitute the main driving factors for the decline in fisheries resources in Kenya. The increasing human population in the coastal region has resulted in a higher demand for fisheries resources and, therefore, significantly contributed to the overexploitation of the fisheries' resources. The use of destructive fishing gears in artisanal fisheries amplifies the pressure exerted on these resources. The prohibited fishing gears such as beach seines and monofilament gill nets result in capturing of large quantities of immature and small-sized individuals in this fishery (Fondo *et al.* 2014; Munga *et al.* 2014b; Osuka *et al.* 2016). Incentives e.g. command and control or market based can be instituted to control fish

overexploitation.

Because of the inadequate implementation of the National Oceans and Fisheries Policy, Prawn Fisheries Management Plan, and the Integrated Coastal Zone Management policy (GOK 2008, 2010, 2013), artisanal fisheries resources along the entire Kenyan coast will still experience much exploitation and various management issues. The responses are characterized by a lackof commitment in implementation and enforcement (Ruwa 2006; Hoof and Steins 2017). Besides,the fisheries policies are developed with no consideration regarding economic, social, biological, and environmental sustainability, thus encouraging conflicts among and between fishing communities (Ruwa 2006). Implementation of existing policies, guidelines and regulations need to be taken up by the relevant authorities.

Improve marine ecosystem health: The Ocean Health Index measures the ability of oceans to sustainably provide food, artisanal fishing opportunity, natural products, carbon storage, coastal protection, tourism & recreation, livelihoods & economies, sense of place, clean waters, biodiversity. This measure for the marine ecosystems in Kenya is on the decline due to over exploitation of marine ecosystem services. This needs to be slowed down if the benefits of the blue economy have to be fully realized in the country.

Open sky policy: Such a policy will encourage many airlines to land in Mombasa without having to transit through Nairobi. This will be a motivation to tourists since many visiting the Coast usually have no business in Nairobi. Currently, there are 38 destinations worldwide mainly in the Caribbean and Asia that have an Open Sky Policy and are beating Kenya in coastal and marine tourism just because of this policy.

Joint collaborations: Currently, many counties have dormant tourism ministries. There is therefore need for coastal counties to collaborate with National government and market the destination (Kenyan Coast) as one, instead of each county marketing separately. This will be more inviting to tourists since there will be diverse activities marketed in one destination. There is also need for partnerships between communities, public institutions like KWS and private investors. Such collaborations will reap more benefits and conserve the ecosystems.

Provide investors with land: Currently, there are opportunistic landowners within the Kenyan coast who are not utilizing lands and who sell land at exaggerated prices. This is a turn-off to many investors. The government should device a way to provide investors with land for investment so that their money goes directly to investing instead of to buy land. This can be achieved through

land banking[7]. Such a measure will attract more investors and thus boost local economies.

3.3 Potential for development of ports, harbours and maritime transport

According to the Economic Survey (2020), Africa remained the leading destination of the Kenya's exports in 2019, accounting for 37.6 percent of the total exports at Kshs 224.2 billion, with exports to EAC partner states accounting for 62.6 per cent of the total exports to Africa. Ports, harbors and maritime transport offer potential for development in the following areas.

3.3.1 *Potential areas for development of ports, habour, and maritime transport*

Export/Import Trade: According to the Economic Survey (2020), Africa remained the leading destination of Kenya's exports in 2019, accounting for 37.6 per cent of the total exports valued at Kshs 224.2 billion, with exports to EAC partner states accounting for 62.6 per cent of the total exports to Africa. Europe was the second leading destination of exports, accounting for 25.4 per cent of the total exports at Kshs 151.3 billion. The share of export earnings from European Union (EU) stood at 22.4 per cent of the total export earnings, mainly from horticultural products. Netherlands, United Kingdom and Germany were the three major export destinations within the EU region in 2019. Asia was the main source of imports in 2019, accounting for 63.8 per cent of the total value of imports, with China, India, United Arab Emirates (UAE), Japan and Saudi Arabia being the main sources of imports from the region. The overall Balance of Payments position improved from a surplus of KShs 103.4 billion in 2018 to a surplus of KShs 106.4 billion in 2019, on account of a build-up in official reserves. The current account balance worsened to a deficit of KShs 567.0 billion in 2019 from a deficit of KShs 511.3 billion in 2018. The financial account net inflows declined by 3.9 per cent from a surplus of KShs 662.0 billion in 2018 to a surplus of KShs 636.3 billion in 20198. With improved performance, there is room for increased trade.

Political-socio-economic regional linkages: Regional Economic Communities have promoted transshipment and hinterland multimodal infrastructural development, have been enhanced through the East African Community (EAC), which was created in 1967, dissolved in 1977 but reconstituted in 2000. Member countries include Burundi, Kenya, Rwanda, Tanzania, Uganda and South Sudan. The EAC boasts a total population of more than 150m and a combined GDPof about $150bn. These linkages were further enhanced by Kenya's membership to the COMESA. Recently, Kenya has ratified the AfCFTA agreement. The IMF underlines the fact that greater integration will allow easier access for effective market demand which will in turn ensure sustained economic

growth and improved economic efficiency. A larger regional market will lead to economies of scale, lower transaction costs, increased competition and greater attractiveness as a destination for foreign direct investments. The community is already one of the fastest-growing economic blocs in the world, and according to the IMF, real GDP growth averaged 6% between 2003 and 2013. The architecture of the regional economic block is already advanced with a Customs Union that has been in force since 2005 and became fully-fledged in 2010; a common market that allows for the free movement of goods, people, labour, services and capital that went into effect in 2010; a monetary union that is in the process of being implemented following a 2013 protocol and the launch of the East African Payment System in 2014 which should result in the introduction of a single currency by 2024; and, eventually the setting up of a political federation. Table 4 below gives foreign trade values of export and imports merchandise passing through the Port of Mombasa.

Table 4: Foreign Trade Values

Foreign Trade Values	2015	2016	2017	2018	2019
Imports of Goods *(million USD)*	16,093	14,113	16,687	17,378	17,655
Exports of Goods *(million USD)*	5,906	5,700	5,747	6,052	5,839
Imports of Services *(million USD)*	2,523	3,095	2,847	3,476	3,440
Exports of Services *(million USD)*	3,692	3,885	3,785	4,512	4,390

Source: World Trade Organisation (WTO) (2022).

Goods Transportation, Connectivity, and Market Capture: The number of vessels visiting a port is dependent on several things among them port connectivity as well as market capture. The total number of ships that visited the Port of Mombasa in 2020 was 1,621. A third were container carriers, 7.2% general cargo carriers, 18.8% bulk carries, 12.5% tankers and 8.6% car carriers; with a gross registered tonnage of 45.041 million. The average port days, given by the ratio of port days divided by the number of vessels, was 3.7 days. These indicators are important for port efficiency performance. It is important to note that Kenya is a member of the Northern Corridor member states and it has been shown that these countries are poorly interconnected with trade transportation regionally and internationally. This situation is reflected in their poor ranking on both the World Bank Logistics Performance Index (LPI) and the UNCTAD Liner Shipping Connectivity Index (LSCI). Out of 155 economies ranked in the WB LPI, Northern Corridor countries are ranked in the bottom 50 consistently between 2007 and 2012. Similarly, out of the 152 economies ranked in UNCTAD LSCI, these key transit countries rank poorly. This

negatively affects vessels calls and contributes to poor port performance.

Cargo throughput: General cargo traffic is dominated by imports which accounted for more than 80% of total cargo handled at Mombasa Port over the 2016-2020 period. This trend has been maintained in the last few decades. Out of total import cargo, about 30% is transit cargo destined to hinterland countries, which has shown a gradual steady increase over time. The overall cargo traffic at Mombasa Port has been increasing due to growth of the Kenyan economy as well as those of the landlocked countries. The large share of imports in total throughput is attributed to the general nature of the East African economies who are net importers.

Containerization: Container traffic at the port continued to increase in line with the worldwide increase in the rate of containerization of seaborne trade. The container traffic increased from a total of 1,091,371 TEUs in 2016 to about 1,359,579 TEUs in 2020. The analysis also shows that containerized imports increased by about 46% while containerized exports increased by about the same percentage on average over the 2016-2020. Transit traffic increased by about 9.5% on average over the review period. Notable is the decrease in container traffic in 2020 as a consequence of the effects of Covid-19 on the global economy. In general, it should be noted that over the review period, terminal utilization rate was over 300% painting a picture of congestion at the port.

Transited Cargo: Transit cargo has registered an upward trend over the years by an average rate of 7% over the review 2016-2020 period. Transit cargo to Uganda dominated with an average share of about 82% and an average annual change of about 5%. South Sudan registered a share of 8.2% and an annual rate of change of 16%. Tanzania recorded a share of 3% of transit traffic but the average rate of change has been declining due to the shift from the Port of Mombasa to the Port of Dar-es-salaam which is the main competitor to Mombasa Port. DR Congo's share stood at 5% with an average rate of change of 20% over the review period. Rwanda exhibited an average share of about 4% with an annual average rate of change of about 7%, reflecting an upward trend. It should also be noted that transit traffic is dominated by import cargo as opposed to exports and also that the increase in the rate of containerization has a positive effect on transport cost since cost is defined for different containers, which has a significant effect on average transportation costs.

Cargo Traffic in Inland Container Depots: The Port of Mombasa also operates the inland

container depots (ICDs) in Nairobi, Kisumu, Eldoret and most recently Naivasha with the Nairobi ICD being the busiest. As already pointed out in other analysis on cargo traffic, import cargo dominates ICDs operations. This is evident in Table 5 which shows ICD operations for Nairobi expressed in twenty-foot container equivalent units (TEUs). There are minimal operations at the Kisumu, Eldoret and Naivasha ICDs but this is envisaged to change in the not-too-distant future.

Table 5: Container traffic (TEUs) at Nairobi Inland Container Depot

	2016	**2017**	**2018**	**2019**	**2020**
Imports full	9,401	15,110	177,652	262,895	234,676
Exports full	4,960	4,713	11,701	13,777	15,200
Empty	13,242	10,636	68,619	142,158	143,276
Total	**27,603**	**30,459**	**257,972**	**418,830**	**393,152**
% change		10	747	62	-6

Environmental Management: The ports, harbours and maritime transport activities have significant negative environmental impacts which if not addressed can curtail the socio-economic benefits of the BE. As such, KPA manages the marine and terrestrial environment in accordance with the IMO Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and Environmental Management and Coordination Act No. 8 of 1999 (EMCA). The above is achieved through the implementation of Mombasa Port Resilient Infrastructure Program (MRIP), under the Green/Eco-Port Policy. KPA has prioritized the following environmental programs:

o Reduction of air pollution caused by Green House Gases (GHG) and their corresponding effects through the establishment of carbon sinkers which has been actualized by planting and maintenance of 7000 trees in 6 counties,

o Enhancement of air quality, reduction of particulate matter/ inhalable particles through the use of eco-hopper (if utilized),

o Efficient energy use and conservation through the use of modern operational machines,

o Promoting Port environment through the implementation of environmental monitoring andmanagement programs for each project undertaken by the Authority,

o Control soil erosion, landslide and marine pollution by surface runoff through the Eco-face terracing

3.3.2 *Priority areas for improved ports, habour and maritime transport*

Increased berth performance: There is a high average berth occupancy rate across all the terminals; an indication of congestion at the port which in turn leads to higher vessel delay

surcharges, higher cargo handling charges and higher other KPA related charges. This has a detrimental effect on freight charges which in turn tend to increase overall transportation costs. This also has a negative spillover effect on the time spent at the One Stop Centre (OSC) and also at the Document Processing Centre (DPC) thereby increasing logistics costs. A high berth occupancy rate also increases berth dwell time. In addition to increasing transportation costs, these negative effects of high berth occupancy rates tend to increase the cost of doing business which makes production uncompetitive. The causes of the high berth occupancy rates include: insufficient berths; few or unreliable gantry cranes, and insufficient, inadequate or unreliable container yard equipment, among others.

Ships waiting time: The average waiting time per ship is predominantly high, at 2.5 days per ship, but this trend is also characterized by large variations. This indicates that the cargo handling process is not only inefficient but also unreliable and unpredictable. Available evidence indicates that erratic waiting times are seasonal and are worse during the rainy seasons possibly an indication of the poor quality of the road infrastructure. This in turn leads to congestion at the port due to the slow off-take of cargo. This has implications for vessel turnaround time.

Ship turnaround time: The ship turn-around time is a summation of two-time limits starting from the time the ship arrives at the berth and time spent as it is served up to the time it departs the port. Ship turnaround is an important indicator of overall port efficiency and is influenced mainly by arrival rates, waiting times and cargo off-take. According to Bitre (2009), vessel turnaround is also a good indicator of the efficiency of shipping operations, cargo loading and unloading, and onward clearance to other cargo destinations. It further indicates the condition and efficiency of port equipment, its information management systems, and its workforce. The ship turnaround time has been above the target of 3 days for the most part. From an institutional point of view, the situation was brought about by a multitude of factors that included inadequate and aged facilities, poor hinterland transport connectivity, inefficient document and cargo clearance procedures and slow cargo loading/unloading. This led to long periods of port

- o congestion. From a management point of view, port operations are hampered by bureaucratic tendencies, political interference, and insistence on increases in labour force productivity and port throughput with little attention being given to internal capacity improvements. A comparison with other ports in the world indicates that the Mombasa Port needs to address this issue in order to operate competitively.

- *Berth length for calling vessels:* Most of the ships vising the port are longer than the designedBerth Length Overall (LOA). This is true across most of the berths. This implies that the berths cannot be efficiently and productively used due to the inadequate length.

- *Mombasa Port Expansion:* It is evident that throughput has been increasing steadily and such increments need expanded port area capacity. Subsequently, new berths are being constructed, the construction of the 2nd Container terminal, set to increase throughput by a further 1millionTEU, is almost complete and structural works to deepen the harbour are on-going. Dredging of the lead channel will allow bigger vessels of capacities exceeding 20,000 TEUs to call at theport. In the medium term, dredging of the harbour to accommodate vessels of at least 10,000 TEUs from the current 6,000 TEUs will contribute to the transformation of the Port of Mombasa from a service port into a regional and international hub. These investments will, *inter alia,* improve connectivity and market capture and create ample spaces needed for the transfer, loading/offloading cargo, increase storage capacity and will improve productivity and efficiency in delivery operations. In addition, the implementation of activities envisaged in the Mombasa Port Master Plan including Dongo Kundu as well as those under the LAPSSET Projectwill enhance port performance. The development of small ports and ICDs will go a long way into reducing pressure on KPA.

- *Equipment shortage:* The findings of this study support port stakeholders who have raised issueson several platforms about equipment shortage, which slows down quay and yard operations, sometimes even hampering delivery operations, especially for ICD bound cargo. The port needs a major audit of its quay equipment, such as ship-to-shore (STS) gantry cranes, transfer equipment such as tug masters and straddle carriers, and yard/stacking equipment, such as reach stackers, forklifts and rail mounted gantry cranes (RMGs). The audit should be carried out with the sole purpose of identifying equipment suitability, availability and if equipment is adequate to meet the demands of the projected traffic. Forecasting will be of utmost importance in procurement of such equipment, to ensure man-hours or moves are adequate to keep up with the operations at the port, and that equipment will not breakdown frequently, causing delaysin operations.

- *ICT infrastructure:* ICT plays a key role in improving communications and needs to be enhanced, especially because of the push for paperless trading and introduction of

systems to improve processes and service delivery at the port. Such systems include Kilindini Waterfront Automated Terminal Operations System (KWATOS), Simba System, KenTrade and the newly introduced Integrated Customs Management System (ICMS) system. All clearance takes place online and should there be downtime in any of the above-mentioned systems, then operations are negatively affected, leading to slowing down of service delivery, increasing cargo dwell time at the port.

o *Automation of port operations:* In a bid to improve service delivery, ports across the globe are adapting to automation. KPA should follow suit, albeit in phases. Automated ports are utilizing artificial intelligence (AI) to control operations, optimization of operations are done by the use of big data and advanced analytics, and employment of dynamic scheduling. Equipment manufacturers, such as Kalmar, have introduced technologically advanced equipment, and respective transport layer security (TLS) and terminal operating system (TOS) software, which make full use of interconnectivity through internet of things (IoT), realized because of the current 4th industrial revolution, termed Port 4.0. This concept minimizes reliance on human dependence and interaction, thereby reducing human error and labour costs.

o *Adequate port staffing:* KPA needs to maintain optimum levels of staffing to ensure that all critical areas are manned adequately and avoid instances where they may be short of staff, hampering service delivery. The issue of manpower is more sensitive in the wake of COVID-19, where older staff, or those that fall in the high-risk category, may have to work remotely. But the port being a complex system, some duties need staff to be present in person, hence the need to ensure that staff are always present, as and when needed.

o *Migrate from service Port to landlord Port:* At present KPA owns the entire port infrastructure and undertakes all port operations. There is no separation between public and private sector roles. Consequently, it becomes quite difficult to strategically plan port management and development. The way out of this institutional dilemma is to undertake an administrative reform that ensures that the port is migrated from a Service Port to a Landlord Port. The new port management model will require, if and when adopted, the acquisition of new project management, implementation supervision and coordination skills including procurement, contract management and transaction advisory skills, inter alia. Stakeholder integration, corporate and development communication

including monitoring and development for results need to be integrated urgently and in a systematic and programmatic way.

Development of port infrastructure, equipment, multimodal transport, ICT and others: This will improve the sub-sector connectedness with other sectors such as agriculture, aquaculture and forestry, tourism, manufacturing, mining, energy, and water and environment, inter alia. It will also increase port productivity levels, reduce berth occupancy, waiting and turnaround times and other logistical bottle necks. The government should also invest more in the infrastructural developments of the hinterland to provide more connectivity between the ports, local population and the neighbouring countries. This will lead to creation of employment opportunities, reduced overload of the port of Mombasa and improvement in efficiency in cargo transportation corridors.

Develop new international port: There is need for implementation of a new international port development study in order to cope with the existing and forecasted demand for port and maritime transport services. Whereas the Port of Mombasa will be improved both structurally and capacity wise, nevertheless the advantages for the development of a state-of-the-art international port, possibly in Malindi cannot be gainsaid. In addition, spatial rationalization, based on the preparation of spatial utilization plans needs to be undertaken in order to improve capacity, efficiency and productivity.

Security and safety: There is to need to guarantee security and safety of both persons and goods within the maritime transport, harbours and ports system to encourage more investments and utility of the maritime transport system and its hinterland connections. Studies have shown that cargo owners prefer road transport as opposed to railway, hence road access development to the ports should be given priority.

3.4 Potential for development of coastal and offshore oil, gas and renewable energy

The cost of exploring especially offshore is very expensive, and Kenya has done very little exploration and exploitation offshore. The Government does not have adequate financial resources and technical capacity to undertake coastal and offshore oil and gas exploration onits own. The inadequacy in technical capacity is mainly in the areas of marine geology, petro-chemical fields and technological sphere. Further, there are limited capabilities in engineering, construction, logistics, and supplies, health and safety. There is an opportunity for higher education institutions, scholars and researchers to venture into the sector for data collection, mapping and even career building in the sector and inform the policy for sustainable

development as well as equip the youth with the necessary skills to venture into the sector. The country can also improve budgetary allocations to promote the small-scale miners who dominate the mining industry and promoting offshore mining.

The Government agencies that are charged with management of environment and ensuring compliance of mitigation measures and monitoring procedures associated with large projects such as offshore exploration are often lacking the technical capacity. Therefore, engaging in capacity building is fundamental for buy-in and participation, which is crucial to confidence building, transparency, and maintaining long term sustainability.

Existing good examples of world standard for sustainable mining such as the towards sustainable mining (TSM) initiative by the Mining Association of Canada (MAC) of 2004 which Kenya as a country can learn from and use to advance the sector. The Canada TSM has so far been adopted by Finland, Argentina, Botswana, the Philippines and Spain and can be adopted in Kenya too.

Efforts should be put in advancing understanding the oil and gas resources sub sector, the associated environment and the social aspects in order to address the pressures and opportunities created by oil and gas exploration activities. It is also critical to put in place an effective regulatory framework for oil and gas exploration to avoid occupational hazards that may occur if the exploration of the newly discovered oil and gas reserves is carried out with inadequate regulation.

There is need to develop and promote renewable energy alternatives for coastal Kenya. The development of renewable energy alternatives including marine based alternatives are weighed down by several constraints namely: inadequate long-term hydrological and meteorological data; inadequate transport infrastructure, the need to include local participation in order to develop acceptance; lack of locally available spare parts; insufficient electricity grid coverage; high dependence of rural communities on ecosystem services. These constraints should be mitigated if alternative renewable energy alternatives are to be realised.

There is lack or shortage of technical personnel due to lack of institutions offering technical and vocational education in the oil and gas sectors especially the offshore exploration and exploitation. Personnel who undertake and explore oil and gas, and especially off shore, are mostly foreigners making the activities more expensive and denying the country people jobs.

The geo-political nature of offshore oil and gas is affected by the maritime boundary dispute

with Somalia. Kenya's maritime sovereignty is being challenged by Somalia which instituted proceedings against Kenya at the International Court of Justice (ICJ) in 2014 (Hasan *et al.*, 2019).
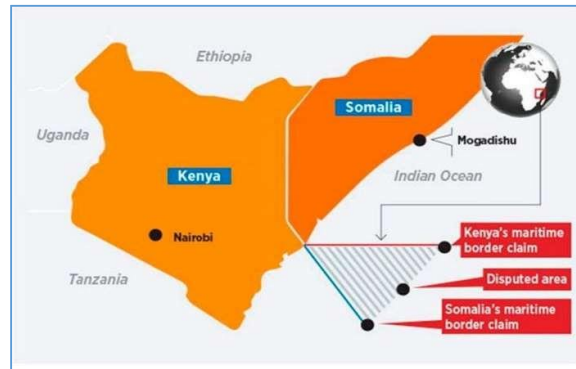

Figure 2: *Kenya-Somali maritime border dispute*
Source: Nyonje, Orina and Ouma

3.5 Potential for development of coastal agriculture

3.5.1 Potential areas for development in coastal agriculture

Identification of agriculture under the Kenya Vision 2030 to drive the economic pillar has put agriculture in focus as a centre of research and development and increased the allocated budget by the government. The coastal counties can take advantage of this and promote agriculture in the counties.

All the 6 counties in the coastal area have huge unoccupied lands especially in the rural areasas people in the coastal areas are segregated in villages, towns, around the beaches and urban areas. These could be exploited for improved agricultural production.

There is availability of a large source of water, the Indian Ocean. Desalinization of this water would be key in solving the largest problem of water scarcity. This coupled with high adoption of water harvesting technologies for surface runoff through excavation of water pans, construction of earth dams, negarims, shallow wells, zai pits among others would provide the needed water for irrigated agriculture and livestock. According to AFA (2017) irrigation alone has the potential of employing 15 persons per acre. There is potential for expansion in irrigation in the coastal counties, which will lead to increased number of direct employments, and indirect employment.

According to FAO (2014), 70% of the agricultural work force is provided by women. However, the women are deprived the power of decision making and secure tenure to the land they work in.

Therefore, empowering and supporting the women and youth in the role they take in agriculture will promote production. This needs to be coupled with awareness creation to the farmers on available government assistance institutes and personnel. It is also important to encourage greater participation of the locals, especially women, who actually do the farming.

Participation should be on decision making, formulation and implementation of policies, development of regulations and consultations concerning farming in the coastal regions.

There are many emerging agricultural innovations and approaches ranging from hydroponics to metal silos and use of technology such as mobile phone systems and TV and radio-based farmers training which could be exploited by coastal farmers for improved production. In addition, merging focus on value addition which could lead to diversifying of agricultural products in the market as well as reducing post-harvest losses.

Existence of collaborating institutions such as learning institutions, research organizations, UN and other international bodies could be harnessed for improved research, awareness creation, funds facilitation and training of agricultural professionals.

There is a large market and demand for agricultural produce that is ever-increasing due to increased population. According to the World Bank, globally, millions of people are either not eating enough or eating the wrong types of food, resulting in a double burden of malnutrition that can lead to illnesses and health crises.

The regional markets that have resulted from regional integration, e.g. the East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA), and trade liberalization are yet to be exploited to a significant level.

Kenya has accreditation and membership to various regional and international bodies e.g. IFAD, FAO and many others. This allows the country to get accreditation and standardization for various agricultural products alongside establishing partnerships to trade and negotiate produce.

Increased supportive incentives and favourable political climate in the last few years e.g., the ongoing allocation of title deeds to the land occupants in all the six coastal counties through the county governments and traditional leadership system can help promote investment in agriculture.

Improvement in education, health, security and infrastructure such as roads and communication in

the coastal region especially in the interior areas being undertaken by the government willlead to more agriculture awareness and knowledge dispersal to the communities and easy access to the markets for sale of agricultural products. The county governments, NGOs and Community Based Organizations can conduct extensive awareness creation among the locals onimproved, modern agricultural methods, which includes post-harvest management.

The country has an active and innovative system that has a history of offering micro-loans in remote rural areas coupled with mobile banking. These can enhance finance for agriculture from different sources for for farm inputs, production and investment in value addition activities.

Coastal county governments should consider providing farmers with quality farm inputs at subsidized prices. Such farm inputs include fertilizer and the right seeds varieties which adapt well with coastal weather conditions.

The county governments in collaboration with the Ministry of Agriculture should set up collection points with efficient storage facilities like granaries for farm production so as to buy directly from the locals at a fair price to eliminate the middlemen who hoard farm products at the expense of the farmers. Additional storage spaces will be critical in managing surplus production and reducing postharvest losses.

Stakeholders in the agricultural sector should set up manufacturing factories in order to add value to agricultural produce since value added products fetch higher returns for the farmers and will create jobs for coastal communities.

There is need to improve research, especially demand-driven research, coupled with effective extension and delivery system of research findings.

Improve agricultural practices: There is siltation, pollution and eutrophication correlated to an excessive use of pesticides, fertilizers, and poor farming methods and farming e.g. poor agricultural land use practices for example in the Athi-Sabaki River Basin for instance, has resulted in the increased discharge of huge volume of sediments in Malindi Bay with far-reaching ecological consequences.

Address climate change: the varying temperatures and rainfall are affecting the traditional farming patterns but also leading to increased flooding, erosion, drought periods, inundation, sea water intrusion, rising salinity, storm surges which affect the farms located near the different water bodies. An example is the flooding during the year 2020 which flooded the aquaculture

ponds leading to losses of the fish and mixing of water and loss of farm crops.

Invest in inputs quality control and inspection personnel to discourage unscrupulous businessmen from selling and stocking substandard and low-quality seeds and other farm inputs which causes low productivity to the farms discouraging the farmers.

3.5.2 *The priority areas for the development of coastal agriculture*

Reduce transportation costs: Majority of the population living next to the ocean depend largely on the ocean for their daily source of livelihood. This leads to the community depending on agricultural products from inland farming, and few coastal farmers that engage in agriculture provide agricultural produce e.g. eggs and cabbage fresh vegetables to the coastal communities at high prices, partly due to high transportation costs. Therefore, reduced prices would avail more food and reduce the high food poverty in the coast of Kenya.

Increase coastal agriculture for reduced pressure on the coastal fisheries and wetlands: The largest natural resource available in the coastal area of Kenya is the fisheries. However, there is high pressure on the ocean as source of fish leading to seasonal over exploitation. However, agriculture and aquaculture can reduce the pressure on capture fisheries and also provide fish during the low fishing season as fish is one of the stable foods for coastal communities.

Increased demand for agricultural inputs and services and consumption goods and services: a variety of products are available in the market thus creating demand for provision of services such as veterinary services and even construction of roads to allow transport of farm products to the market.

The livestock are a source of food, a storage of wealth, a means of transport, provide manure for agriculture and serve as means of exchange. In Lamu Island for example, donkeys serve as one of the main source of transport. Crops also provide food, raw materials for the industries, source of income; while aquaculture is source of food, raw materials, items of trade, and source of income.

3.6 Potential for development of coastal and marine forests

3.6.1 *Coastal forests conservation efforts*

Government and non-governmental organizations, private entities and local stakeholders have increased efforts over the past and present decade to promote programs that enhance

ecological integrity, social and economic development around coastal and marine forest resource (Yarhood *et al.*, 2020).

Externally funded conservation initiatives: A number of externally funded projects have been developed and implemented in Kenya's coastal and mangrove forests over the past decadeson top of government budget and forest management agencies. The selected forest areas and types have been the focus of most of external investments. These areas include mangrove forests, Arabuko Sokoke, Shimba hills, and the sacred Mijikenda Kaya forests. Notably, the bias mayhave been due to several reasons. For instance, Arabuko Sokoke has been identified as a primary conservation site for endemic birds for many years (the second most important site on the Africa mainland) (Burgess & Clarke, 2000).

While mangrove forests had been neglected over the past decades, the development of the Mangrove Ecosystem Management Plan (2017-2027) is likely to open new frontiers to enhance

ecosystem integrity and its contribution to the local and national economy through sustainable management and rational utilization of mangrove resources (GoK, 2017). Specific programs inherent to the management plan include (a) conservation and sustainable use of mangroves, (b) fisheries development and management, (c) community participation, (d) research education and development, and (e) ecotourism development. Additionally, mangroves' efficiency to capture and store huge stocks of carbon, support to fisheries and biodiversity and high productivity has attracted external support of several programs along the Kenyan coast. In particular, Paymentfor Ecosystem Services (PES) in compensation for the conservation of mangrove forests aims to improve the health and productivity of these ecosystems while at the same time improving community livelihoods. For example, Mikoko Pamoja is the world's first community type projectto restore and protect mangrove forests through the sale of carbon credit. The project is nowachieving its climate and community conservation benefits. Activities of Mikoko Pamoja have been replicated in Vanga Blue Forests (VBF) in Vanga (UNEP 2020).

The Kayas have also benefited from World Wildlife Fund (WWF) involvement in conservation activities in the eastern Africa coastal forest mosaics over the past decades. This is due to their richness of biological life forms in the region combined with severe threats. Extensive research on taxonomy and successful execution of projects seems to have encouraged donors to invest in extensions to project activities. Shimba hills forest is also endowed with high plant diversity and large mammals including elephants and the graceful Sable antelope alongside beautiful landscapes. For this reason, there has been long standing interest by the wildlife managers to protect these species (Githitho, 2004).

Government Initiatives: Other conservation initiatives have been implemented by the Government in response to national and international frameworks (Table 4). As a signatory to the Convention on Biological Diversity (CBD), Kenya commits to the CBD Aichi Target 11 and the SDG 14 which calls for conservation of 10% of the coastal and marine areas through effectively and equitably managed, ecologically representative and well-connected system of protected areas (CBD, 2012). Kenya uses two approaches namely, the Marine-Protected Areas (MPAs) and locally Managed Marine Areas (LMMAs) (Table 6) as strategies to meet its conservation obligation to the CBD. The protected areas constitute coastal and marine forests that prohibit or limits the rights for direct utilization of resources by the local communities. While the existing challenge is how to make the already conserved areas deliver tangible benefits to the local communities,

this potential needs to be fully tapped to benefit the local and national blue economies.

Table 6: Some of the Kenya's protected coastal and marine forests

MPA	Designation	Size (km³)	Year established
Kiunga	Marine reserve	600	1980
Malindi	Marine park	6.3	1968
Watamu	Marine park	32	1968
Malindi & Watamu	Marine reserve	177	1968
Mombasa	Marine park	10	1986
Mombasa marine reserve	National reserve	200	1986
Diani	National reserve	75	1993
Kisite	National park	28	1978
Mpunguti	National reserve	11	1978

(Source: Tuda and Omar 2012)

3.6.2 Priority areas of development of coastal forestry

The livelihood activities of the coastal communities surrounding the coastal forests include; tourism, mariculture, fishing, carvings, agriculture, salt production and harvesting of wood, wildlife and medicinal plants. The main goods derived from this forest are medicine, honey, fuelwood (firewood and charcoal), timber, carving logs, water, snakes, poles and even pasture for livestock, while the services include habitat for biodiversity, catchment for water, shorelineand erosion protection, cultural and socio-economic values e.g. tourism, and carbon sequestration etc. The forests also provide other cultural services as they are used for worship, as burial sites, ceremonial sites and meeting places for special occasions by the communities. These forests arealso rich in minerals like titanium, lead, silica sand, limestone, coral blocks, iron ore, rubies, barites, galena, gypsum and even salt. The priority areas for coastal forestry development include:

Inclusion of indigenous knowledge in conservation and management: Traditionally, the local communities had knowledge on the conservation and management of their coastal forests. While some of this indigenous knowledge has been incorporated into current conservation and management plans such as the development of harvest plans for coastal forests, a lot of indigenous knowledge is yet to be incorporated into conservation programmes. This information can provide cheaper or easier alternatives to the conservation and the management of coastal forests.

Potential for the development of pharmaceutical and industrial products: The high degree of endemism witnessed in the coastal forests of Kenya presents an opportunity for research

activities. There are over 550 endemic plants in the forests, and high botanical diversity, which

present huge potential for the development of pharmaceutical and industrial products from the area.

Involvement of institutions and stakeholders as partners: The devolution of government provided for by the Constitution of Kenya, 2010, provides an opportunity for institutions and other stakeholders to be involved as partners, managers and co-managers of forests and forest resources especially at the local level. This together with the Forest Conservation and Management Act of 2016 enhances the role of the county governments in adopting and implementing policies on forest activities. The Forest Conservation and Management Act, 2016 also opens up a more decentralised way of managing forest resources through the formation of rules and regulations governing the exportation and trade of forest produce as well as rules for incentive and benefit sharing. The Act therefore guarantees the long-term public benefit provided by the forests, while enhancing bottom-up decision making. This enhances accountability and harmonises the processes for developing participatory forest management plans at both national and county levels.

Establish REDD+ to reduce deforestation in coastal forests through the conservation: It is likely that moving forward into the future, REDD+ payments will be a significant source of forest-based revenue. Such programs have already been implemented for the dryland woodland of Taita Taveta (Kill, 2016) as well as the mangrove forests of Gazi and Vanga.

Kenya is signatory to a number of international agreements e.g., the 1992 Convention of Biological Diversity (CBD). Through CBD, the country has committed to protect and enhance biodiversity. The sustainable development goals(SDGs) ensure the sustainable use of natural resources making sure they are protected while at the same time providing benefits to the communities that depend on them. As a signatory to the Paris Climate Agreement, the country has also committed to reduce greenhouse gas emissions. This means that the country will support activities aimed at reducing emissions. Coastal forests have a huge role to play, especially the mangrove forests, due to their higher capacity to sequester carbon compared to the other coastal forests, and their protection is critical in supporting carbon capture.

3.7 Potential for development of inland, coastal and offshore mining and extractives

3.7.1 Potential for development of coastal and offshore mining and extractives
Kenya has a coastline of about 640Km, with five counties bordering the Indian Ocean, namely; Mombasa, Tana River, Lamu, Kilifi and Kwale. Coastal and offshore mining in Kenya consists of

mining in the 6 coastal counties (Lamu, Tana River, Kilifi, Mombasa, Taita Taveta, and Kwale; and direct mining in and off the ocean coastline of Kenya areas extending from the shoreline

of Kenya to the exclusive economic zone (EEZ) that is 200 nautical miles (nm). Minerals are distributed in all the 6 counties but not all minerals are currently being mined despite their identification and exploration in certain areas. Offshore mining or deep-sea mining is the sourcing of rare earth minerals on the ocean floor. Offshore mining can either be within a country's EEZ, or in the international waters. Within a country's territorial waterline, the country's law is applicable for marine activities within the area which includes 200 nautical miles from the coastline.

Kenya can tap into the valuable resources in the deep sea like cobalt-rich ferromanganese crusts, polymetallic manganese nodules and polymetallic sulphides. Deep-seabed mining is capital intensive requiring complex infrastructure, appropriate technology and skills. This will be possible if Kenya partners with private sector investors and developed countries having the skills and financial muscle to be able to exploit these resources.

Coastal mining activities include quarrying of coral rock and limestone for cement manufacturing and coarse aggregates for concrete and road building; artisanal sand mining from the catchment, floodplains, riverbanks, estuaries and lagoons; informal removal of sand from beaches and foredunes; formal mining of minerals from titaniferous sands; and, production of sea salt from saltpans typically located on estuary flood plains.

Mining and coastal areas mining in depths of less than 50m has been happening for many years in the world. However, in the recent decades, mining has proceeded into the deep waters andled to an increased surge of interest by marine scientists and the mining industry as the oceans have high future potential as they are relatively unexplored. The types of mineral occurring inthe deep sea are; polymetallic sulphides, cobalt rich ferromanganese crusts and polymetallic nodules. According to Murton report of 2000, the continental shelf area of Kenya has 1,039,100 tonnes of manganese, 41,564 of copper, 10,391 of Nickel and tonnes of cobalt all unexploited to date.

The technologies for extracting resources off the seafloor, e.g., iron sands, rock phosphate, precious and base metal sulphides, are very different to that deployed on land, with the added challenges of working at depth and often by remote control. Materials have to be scooped off the seafloor and pumped via a pipe to the surface via purpose-built vessels. Separation of ore from waste rock is carried out on board, and the waste rock is then returned to the seafloor viaa

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pipe to minimise sediment dispersion. There are three types of deep seabed mineral resources that are of interest to mining companies: seafloor massive sulphides, cobalt-rich ferromanganese crusts, and polymetallic nodules. Extracting sulphides and crusts entails cutting into the seabed surface. By contrast, polymetallic nodules are rock-like accretions that lie unattached on the surface of the ocean floor and can be collected without cutting or drilling. Kenya has, however, not yet tapped into offshore mining.

3.7.2 Priority areas for in inland, coastal and offshore mining and extractives

Kenya can tap into the valuable resources in the deep sea like cobalt-rich ferromanganese crusts, polymetallic manganese nodules and polymetallic sulphides. Deep-seabed mining is capital intensive requiring complex infrastructure, appropriate technology and skills. This will be possible if Kenya partners with private sector investors and developed countries having the skills and financial muscle to be able to exploit this resource. Some of the possible priority areas include:

Dispute resolution mechanism: There are frequent land disputes between formal mining companies and local Kenyan communities. In the case of Tiomin, the challenges could not be resolved on timely basis leading to closure of operations at the Coast by Tiomin, a Canadian mining company.

Tackle environmental concerns on mining along the coast and even inside the Indian Ocean. In the case of salt mining, many grievances have been raised regarding the establishment and operation of salt works in Gongoni, Marereni and Kurawa areas within the greater Magarini division. Field survey results indicated that the ongoing salt works contributed to several environmental impacts including; corrosion of iron sheets, rise in temperatures, deforestation, loss of pasture, salinity of freshwater, air pollution, reduction of rainfall in the area, land degradation and increased dustiness in the area (Ocholla *et al*., 2013).

Improve infrastructure in mining areas: Much of the areas where locals undertake mining have poor or lack infrastructural facilities. This has led to high cost of transportation, unregulated, uncontrolled and unmonitored mining activities by the mining authorities. This also makes the areas unattractive to investors.

Increase support to promote small scale artisanal miners who dominate the mining industry and promoting offshore mining. This will also reduce the use of rudimentary techniques such as hazardous substances, blasting and mining which undermines the health of the miners as they get

exposed to materials such as mercury, zinc vapor, cyanide, dust and fine particles, large amounts of noise, leading to a high number of accidents and possible pollution of the natural resources such as water bodies.

Invest in technical personnel and institutions offering technical and vocational education in the mining extractive sectors especially the offshore mining. Personnel who undertake and explore minerals mostly are foreigners making the activity of exploring and mining more expensive and denying the country people jobs. The country needs to invest in technological development to promote the exploration of offshore mining.

Enhance and standardize the mineral supply chain: There are low prices for the minerals due to lack of a concrete supply chain and or standardized market. This has created a loophole for the scrupulous middlemen to take advantage of the small-scale miners.

Ensure rehabilitation of mine areas: The coast region has numerous abandoned quarries with no rehabilitation actions taking place. The current mining areas equally lack rehabilitation measures in place. This is due to the fact that most mining is unregulated and illegal thus no sense of responsibility is put in place. These abandoned mines are a source of accidents especially the abandoned pits and also environmental degradation and hazards such as breeding grounds for mosquitoes when the holes fill up with water during the rains, soil erosion of arable land, and even landslides.

On marine biotechnology, more research should be done on the potential of commercialization of marine biotechnology in Kenya. The Government of Kenya launched the National Biosafety Authority in May 2010 whose aim was to regulate research and commercial activities involving GMOs with a view to ensuring safety of human and animal health and provision of an adequate level of protection of the environment (NBA). According to NBA, GMOs are products of modern biotechnology that involve the manipulation of the genetic material of organisms through genetic engineering procedures. Data on marine biotechnology however remains scanty. Kenya mostly produces its marine bio resources for food. They include marine fish, crustaceans and molluscs among others. The value of the three bio resources for food had an estimated value of Ksh. 4748 million in 2019 (KNBS Economic Survey 2020). The Government of Kenya however, is encouraging biotechnology research using various institutions such as Kenya University Biotechnology Consortium (KUBICO), Centre for Biotech and Informatics (CEBIB), National Biosafety Authority, and KMFRI.

CHAPTER 4
KENYA INLAND BLUE ECONOMY

In recent years, several sectoral initiatives have been launched and new institutional structures established for the integrated governance of the Blue Economy. However, the major focus has been on promoting the coastal or maritime blue economy, with less attention paid to inland blue economy opportunities (rivers and lakes), especially for the tourism sector. It should however be appreciated that apart from the popular coastal landscapes and seascapes, Kenya is blessed with inland blue economy resources whose potential has not fully been tapped for economic growth through economic activities such as fishing, mining, tourism and others. The country has over eight major lakes, including Victoria, Turkana, Nakuru, Naivasha, Elementaita, Baringo, Bogoria, Magadi, and over seven major rivers, including Tana River, Athi river, Nzoia, Yala, Sondu-Miriu, and the Mara.

4.1. Rivers

Rivers and their ecosystems are important to the country's development as they provide myriad essential ecosystem services such as cultural sites, cleaning of air, water purification, climate regulation, food, and many others. In addition, they also provide tourism services that are a source of leisure and revenues to communities and country. Several river tourist activities exist in the country. They include water rafting, sport fishing, site seeing, animal and bird watching, and cultural sites. Mara River, for instance, is one of the famous and popular river basins in Africa. It serves Kenya and Tanzania through the Masai Mara National Park in Kenya and Serengeti in Tanzania. The famous wildebeest great migration, where millions of animals cross the river twice to Mara and back to Serengeti, has been recognized and included among the wonders of the world. As a result, the Mara river tourism-associated activities, mainly wildebeest migration, contribute 8% of total Kenya's tourism income. The total value and income generated from the tourism activities along with the Mara River amount to more than stated. However, climate change, human activities, and other factors affect the river basin's ability and its contribution to GDP.

The Tana River Basin covers 22% of Kenya's total landmass and is home to 18% of the country's population. The river itself stretches for 621 miles from the Aberdare Mountains to the Indian Ocean. It provides a range of ecosystem services vital for human well-being, such as drinking water, hydroelectric power generation in the seven folk's dams, fisheries, agriculture, and biodiversity. The delta presents a natural habitat to diverse flora and fauna, forming an ideal ecosystem for the promotion of eco-tourism. Due to its rich biodiversity, the Tana River basin is

home to Kora National Reserve, Arawale National Reserve, and Tana Primate National Reserve. In these reserves and conservation areas are the Red Columbus Monkey, Tana River Crested Mangabey monkeys, elephants, and heartbeats (Hirola). However, tourism along the river basin is not accorded much importance or at least promotion as it is shadowed by other economic activities such as hydroelectric power generation and agriculture. According to the African Bird Club, the delta hosts about 15,000 migratory birds from 69 bird species, including Allen's Ganulles. It is also internationally important for the survival of no less than 22 species of birds (such as ibises, egrets, geese), making the delta one of the key sites in the country for waterbird conservation. The endangered Malindi Pipit and Basra Reed-warbler bird species have been observed in the river's habitats. It also holds the breeding sites of valuable edible fish and shellfish and the rich biodiversity of other wildlife. Besides the flora and fauna, there are watersporting activities along with one of the Tana tributaries, River Sagana. The river has several rapids popular for local and international tourism, such as camping, rafting, kayaking, bird, and hippo watching. Despite having such spectacular and potential tourism attraction sites, the number of tourists per year has been minimal, adversely impacting the expected earnings.

Athi River, the second-largest river in the country, also offers exciting tourism destinations and attractions, apart from other socio-economic benefits. It is one of the best water rafting places in Kenya, and offers the most interesting rafting adventure and wonderful game views of various wild animal species in their natural habitat. However, even with such natural and scenic promises, very few visitors frequent these sites where sightings of crocodiles, hippos, lesser kudus, waterbucks, dik-diks, and to a lesser extent, lions and leopards are relatively common. Upstream, near Thika, the river is home to Fourteen Falls, which attracts local and even international tourists. Downstream the river changes its name to Galana and has some beautiful sceneries such as Lugard's Falls, a wonderful landscape of water-sculpted channels and striated rocks. The Tsavo River which forms a part of the Athi-Galana-Sabaki drainage originates from the west side of the Tsavo national park drains to the Athi River. It is the main contributor to the watershed of the lower portion of the park region and is home to abundant fish. The River is the site of the famous 1898 Tsavo maneaters. These are monumental sites that attract tourism inflows but are not well promoted.

Another important river is the Ewaso Ng'iro River which stretches for 435 miles from its source waters in Mount Kenya and eventually joins the Jubba River in Somalia. The riverbanks support wildlife, including elephants, buffalo, rhinos, cheetahs, leopards, and Zebras. Wildlife protection areas such as the Lewa Conservancy and Samburu Game Reserve in Isiolo were founded to protect

vulnerable wildlife. However, tourism is mostly attracted by the river's wildlife and is not directly associated with the river.

Other rivers in the country have scenic landscapes such as waterfalls, rapids, and magnificent wildlife, and hold a great potential to contribute to the country's tourism activities, and revenues at both county and national levels. Nonetheless, the focus has been on coastal tourism, while the inland area is famous for the national parks, game reserves, and the lakes to some extent. Rivers have largely has been ignored and not treated as a priority tourism contributor, or indeed important for other socio-economic activities such as fishing.

There has been no effort to separate the river tourism activities and those of other sources like game reserves, sanctuaries, and national parks partly because many of the major rivers in Kenya flow through major national conservation zones such as Masai Mara (Mara River), Kora National Reserve (River Tana) and Tsavo National Park (Athi River) among others. Secondly, there is no clear mention of river tourism and its associated activities or its promotion in the County governments' CIDPs where the major rivers flow through e.g. Kitui, Machakos, Makuaeni, Isiolo, Tana River, Narok, etc. This clearly shows that county governments concentrate more on safari and lake tourism (for off coast counties) and beach tourism for coastal counties ignoring the potential economic and social impact that river tourism could contribute to diversifying the blue economy.

4.2. Lakes

Kenya is part of the African Great Lakes region, and its lakes are fundamental to the nation's biodiversity. The country is home to 64 lakes, both salty and fresh water. The Lakes are an important source of livelihood in the country, and provide a plethora of benefits including fishing, water for agriculture, minerals, conservation areas, tourism activities etc.

4.2.1 *Lake Nakuru*

Lake Nakuru is at the edge of the city of Nakuru, and approximately 60km from Naivasha, with Lake Elementaita in between the two lakes. The lake lies on the floor of the Rift Valley at between 1760 and 2080 m above sea level. The shallow, (approximately 3m deep) alkaline lake is fed by seasonal rivers (Njoro, Nderit, Makalia, Naishi and Larmudiak) and the permanent Baharini springs which flow from either the Mau Escarpment or the Aberdares. The lake is surrounded by the Mau ranges to the West, Eburru to the South, Bahati Escarpment to the North-East and Menengai crater to the North. It covers an area of 43.3 km^2, which is part of the 188 square km of the Lake Nakuru National Park. It has a maximum depth of 7.5 m with a

mean depth of 2.8m (Kiogora *et al*. 2020), and has no outflow, thus losing water by evaporation. Among the inflows are partially-treated sewage and industrial effluents from the nearby Nakuru Town – a major commercial and industrial Centre and Kenya's fourth-largest city(Raini, 2009). The lake's surface area has increased from 43.3 km^2 to 70 km^2 in 2014 and still increasing due to high rainfall patterns experienced in recent years (Kiogora *et al.* 2020). The rise in lake levels has seen an increase in the lake's surface and inundated the hinterland riparian area previously uncovered by water. The lake is a nationally-protected area under the management of the Kenya Wildlife Service (KWS), and internationally classified as a Ramsarsite, Important Bird Area (IBA), and a World Heritage site. It is renowned for hosting the largest

population of Lesser flamingos worldwide – what has been described as "the world's greatest ornithological spectacle".

The park also has more than 56 mammal species and over 450 bird species, including 70 speciesof waterbirds. In 2005, the KWS branded Lake Nakuru a bird watcher's paradise. Tourists watch bird species, such as the lesser flamingos, greater flamingos, pelicans, and the Africanfish eagle, feeding in or flying over the lake. The Lake, therefore, offers a profusion of tourismactivities which include bird watching and game drives, where tourists are treated to the rare and endangered Rothschild's giraffe and the endangered White rhino and Black rhino, amongother wildlife species. Other natural features surrounding the Lake are Baboon Cliff, Honeymoon Hill, Lion Hill, Hyrax Hill, Makalia Falls, Menengai Crater, prehistoric sites and caves, which are also great tourist attractions. Boat cruising is also common on the lake waters for local and international tourists. A study conducted by Ariya *et al.* (2017) on the perceived value of wildlife tourism products at Lake Nakuru National Park showed that many of the tourists visiting the lake are non-residents, especially from Europe and America. Further, it showed that the Lake and the adjacent park receive around 245,000 visitors each year, including over 146,000 international tourists and over 95,500 domestic visitors. The park also generates about Ksh. 17 million annually from the two privately owned lodges in the park leased as concessions from KWS.

Over the decades, the accumulation of inflows into the lake have led to the development of strongly alkaline conditions that have created harsh conditions that have limited the range of species that could inhabit the site. The Lake has, however, for many years been inhabited by *Sarotherodon alcalicum grahami*, a small Cichlid fish that can tolerate harsh conditions. The fish was introduced in the lake during the early 1960s and had flourished during the 1970s. A rise

in water levels experience in the past few years has increased the lake's surface and inundated the hinterland riparian area previously uncovered by water. This has expanded the fish habitat providing feeding and breeding grounds outside the park. This phenomenon has introduced a change in the fish species composition to include additional three cichlid species namely; *Oreochromis niloticus, Oreochromis variabilis*, and *Oreochromis leucosticus* (Kiogora *et al.* 2020; Waithaka 2020). As a result, a small artisanal fishery has emerged outside the park with several unlicensed boats, but the full potential of the Lake Nakuru fishery is not well understood. *Oreochromis niloticus* has become the most abundant fish species with an average catch rate of 10.6 kg/hr, followed by *O. variabilis* and *O. esculentus* respectively, while the population of *a. grahami* has been reduced probably due to the intrusion of the three cichlid species and changes in water quality parameters.

On mining, there is limited information is available regarding the mineral potential for the Lake. However, given its location and alkaline nature, Lake Nakuru is rich in bicarbonates and carbonates. With partnership with the KWS, it is possible for research scientists to estimate the economic potential of minerals and extractives in the Lake Nakuru basin .

The closed basin lake lies in a particularly precarious location in the sump and is currently threatened by many issues (Kiogora *et al.* 2020) such as; human population explosion, rapid infrastructure development, climate change (drought and flood management) and ecosystem degradation, inadequate integrated basin planning and management, inadequate flood and drought management, and the increase of needs for residential, industry, materials, and renewable energy. These in turn affect biodiversity resulting in various adverse effects like the fish deaths in early 2020. The rising water levels have also led to reduced wildlife terrestrial areas and sub-merging of the original park road circuits and some KWS facilities. The strong alkaline conditions in the Lake also create harsh conditions that limit the range of species that can inhabit the site, such as the blue-green algae species, which is a major food for flamingos. A low number of flamingos due to limited feed will implications on the park as a choice among tourists. To maintain the potency of the lake as an important tourist site with a vibrant ecosystem; there is a need to continuously monitor the lake levels and the related changes in water quality parameters including the pollution levels; and devise appropriately controlled methods of culling the high biomass of *Oreochromis niloticus* that has invaded the lake.

4.2.2 *Lake Naivasha*

Lake Naivasha, the second largest freshwater Lake in Kenya located in Nakuru County, covers an average water surface area of 139 square km. The economic activities around the Lake include small-scale and large-scale agriculture, ranching, tourism, fishing, geothermal power production, and pastoralism. In addition, over 50 square km of land around the lake is under intensive commercial horticulture and flower (horticulture) farming. These activities provide livelihoods for over half a million people living within the basin.

Lake Naivasha is one of the most important fishing areas in Kenya, after Lake Victoria and Lake Turkana in that order. Its fishery plays an important role in the Kenyan economy by providing food and nutritional security, generating employment and income. Lake Naivasha fishery output has increased from approximately 680 tons in 2008 to 3400 tons in 2019 (Njiru *et al.*, 2017; Nyamweya *et al.*, 2021). At present, all fish species in Lake Naivasha are non-indigenous since the first introductions in the 1920s, with the exception of *Aplocheilichthys antinorii*, last reported in 1962 and *Barbus amphigramma* which is a riverine intruder. The introduced species include: The Blue-spotted tilapia, Red-bellied Tilapia, Largemouth bass, Crayfish, Common carp, Nile Tilapia, and the African catfish. All but gyppus have been exploited commercially in Lake Naivasha in various quantities over the years.

The lake has great potential for tourism since it is surrounded by a variety of wild animals and bird species. A trip to the lake treats visitors to a stunning forest of Acacia and the magnificent sight of buffalos wallowing in the swampy, marshy areas or the hippos sleeping in the shallow ends of the lake. The lake is also the perfect place to watch monkeys swing on treetops and watch giraffes striding across the acacia trees. The Lake's Forest is home to over 400 bird species and a perfect destination for bird watchers. These include the pink-backed pelicans, long-tailed cormorants, goliath heroine, black-lored babblers, grey-capped warblers, white-fronted bee-eaters, great white egrets, brimstone canaries, weavers, and the iconic fish eagles, among others. There are boat rides along the Lake which provide a perfect view of the crescent island dotted with animals such as the hippos, kongoni, and zebras. In addition, an Island in the Lake is ideal for activities such as hiking, biking, walking, and weekend retreats. It is also home to Impalas, Wildebeests, Giraffes, Zebras, Waterbucks, and elands.

The tourists could also hike up Mt. Longonot, a dormant volcano which is 16.1km away from the lake. There are game drives which can be done on bikes, foot, horse ride, and safari vehicles.

Tourists also flock the lake for leisure sportfishing, targeting *Micropterus salmoides (*Largemouth bass*)*. In addition, recreational fishing is a popular leisure activity that can potentially support species conservation and provide socio-economic benefits to the local economy. The area aroundthe lake attracts thousands of local and international tourists to its resorts, camps, and two national parks.

Despite its rich variety of tourism activities and vibrant fishing, there are environmental challenges affecting the Lake which emanates from poor land-use practices within the watershed e.g., watershed being cleared for farms, unregulated and excessive water abstraction for domestic and agricultural or horticultural use, weak policy enforcement, and population pressure on natural resources. There is also water pollution caused by fertilizer runoff from flower farms that kill fish and causes climate change. These have resulted in degradation of ecosystem services, economic losses, worsening poverty, and reduction of biodiversity.

To manage sustainably manage the fishery in the Lake: a) the carrying capacity of Lake Naivasha should be properly researched in order to provide better estimates on the production capacity of the lake and how much fish can be harvested without adverse effects to the fishery; b) there should be increased surveillance and monitoring of the fishery due to the illegal, unregulated and unreported fishing activities. These serve to allow for obtaining accurate catch estimates of the production of Lake Naivasha fishery resources and protection of important fish breeding and nursery grounds that will allow for and enhance the recovery of the fish stocks; c) there should be an ecosystem-based approach to fisheries management of the lake that holistically takes into account, the whole lake basin into consideration, with relevant stakeholders involved in the formulation and implementation of the decisions to manage the fishery. Increased tourism around Lake Naivasha will aid in the conservation of its variety of aquatic flora and fauna.

4.2.3 Lake Victoria

The Lake Victoria, the second largest freshwater lake globally and the largest lake in Africa, has a surface area of 68,800 square km and a catchment area of 193,000 square km**.** It is shared by three countries, namely: Tanzania occupying 49% (33,700 square km), Kenya occupying 6% (4,100 square km), and Uganda occupying 45% (31,000 square km). The Lake flows out through the River Nile, supplying the river with fresh water throughout the year. In addition, the lake supports a large population through economic activities such as fishing (thelargest

source of freshwater fish in the country), agriculture, transport, and tourism. It is worthnoting that, most of the tourist attractions are not found on the Kenyan front as Kenya occupiesa small percentage of the lake.

Attractions in the Lake include the Ngamba Island, a Chimpanzee sanctuary located south-east of Entebbe in Lake Victoria. It is also called the Chimpanzee Island and is home to more than40 rescued chimpanzees that cannot return to the wild. Tourists also take boat trips to the Equator Island, also called Lwaji Island where Equator passes across Lake Victoria. The Island has many different bird species such as flying egrets and kingfishers flying along the surface of the water. In addition, tourists can also view the incredible and giant trees that grow on the island rock's surface. The Lake is also home to many water birds such as Shoebill in Mabamba wetlands, Malachite Kingfisher, Black-headed Weaver, African Jacana, Black-headed heron,Black kite, etc. The vegetation surrounding the Lake provides breathtaking views to visitors in addition to the scenic views of the Lake shores.

There are also boat rides to the source of the Nile in Uganda, which provides beautiful gardens that attract thousands of tourists. There are also ffishing trips in search of the giant Nile Perch. The Lake's water provides beautiful glittering sunset that people within and from outside the country travel to witness. In addition, people do swimming in the lake waters. However, the waters are dangerous because of diseases and animals, and swimming is done with caution.

Being a transboundary resource, anthropogenic activities around the Lake and on catchments of the rivers draining into the Lake have resulted in a plethora of challenges. These include: declining water quality, increased pollution loads, wetland degradation, decreasing biodiversity, and water hyacinth infestation. These environmental concerns threaten and undermine the Lake's ecosystem, as well as the health and livelihoods of the millions of people who depend on its resources. These challenges threaten the lake's tourism potential. The county government of Kisumu has however, decided to take actions to save and conserve the lake for its natural and economic potential. For instance, the County Integrated Development Plan (CIDP) 2018–2020 outlines possible sustainable development strategies including monitoring water levels and quality, regulating wastewater and effluents from farms to fully utilize the cage fishing culture and water sports and industries, enacting harmonized laws, and Lake surveillance.

Fishing is also a key economic activity in Lake Victoria, and fishers, Kenya mainly use Sesse boats that are pointed at both ends when using sails as a mode of propulsion or Sesse boatsflat at one

end when using outboard engines. The main fishing gears that are used are the Long Line (LL) and Gill Net (GN) for Nile Perch and Tilapia fisheries respectively; and the Small seine for the Dagaa (*Omena*) fishery (Table 4). Destructive fishing gears such as monofilament nets, beach seines and boat seines are generally outlawed gears by the Lake Victoria Fisheries Organization partner states due to their perceived negative impacts on aquatic habitats but, they are still prevalent in the lake (Onyango *et al*., 2021).

Table 8: Fishing effort indicators in Lake Victoria, Kenya

Indicator	Total Number
Landing sites	338
Fishers	43,653
Fishing crafts	
Total number of crafts	14,209
Foot fishers	156
Dugout	3
Parachute	2902
Raft	18
Sesse Flat at one end	3503
Sesse pointed at both ends	7783
Modes of propulsion	
Outboard Engines	3155
Paddles	6884
Sails	4169
Fishing gears	
Beach seine	906
Boat Seines	901
Cast net	75
Gill nets	192,987
Hand lines	2810
Long line hooks	2,507,893
Monofilament	20,842
Small seines	13,156
Traps/baskets	1097

Source: Adapted from Onyango et al. (2021).

The Catch Per Unit Effort (CPUE) at the inland waters revealed that the average catch per trip declined significantly between the Financial Year 2003/2004 and 2014/2015 (Table 5). The CPUE has been fluctuating with a decline on gillnet of 0.4 kg per fisher per day and a general increase of 0.7 - 9.9 kg per fisher per trip among the commonly used fishing gears (longline, handline and small seine) between the Financial Year 2008/2009 and 2014/2015 (Table 5) (Kimani *et al*., 2018).

Table 9: Composition of mean CPUE of common fishing gears at Lake Victoria

Gear type	CPUE (Kilogrammes fisher per trip)		
	per 2003/2004	2008/2009	2014/2015
Gillnet	4.1	2.9	2.5
Longline	5.8	5.0	5.7
Handline	3.8	3.7	4.5
Small seine	38.3	23.6	33.5

Source: Lake Victoria Catch Assessment Surveys, LVFO/KMFRI

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4.2.4 Lake Turkana

Lake Turkana is found within the East African Rift System that extends over 3,000 kilometres from the Red Sea and Gulf of Aden, through Ethiopia, Kenya and Tanzania, to Southern Mozambique (Dunkley et al., 1993). The Lake, formerly known as Lake Rudolf, is the largest desert lake globally. Three rivers namely the Omo, Turkwel, and Kerio flow into the lake, with nearly 90% of the lake's water coming from Ethiopia via the Omo River. The river lacks an outflow, and thus loss of water is by evaporation. Its length is 257 kilometres, its average width 31 kilometres, and an average depth 31metres which reaches its maximum depth of 114 metres near its southern end.

In 1997, the 'Lake Turkana National Parks' were added to UNESCO's World Heritage List as a site of 'outstanding universal value'. This World Heritage site comprises Sibiloi National Park and the two island national parks, Central Island and South Island. Sibiloi National Park is the only Kenyan national park created for archaeological reasons. The lake's third island, North

Island, is not a national park, and hence is not within the protected area. The crater lakes of Central Island were formerly submerged and have progressively emerged as the main lake level declined (Hopson *et al.,* 1982). Flamingo Lake became isolated in the late 1890s, followed by Crocodile and Tilapia Lakes in 1902 and 1972 respectively.

Despite the low carrying capacity of the area the fauna is relatively diverse, especially in breeding and migratory birds. The island Parks were established to protect the breeding habitats of the Nile crocodile *Crocodylus niloticus*, hippopotamus *Hippopotamus amphibius* (VU), puff-adder *Bitis arietans*, cobra *Naja haje,* and Egyptian saw-scaled viper *Echis pyramidum*. The lake is an important flyway for migrant birds. Over 350 species of aquatic and terrestrial birds are known for the region, which is recognised by BirdLife International as an Important Bird Area, and a priority for conservation. At least 23 bird species are known to breed in the environs of the lake, including the goliath heron Ardea goliath. Mammals in the area include olive baboon, wild dog, striped hyena, caracal, lion and cheetah, warthog, hippopotamus, reticulated giraffe Giraffa, plains and Grevy's zebras, Grant's gazelle, Beisa oryx, lelwel hartebeest, topi,greater kudu, lesser kudu, and dikdik.

Lake Turkana's broader basin, the lake, and its fringing floodplain wetlands provide a host of hydrologic, ecological, economic, and socioeconomic services. These services include provision of water for domestic and livestock use, energy (hydroelectric power) and agricultural uses, habitat for fisheries, forage for livestock, fuel, building materials, natural food products, climate moderating effects, as well as significant opportunities for ecotourism and preservation of cultural values. The lake, the Omo and Turkwel rivers, and associated springs are permanent water sources utilized by thousands of people, hence forming important lifelines in the regionfor millennia. Although Lake Turkana may have the potential to increase food security in a region where reliance on food aid is ubiquitous, the sustainability of the fishery has not been extensively studied. Pastoralism has been the preferred livelihood of people surrounding the lake for the last few thousand years, but fishing provides an important alternative and a "safety net" livelihood in the region (Kaijage and Nyagah 2010). Currently, one of the largest obstacles faced by the Lake Turkana fishery is postharvest losses, which can be as high as 50% (Ojwang *et al.* 2007).

There are several tourist attractions in the Lake such as *sport*fishing which normally done around Central Island, Kampi Turkana on the east side, and around the Alia Bay area in Sibiloi National

Park. There are also 60 fish species, seven being endemic to the lake, and support the world's largest populations of Nile crocodile. An estimated 120,000 Nile crocodiles breed on Central Island. Fishing is the main economic activity and tourists can catch Nile Perch, Tilapia, Tigerfish, catfish, etc. The Lake hosts many waterbirds including flocks of flamingoes which are an attraction as they feed and fly over the lake waters. At the shores of the Lake boat rides to three craters or for scenic view of the lake. Boat visits to the Central Island national park and South Island National Park, known for Nile Crocodiles can also be organized.

The Lake also hosts the Nabiyotum crater, is an impressive landform found in the middle of Lake Turkana. This crater, which was discovered in 1988 is of volcanic origin and offers special experience for nature enthusiasts. One can also swim at Eliye beach or enjoy cultural visits to the Turkana communities which offer a chance to experience the pastoralist way of life.

Wild safaris to the Sibiloi National Park are an attraction to a wide range of domestic and international tourists. The Park has a variety of wildlife animals including reticulated giraffe, beisa oryx, gerenuk, grevy's zebra, lions, leopard, and cheetah. Sibiloi is also home to important archaeological sites, including Koobi Fora, where the fossil remains have contributed more to understanding human evolution. Extensive palaeontological finds have been made in this area, starting in 1972 with the discovery of *Homo habilis*. This area is the only archaeological conservation area in Kenya gazetted as a National Park, with 100 archaeological sites have been discovered. Other findings include several ancestors of modern animal species. The area also has a unique archaeological site for hominid remains and relics of giant tortoise, crocodile and behemoth mammoth. Very few visitors travel to these National Parks although their tourist potential is quite high. There is an airstrip at the Turkwel dam, and camping facilities at the Koobi Fora Museum & Research Base and at Rocodoni facing Mount Sibiloi. There are also hotels which could host tourists during bird watching or game viewing. To make the Lake more attractive as a tourist destination, the county needs to develop infrastructure and tourism products for marketing, setup fish processing industry, and promote tourism (CIDP; 2018-2022).

Little is known about mining in and around Lake Turkana. Some sand harvesting takes place in a few areas around the Lake. Stone harvesting for construction also takes place around Lake Turkana. Lake Turkana is a shared transboundary resource by Kenya and Ethiopia. The region is rich in natural resources and hosts unique endemic species. Part of the lake and lower Omo Delta havebeen zoned as an international biosphere reserve protected areas, but are facing immense threat from anthropogenic activities. In spite of these threats, there is no management plan in

place to guide resource use in the region, but recent efforts toward the development of wildlife management and fisheries management plans by Kenya Wildlife Services (KWS), National Museums of Kenya (NMK), and the State Department of Fisheries are commendable. Human activities in the Lake Turkana basin have accelerated the rate of ecological change and increased threats to the existing natural resources. Major threats in the region include current and planned construction of dams on the Omo River. Two dams (Gibe I and Gibe II) have been constructed along the Omo River, a third dam is under construction (Gibe III), and there are plans to build two additional dams in the future (Gibe IV and V). Other threats include agricultural expansion and intensification through irrigation projects along the Omo River; environmental stressors including climate change, recent oil discovery, and ongoing exploration activities; associated resource use conflicts, and construction of Africa's largest wind power plant.

The potential for wind energy in Lake Turkana and oil and gas in the Lake's basin also ought to be further investigated.

4.2.5 *Lake Bogoria*

Lake Bogoria is one of the lesser celebrated and important lakes in the Rift Valley is the Lake Bogoria, an alkaline lake that lies just south of Lake Baringo which is approximately 34km long and 3.5 km wide, and has a depth of about 10 meters, hence relatively shallow. The lake andits catchment are rich in natural resources that include landforms, forests, wildlife, wetlands and pastures. In the catchment there are moist upland forests around Subukia that are the major sources of surface inflows into the lake and are rich in forest products and biodiversity. The wider catchment has multiple land-use types that have undergone major changes in the last 100 years. The moist upper catchment area changed from forests to large-scale commercial farms and ranches, which were later sub-divided into small-scale holdings. The lower catchment was under nomadic livestock production, which has changed over time to a relatively sedentary mode of livestock production.

The lake is characterised by steep shoreline and has a trough basin morphometry comprising of three semi-distinct but interconnected basins consisting of; the northern, central and southern basins. The southern basin, a relict volcanic crater is the deepest part (14 m), joined to the restof the lake by a narrow isthmus. The Lake has a high alkalinity with pH ranging between 9.8-10.6, alkalinity between 480-800 meql^{-1} and an electrical conductivity of 45,000-85,000 μScm^{-1}. The phosphorus levels are also extremely high and occur in the form of orthophosphates.

The open water is dominated by phytoplanktons and bacteria extremophiles, while the shoreline vegetation is characterised by several plant species. Soon after their discovery, the heat-stable enzymes of thermophiles proved to be very important to the field of biotechnology. Two thermophile species *Thermus aquaticus* and *Thermococcus litoralis* are used as sources of the enzyme DNA polymerase, for the polymerase chain reaction (PCR) in DNA fingerprinting. As thermophiles have become increasingly important in biotechnological research, the number of bio-prospecting groups searching for useful organic compounds in nature has dramatically increased as well. Consequently, concerns over preservation of biodiversity and natural resources as well as profiting research results have given way to benefits-sharing agreements, such as the Cooperative Research and Development Agreement between Yellowstone National Park and the Diversa Corporation, and Novozyme of Denmark and KWS.

The lake has several hotsprings, geysers and fumaroles which have high temperatures of between 100-170 ^{0}C, are highly mineralized and are sourced from shallow aquifers in contact with lava intrusions. All the springs are alkaline with a pH above 8.0. Within the reserve, biodiversity inventories have identified approximately 210 plant species belonging to 53 plant families in the reserve and neighbouring wetlands. The area is rich in wildlife species characterised by a high diversity at low densities. Animals found in the area include the Greater Kudu and several reptiles that include monitor lizard, tortoise, crocodiles and various species of snakes. Over 373 species of birds have been recorded in the area including over 50 migratory species, making it one of the richest birdlife areas (IBA) in Kenya. The lake also holds huge congregations of lesser flamingo that feed on the high production of blue-green algae dominated by *Spirulina platensis*.

The first formal conservation initiative around the lake was gazettement in 1970 of the Lake Bogoria National Reserve (LBNR) under the wildlife Act by the Wildlife Conservation and Management Department (WCMD). The management of the reserve was later transferred to the Baringo County government. Currently there is a 10-year (2019-2029) management plan for Lake Bogoria National Reserve has been developed in accordance with Section 44 and The Fifth Schedule of the Wildlife Conservation and Management Act, 2013. It is also based on KWS Protected Area Planning Framework (PAPF), the planning standard for preparing PA management plans. In line with the PAPF, this plan has been developed in a highly participatory manner, incorporating and building on ideas from a broad cross-section of LBNR stakeholders.

Entry to Lake Bogoria National Reserve
Plate: Richard Mulwa, 2022.

According to Baringo county CIDP 2018 – 202O the total number of domestic and foreign tourists visiting Lake Bogoria in 2017 were 66,561. Although small, the lake has plenty of tourism activities and attractions. The Lake is home to the lesser flamingos, and important attraction to visitors who come to see the wonderful blazing scene of the pink flamingoes feeding. There are also many other birds and wildlife, such as buffalo, zebra, baboon, warthog, caracal, spotted hyena, impala, and dikdik. The Lake has 200 natural hot springs close to the lake or are inside, and their water temperatures vary from 39 to 98.5C which offer cooking experiences to tourist.

Due to high alkalinity and other unfavorable conditions in the Lake, there are no fish or other fauna in the lake, thus no economic activity takes place in the Lake. Tourism, and perhaps mining of enzymes from thermophyles are most suited economic activities for the lake. To fully utilize it therefore, there is need for specialized boats made from materials that can withstand the adverse conditions in the lake, and enable visitors to explore parts of the Lake, especially the steep shoreline on the opposite side of the LBNR main gate which has not been explored at all.

The Lake, like other water bodies in the country is experiencing deteriorating environmental

conditions that threaten sustainable livelihoods, environmental integrity and the continuation of natural ecological processes. The negative environmental impacts are emanating from demographic changes, inappropriate land use types and trends, poor governance and policy failure and high poverty prevalence. High livestock densities of poor stock quality have accelerated environmental degradation in this semi-arid area. Livestock numbers in this area have increased over time and are restricted to a smaller range compared to the past herding

system. These land use changes and a high human population growth has exerted enormous pressure on the environment and natural resources. Consequently, these developments have disrupted ecological processes and have negatively impacted the environment. These impacts are manifested by severe soil erosion, mass wasting, high silt loads in runoff, agro-chemical pollution, land degradation, deforestation, land fragmentation and encroachment into sensitive habitats.

The lake is also facing the increasing water phenomenon experienced by other lakes in the Rift valley such as Naivasha, Nakuru, Baringo, etc. Lake Bogoria has spread northward towards Lake Baringo and whereas the two lakes are on average 22 Km apart they have now closed the gap to just about 11 Km apart. They are likely to merge in the near future if the rise continues. Already Lake Baringo and Lake 94 have merged and Lake Bogoria is threatening to spill over if it scales 1003 m elevation at Kisibor Swamp. The possibility of the two lakes merging is a big threat ecologically and could result in detrimental impacts on aquatic life and biodiversity.

4.2.6 Lake Baringo

The Lake Baringo situated in Northern Kenya's Rift Valley is an important freshwater lake with surface area of about 220 square kilometres and an elevation of 1000 meters (3200 ft). The area around the Lake is inhabited by the Ichamus, the Tugen, the Turkana and Pokot communities. Several rivers including Perkerra, Ol Arabel, Chemeron, Ndau, Mukutan, and El Molo which originate from the Tugen Hills and Mau Hills feed the lake. The lake is important to the communities in its basin as a source of water for domestic use and livestock consumption. Other important uses are income generation through tourism, biodiversity conservation and fishing activities. The lake also is a source of vegetation products (e.g. *Aeshynomena elephroxylon*), which is used for boat construction, and water lily.

The composition of the lake's fish species includes *Oreochromis niloticus*, *Protopterus aethiopicus*, *Clarias gariepinus*, *Barbus intermedius* and *Labeo cylindricus*. Kampi ya Samaki, centre that has grown mainly because of fishing activities in the lake. Half of the population inthis centre is fishermen or fish handlers, while others earn their living through such activities as boat construction. As a result of an overdependence on fishing, there has been a remarkable fluctuation in fish production. Its shoreline also is used as a grazing ground for livestock, especially during dry seasons when the catchment is dry and grass is scarce. The local people also

use the lake for navigation to link the eastern and the western parts of Baringo District (Odada, 2006).

The lake also is an important tourist attraction because of its rich biodiversity, which comprises hippos, birds and crocodiles, among others. There are tour operators who own boats used by tourists for navigation in the lake and sport fishing. There seven islands on the Lake are important tourist exploration sites. These are Ol Kokwe Island, Devil's Island, Samatian Island, Rongena Island, Parmolos Island, Gibraltar Island, and Lokoros Island. Ol Kokwe is the largest island in the middle of the Lake which has hot springs and fumaroles containing sulfur deposits, and houses Baringo island camp. There is also Roberts camp is situated on the shores of Lake Baringo. At night tourists can experience the thrill of seeing or hearing hippos and seeing floating crocodiles at the lake shores. There are also two reptile parks in the lakeshore i.e. the Lake Baringo Reptile Park and Dr. Richard Leakey's Snake Park. These house snakes, crocodiles, tortoises, turtles, monitor lizards, and offer a panoramic view of the Lake and Kampi Samaki Escarpment.

Boats used for navigation in Lake Baringo
Plate: Richard Mulwa, 2022.

The Lake is important for wildlife viewing as it hosts the last remaining population of the greater kudu. Other wildlife include impala, dikdik, zebra, grant's gazelle, warthogs, hippos, crocodile, rock hyrax, and klipspringer. It is also habitat for over 450 bird species a paradise for birders. The birds which habit the shores and islands of Lake Baringo include flamingoes, Goliath heron, African eagle, African openbill stork, etc. According to Baringo county CIDP 2018 – 202O thetotal number of domestic and foreign tourists visiting Lake Baringo conservation area in 2017were 3606. The Lake offers several tourist attractions and activities which could be exploitedto attract more tourists. Besides small-scale sand harvesting, there is no known mining activity carried out in or around Lake Baringo.

Studies by Onyando (2002) revealed that the area of the lake was 219 km^2 in 1976, 136 km^2 in 1986, 114 km^2 in 1995, and 108 km^2 in 2001. In the past few years however, the Lake waters have been rising due to the phenomenon experienced by other lakes in the Rift Valley and the waters have submerged homes, churches, and schools, hotels, offices etc. Although a tragedy, the phenomenon has attracted many for leisure and academic interest. Overgrazing is a major problem in this area, because the pastoralists communities are not willing to reduce the number of their herds to conform with the available food biomass. Their livestock is comprised of cattle, sheep and goats. Dry seasons are critical periods for raising livestock because the grass is rare at that time and most cattle graze along the lakeshore, thereby interfering with the lake's ecosystem. This is compounded by the communal land tenure system which accelerates soil erosion as the cattle graze together and are driven in herds from place to place in search of pasture. The water quality of Lake Baringo has also deteriorated over time. The main concern is turbidity, which has increased because of high rates of sedimentation from increased soil erosion in the catchment.

Submerged hotel in Lake Baringo
Plate: Richard Mulwa, 2022.

4.2.7 Lake Magadi

Lake Magadi is an important Lake for inland tourism and mining which lies slightly to the north of Lake Natron and at the bottom of a steep-sided valley, the lowest point in the eastern or Gregory Rift Valley. The lake is roughly 20 km long by 6 km wide and covers an area of 90 square km. It is one of the most saline Lakes and one of the smallest alkaline lake sumps in the Rift Valley. The main economic activity in the lake is trona/soda ash extraction and tourism.

Trona, a naturally occurring mineral that contains sodium carbonate compounds, is found at the

surface of the lake. The high temperatures and long sunny days in this area cause the solution to concentrate by evaporation eventually giving rise to more trona. Thus, the trona deposit inLake Magadi is constantly renewing itself by natural means. After the Unites States of America and Turkey, Kenya is the third largest producer of soda ash in the world, with an annual production of about 360,000 metric tonnes.

Besides trona, there are several wild animals to see around the lake, including the giraffe, wildebeest, zebras, antelopes, and gerenuk. Others are hyenas, lions, buffalos, and elephants. Tourists can also trek and hike around the lake, identifying the different bird species, the eggs on the ground, and the northern hot springs for egg boiling. The sky above the Lake is mostly clear blue, enabling visitors on a camping safari to gaze and identify the stars and milky way pattern at night. Plans are currently underway to acquire equipment to view the stars. The Lakeis also endowed with many bird species such as flamingos, water ducks, pelicans, white stalk, marabou stalk, blacksmith pullover, eared avocets, black wing stilt, among many others. During the rainy season, the lake receives thousands of flamingos from Lake Natron's breeding grounds close by.

The hot springs in the Lake are a key attraction to many visitors for hotsprings bath. The water is believed to have medicinal value to the skin, curing ailments such as skin rashes, pimples, acne, dry skin conditions, and helps in strengthening the bones in the body. They can also visit local traditional Maasai bomas, commonly known as manyattas: the visit is organized early in the morning or in the evening when the cattle and goats are in the homesteads. The visitors can learn about the community's lifestyle and beliefs and milk the goats and cows. Despite its economic and social importance, the lake faces imminent threats from increased human activities resulting in siltation.

The Lake also has the Lake Magadi *Tilapia* (*Tilapia grahami*) lives in extreme conditions of temperature, salinity and *p*H, in the lagoons and alkaline volcanic springs around the margin of Lake Magadi in Kenya, although no fishing is done in the Lake.

The lake is being threatened by soil erosion, which causes siltation. Increase in population in towns around or in the Lake catchment e.g., Narok has pushed residents into cutting down trees to increase habitation areas. The residents have also adapted poor agricultural practices thathave further fuelled soil erosion. Trona takes as much as 15 to 20 years to regenerate. But with silt, it takes much longer while also reducing its purity. If this current trend continues, future generations

will not have any trona to mine.

4.2.8 Lake Elementaita

Another small but important Lake is the Elementeita located between Lakes Naivasha and Nakuru. It is a breeding and feeding ground for many threatened bird species, and its shores are important areas for animals such as zebra, gazelle, eland, hippopotami and warthog, and a sanctuary for the rare Rothschild giraffe. It also serves as a sanctuary for the nationally threatened colobus monkeys. The Lake is surrounded by hotels and resorts that attract domestic and international tourist. According to an evaluation report by IUCN in May 2021, artisanal extraction of soda and sand exists in Lake Elementaita. The report further identified diatomite extraction site outside the buffer zone, east of the sanctuary.

4.2.9 Other minor lakes

Lake Kenyatta, or Lake Mukunganya, is also a small important lake in Lamu County which, supports zebra monkeys, waterbuck, buffalo, hippopotami, and warthog. It also houses many wild birds. However, due to encroachment from the rapidly increasing population in Mpeketoni, the lake is shrinking because of silting, humans invading its wetlands, drilling many boreholes in the catchment area, and large invasion by large herds of domestic cattle. Finally,Lake Jipe is a relatively small lake located in Tsavo West National Park. It lies on both the Kenyan and Tanzanian borders, and houses the Jipe Safari Camp, located on its shore, an ideal camping spot for travellers seeking peace and quiet.

Other minor but important inland tourism Lakes include Lake Kamnarok and Lake Kenyatta. Lake Kamnarok is a seasonal lake at the base of the Kerio Valley. The lake was gazetted in 1984 when Lake Kamnarok Game Reserve was created. It occupies an area of approximately 1 square km; however, being a seasonal lake, the size may at times be much smaller. The tributaries that feed the Lake include the rivers Ketipborok, Cheplogoi, Oiwo, and Label. Thick mash surrounds the lake making accessibility to the lake challenging. The Lake is home to 500 elephants. Like other Great Rift Valley lakes, its existence is being threatened, mainly becauseof farming activities in the area. In addition, deep gullies are likely to lead to the spilling of the water, thus joining it with the Kerio River. A few measures have been taken to save the lake, including the building of gabions.

Although lakes have been accorded quite some attention, especially with regard to fresh water

capture fisheries, there has been rather low focus on their tourism potential. Much focus has beenon coastal tourism and safari drives with very few attempts made to promote and quantify their contribution to the tourism sector apart from the parks and conservancies that surround them. Thus, the value of the activities they offer such as boat riding, sport fishing, etc. is not known.This could be attributed to weak policies and less prioritization towards such activities. Further, activities such as sports tourism niches and eco-tourism have not been completely utilized, as most tourists engage in activities such as bird watching and wildlife viewing. Also their potential for mining and extractives has not been given focus. As such, the inland blue economy, especiallyfrom the tourism lens, has largely been neglected. However, this blue economy subsector has thepotential to boost the earnings of the sector and promote domestic tourism across all counties including those off the coastal areas.

CHAPTER 5
GOVERNANCE FRAMEWORKS AND GAPS FOR COASTAL AND MARINE BLUE ECONOMY SECTORS

The governance framework of the blue economy sectors comprises of institutional, regulatory and policy frameworks which guide the development of individual sectors. Given the importance of the blue economy, we have identified some governance gaps in each sector which if addressed can help promote the development of the sectors.

5.1 Governance gaps in Coastal and deep-sea fisheries, mariculture and aquaculture

Governance of the fisheries sector is undertaken through various legal, policy and institutionalframeworks. These capture international and regional agreements that Kenya has ratified andare then domesticated at the national level. The Constitution at Article 2(5) provides that, "thegeneral rules of international law shall form part of the laws of Kenya." Article 2(6) of theConstitution then stipulates that "any treaty or convention ratified by Kenya shall form part ofthe laws of Kenya under this Constitution." These articles make international Conventions ratified by Kenya to be part of relevant laws of Kenya. Consequently, any Convention that Kenya hasratified and has provisions addressing aspects of fisheries is relevant. The discussion hereunderwill highlight the legal, policy and institutional frameworks relevant to the fisheries industry. The legal frameworks will capture the international, regional and domestic obligations of Kenya.One of the key challenges facing the fisheries regulatory framework is the overlap in various laws. For example, different statutes create different criminal offences and penalties over thefisheries resources. There is also an overlap in the requirements on the issuance of permits andlicences. These problems lead to confusion in implementation or lack of it. For example,prosecution may not be undertaken since none of the agencies involved take a lead role. This isexacerbated by lack of co-ordination between the relevant agencies.

There are gaps, omissions and loopholes in the current legal and policy framework governingthe fisheries industry, which if improved could improve the sector.

The fish feed certification and mechanisms to monitor compliance to fish feed production areoutdated and are not in line with international requirements, the constitution, and other relevant laws and policies (Munguti *et al*, 2014).

Gaps are also created by taking too long to develop regulations required to support specific laws. This leads to loopholes/gaps which can be exploited since the relevant guidelines are lacking. The problem is aggravated by the ineffective enforcement of fisheries laws and regulations. This is caused by lack of sufficient number of staff to ensure enforcement, lack ofinvolvement of the stakeholders who are expected to play a role in implementation (JICA, 2018). Accordingly, there is a need to bring together all the relevant stakeholders in order toensure effective implementation.

There are omissions in terms of laws and regulations these include an integrated national ocean law and ocean fisheries and mariculture policy and law (Ruwa et al, 2011; Rasowo et al, 2020). Additionally, the laws, policies addressing the utilisation of ocean resources are contained in various fragmented pieces of legislation. There is need to develop an integrated national ocean law that also addresses mariculture issues. Since development of the blue economy is now gaining momentum, it is necessary to review the existing policy and regulatory frameworks then work towards their integration. The regulatory review can be preceded by a blue economy survey this will provide data that can assist in drafting of a comprehensive regulatory framework that captures relevant aspects.

Generally, the institutions mandated to implement the fisheries regulatory framework are faced with the challenge of inadequate resources. This is in form of insufficient skilled manpower and lack of resources to facilitate capacity development among the staff (Rasowo *et al*, 2020; JICA, 2018). The institutions are, therefore, unable to consistently improve the skills of its staff or train new manpower. Ultimately this has an effect on implementation as the institutions will be unable to reliably, efficiently and effectively implement their mandates.

To ensure effective and efficient implementation, it is necessary to update the institutional structure of some of the existing fisheries' agencies to align them with the current realities facing the sector.

There has been a lack of consistency in the institutional governance of aquaculture. For a long time there has been no reliable/consistent institutional governance, as the managing this sector has been undertaken by twelve different ministries since independence. This interferes with developing of the regulatory framework and following up on its implementation (Obwanga & Lewa, 2017).

There are mandate overlaps in regulation of the maritime environment. This leads to Institutional conflicts, lack of co-ordination and inefficiency in implementation (Saeed, 2020). It also creates a wait and see approach as one institution decides not to take action leaving it to another institution. It could also lead to institutions blaming each other for inaction. This creates loopholes in implementation and weak enforcement of the regulatory framework. Exploitation and conservation of the marine environment requires co-ordination and collaboration since the resources are not confined to one jurisdiction in certain instances. It is also necessary to have a regional institutional framework for collaboration in some of the trans-boundary water bodies.

There is also need to have a comprehensive Integrated Ocean Policy and Law to address living and non-living resources management including the ocean waters and environment for sustainable exploitation and conservation in an ecosystem based approach. The geographic

Information System (GIS) could be used to map coastal resources and identifying overlapping uses hence assist planning to avoid conflict of interests.

Fisheries resources are directly and indirectly interlinked with the use of land, water, environment, wildlife and forestry and therefore interlinked with laws or Acts that manage these sectors and their institutions. It is thus clear that the institutional mandates provided by the different Acts cause various degrees of overlaps in their mandates and therefore weaken enforcement besides causing inefficiency. The gaps in this area include:

The Fisheries Act which requires to be fully reviewed to empower the coordination role whichhas been weakened by various overlaps in institutional mandates of institutions that directly or indirectly interlink with fisheries resources and its environment. The draft Fisheries bill does not address this observation as well. There is further need to review the Fisheries Act to domesticatethe regional and international conventions, and agreements into Kenyan law for their efficientimplementation.

The country needs a specific Ocean Fisheries and Mariculture Policy and Law to coordinate and implement fisheries activities. This legislation should take into consideration the necessary elements identified in the existing National Oceans and Fisheries Policy which covers also inlandfreshwater resources and other sectors such as tourism necessary for an integrated economy. The law and policy should be detailed enough to address Marine and Coastal Fisheries issuesin the context of ecosystem-based management and ecosystem approach to fisheries. It should further support management of economically sustainable industrial or commercial fisheries by legislating issues of total accordable catches (TAC), port state issues, Rules of origin, and Sanitary and Phytosanitary (SPS) issues which are important especially in Economic Partnership Negotiations and Trade Agreements. Mariculture production is gaining a significant role in enhancing marine fisheries production. There is therefore a need for the Oceans Fisheries and Mariculture Policy and Law to address this activity including Environmental Impact Assessment (EIA) for mariculture production and provide management guidelines that are in harmony withother maritime activities in the context of ecosystem-based management.

The policy and legal gaps need to be bridged, capacity and skill fissures need to be addressed, the infrastructural development ought to be sped up, provision of adequate and powerful equipment such as deep-sea boats also need to be addressed as some of the opportunities lie deep in the sea.

It will also be important to develop and implement robust marine spatial planning to control the extent of coastal and marine tourism and to protect the delicate and fragile ecosystems. The realization of the coastal and marine potential is foreseeable and achievable. However, some limiting factors like the Covid-19 pandemic restrictions on travel and human interactions slowdown the speed. Kenya has made notable milestones towards increased cruise ship tourism via the construction of a 2000 passenger capacity terminal fitted with all essential facilities. The achievement of tapping this frontier of marine and coastal tourism is well on course to be fully achieved by 2030.

Deep-sea sportfishing is already happening in Mombasa, Kilifi, and Watamu. However, there is a need to tap into the domestic market as most of the deep-sea sportfishing tourists are international making the subsector susceptible to seasonality. Promotion of domestic tourism will reduce the effect of the seasonality problem and ensure continued revenue generation to the sector. Rigorous marketing of the Kenyan coast as an ideal destination for deep-sea sport fishing is therefore paramount.

5.2 Governance gaps in Coastal and marine tourism

To explore the full potential of coastal and marine tourism will require strengthening the existing support instruments. The framework for exploiting, developing and managing natural resources for sustainable development must include consideration for economic, social and environmental objectives while taking into account stakeholders diverse needs.

Marine ecotourism is another frontier with potential to simultaneously contribute to the sector's growth and conservation of marine resources. With robust marine spatial planning in place, marine ecotourism potential could be realized. This is easily achievable as the marine ecosystem is already protected, and more efforts are underway to limit certain human activities that could compromise these essential ecosystems.

Heritage and cultural tourism, gastronomy, among other exciting activities, do not require much investment to actualize. The tourism sector players must, however, create a conducive environment for such activities. Policy and legal framework and incentives to the private sector investors need to be aligned with these activities.

The social responsibility of the tourism industry to local communities is weak and not commensurate with the level of revenue generation derived from the ecological areas and cultural zones where they operate. This is probably because of a gap in the tourism Act existing that are blind to the social responsibility for wellbeing of communities around tourism areas.

5.3 Governance gaps in ports, harbours and marine transport

Ministerial Realignment: The blue economy falls under the State Department for Fisheries, Aquaculture and the Blue Economy which is under the Ministry of Agriculture, Livestock, Fisheries and Cooperatives.[9] The State Department for Fisheries, Aquaculture and the Blue Economy is tasked with a number of functions including: (a) co-ordination of development of policy, legal, regulatory and institutional framework for the fisheries industry and the blue economy; (b) enhancement of technical cooperation with partner states; (c) Co-coordinating maritime spatial planning and integrated coastal zone management; (d) Protection and regulation of maritime ecosystems; (e) management and licensing of local and foreign fishing trawlers in Kenya waters; (f) protection of the maritime resources in EEZ; (g) overall policy for exploitation of agro-based maritime resources; (h) policy on development of fishing ports and associated infrastructure; and (i) capacity building for sustainable exploitation of agro-based maritime resources.[10] The linkages in the functions of the State Department for Maritime and Shipping Affairs and the State department for Fisheries, Aquaculture and the Blue Economy illustrate the need for a multi-sectoral approach between the two institutions. Other related administrative, policy, legal and institutional coordination issues need urgent attention in order to optimize the contribution of Ports, Harbours and Maritime Transport to Kenya's GDP and to Kenya's BE.

Support to KNSL: KNSL currently falls under the State Department for Shipping & Maritime Affairs. Over the years, it has been extensively reported that KNSL had almost reached an insolvent status due to lack of business, despite reported attempts to revive it.[11] The KNSL website identifies a number of challenges and latent opportunities which affect the institution's contribution to of Ports, Harbours and Maritime Transport sector to Kenya's GDP and blue economy. The current shipping industry, for instance, requires KNSL to expand its competence to meet its goals through enhanced services.[12] It also demands that KNSL develop capacity in new areas related to public policy, communications, and collaboration in order to address the changing environment in the region. Success and relevance of KNSL in capacity expansion and effectiveness requires a significant infusion of resources and intellectual capital.[13]

There is need to enhance KMA and KPA roles as environmental leaders. This is in the areas of monitoring, evaluation and management of offshore and onshore environment and implement

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[9] 'State Department for Fisheries, Aquaculture and The Blue Economy' (*Ministry of Agriculture*)
<https://kilimo.go.ke/state-department-for-fisheries-aquaculture-and-the-blue-economy/> accessed 19 April 2021.
[10] ibid.
[11] https://www.businesschief.eu/leadership-and-strategy/government-approves-revival-kenya-national-shipping-line
[12]   https://knsl.go.ke/background-2/
[13]   https://knsl.go.ke/background-2/

proactive measures against potential concerns of pollution control, waste management, global warming prevention, and occupational health and safety in coordination with the relevant authorities. Pollution mitigation measures contained in the Green Port Policy will need to be implemented.

An administrative reform is needed to ensure that the port is migrated from a Service Port to aLandlord Port. In addition, other related administrative, policy, legal and institutional coordination issues need urgent attention in order to optimize the contribution of Ports, Harbours and Maritime Transport to Kenya's GDP and to Kenya's blue economy.

5.4 Governance gaps in offshore oil and gas mining and renewable energy

Offshore oil and gas exploration and renewable energy are governed by a robust legal, policy and institutional frameworks that support sound environmental management procedures to ensure that exploration for oil and gas, and development of renewable energy is optimally done for sustainable development in the country. These frameworks provide for mitigation oflikely pollution from offshore oil exploration or eventual drilling and should therefore be implemented as outlined.

The Government does not have adequate financial resources and technical capacity to undertake coastal and offshore oil and gas exploration on its own. The inadequacy in technical capacity is mainly in the areas of marine geology, petro-chemical fields and technological sphere. Further, there are limited capabilities in engineering, construction, logistics, and supplies,health and safety.

The Government agencies that are charged with management of environment and ensuring compliance of mitigation measures and monitoring procedures associated with large projects such as offshore exploration are often lacking the technical capacity. Therefore, engaging incapacity building is fundamental for buy-in and participation, which is crucial to confidence building, transparency, and maintaining long term sustainability.

The development of renewable energy alternatives including marine based alternatives are weighed down by a number of constraints namely: inadequate long-term hydrological and meteorological data; inadequate transport infrastructure, the need to include local participation in order to develop acceptance; lack of locally available spare parts; insufficient electricity gridcoverage; high dependence of rural communities on ecosystem services.

The country needs to sign and ratify all International Maritime Organization (IMO) Conventions relevant to oil and gas exploration, adhere to the conditions of the Nairobi Convention, promote regional coordination on planning of transboundary issues such as oil spill contingency measures, piracy and security.

There is need to promote effective management and governance of the oil and gas resources, and promote participation of the civil society organizations

The government should also ensure that bilateral agreements made with prospecting companies are designed to provide direct and indirect benefits to the local people and the country at as a whole.

5.5 Governance gaps in coastal agriculture

There are rather many policies and laws governing the agriculture sector in the country which, by extension, cover coastal agriculture. There multiplicity of policies and laws creates potential for many areas of overlaps which increases areas of conflict. Duplication in some areas essentially means that resources are not optimally utilized. There is need to harmonize policies and laws governing this sector.

There is a lack of a comprehensive Land Use Policy: the country lacks a clearly articulated land policy implying that issues like land use, management, tenure reforms and environmental protection are inadequately addressed through the existing systems.

Low public public expenditure in agriculture: Kenya's allocation to the agriculture sector has been less than two percent of agricultural total expenditure, well below the average for sub- Saharan Africa of 4.5 percent (World Bank, 2018), and well below the Malabo commitment of 10% of total agriculture GDP.

The sector is characterized by weak vertical integration, made worse by weak institutions and support services for agricultural exports.

Ban of certain traditional farming practices: In the coast of Kenya most farmers still practice shifting cultivation, and slash and burn method is used before planting is undertaken. The method was practised in the traditional societies because parcels of land were large. However, currently especially in the coast of Kenya, the same piece of land is burnt regularly and several times per year. This is of concern as fire has on several times ran out of control burning other farm crops or reaching the forests. This could lead to destabilization of the coastal soils structures such as bluffs and dunes.

5.6 Governance gaps in coastal forestry

Despite the development different forest policy and legal reforms, their implementation remainsa challenge due to limited human and financial resources. There still exists some gaps and failures in policies regarding coastal forests in Kenya. For instance, the Shimba Hills forest isgazetted both as a forest reserve and a national reserve. This creates conflict in terms of theprosecution of offenders and even the development of new programs and activities within theforest. There is also poor coordination among law enforcement agencies such as the Kenya Forest Service, the Kenya Wildlife Service and the Kenya Police. This leads to uncoordinatedefforts that result in low compliance.

The Forest Policy does not give much recognition to farm forestry but to redeeming and protection of natural forests, while sustainable use of biodiversity in forests is largely ignored.It should be emphasized that without a firm agriculture foundation based on successful practices on the basis of which emerging issues can be tackled, the challenges will continue to be overwhelming hence the need of firmness in executing the food policy.

EMCA (2015) provides for a broad crosscutting framework for environmental issues. To ensure successful implementation, there is need to provide a specific legislation to provide a legal framework for integration and coordination of the sectors that directly or indirectly have stakein use of coastal and marine resources.

In wildlife management, there are legal gaps that lead to land use conflicts resulting to encroachment into the wildlife protected areas which arise from poor local and national landuse planning. There is also need for innovative approaches e.g. devolved participatory wildlife management to enlist support from private sector, NGOs and CBOs.

There is need to review the Fisheries Act to harmonize the regional and international conventions, and agreements into Kenyan law for their efficient implementation. This is largely due to the overlapping institutional mandates by the various institutions birthed by the fisheries Act thatare interlinked with fisheries resources.

5.7 Governance gaps in coastal and offshore mining and extractives

Inadequate comprehensive, clear and harmonized mining policies and guidelines coupled with poor law enforcement in the mining sector has led to smuggling of mineral across the region and thus affecting the entire mining sector.

Gender discrimination: very few miners participating in the rampant artisanal mining activitiesare women. This is due to gender discrimination in terms of access to resources and ownership

and tenure, the work undertaken, and the pay differentials. There is need to devise ways of incorporating women participation in artisanal mining.

There is a general lack of appropriate policy frameworks and strategies to drive the industrialization, value addition and benefaction agenda in the sector.

There is inadequacy in regulations to govern the activities of artisanal miners leading to conflicts over the mineral resources.

The definition of who consists the community is ambiguous. This needs to be clarified especially in matters of public participation and benefit sharing

There is lack of clear, streamlined procedures, imprecise methods for offshore mining that put into consideration ecological and social impacts.

There are institutional overlaps and conflicting mandates which need to be ironed out for improved performance of the subsector.

There is inadequate national legislation on offshore mining that is coherent with the regional laws and policies thus resulting to use of international law. This lack of legal clarity leads to uncertainties which discourage companies from committing capital. This calls for national laws which would be interpreted and understood locally and capable of implementation by stakeholders.

5.8 Gaps in Governance of Inland Blue Economy

Apart from the various sector specific governance gaps that have been highlighted above for the various blue economy sectors, there are some generic gaps that arte relevant to the inland blue economy resources.

Constitutionally, water bodies including lakes and rivers are included as part of the definition of land under Article 260 of the Constitution of Kenya 2010. These water bodies are placed under the jurisdiction of the National Government. However, since the rivers and lakes often traverse various counties, which are devolved units under the Constitution, the role of the riparian counties in not very clear. Ideally, the riparian devolved units should have a direct stake in the governance of rivers and lakes, and legal and policy frameworks should clearly define these roles. They should also invariably be involved in the governance of fisheries and aquaculture, ports, shipping and maritime transport, agriculture and forestry, off shore oil and gas and renewable energy, and mining and extractives, among other sectors of the blue economy.

One important area of convergence would be environmental and natural resource conservation, including the requirement under the Environmental Management and Conservation Act (EMCA) for environmental and social impact assessments which relate to rivers and lakes and other water bodies or activities or programmes relating thereto. Counties, in their mandates for development control and zoning, among others, have to deal with areas adjacent to or riparian to water bodies. These areas are also often highly populated, thus requiring local communities to be mobilized and involved.

By law, counties are required to develop their respective County Integrated Development Plans (CIDP). The counties that host or are riparian to major lakes, such as Nakuru, Baringo, Turkana, Kajiado, Kisumu, Homa Bay, Migori, Siaya and Busia have attempted in various ways to address inland blue economy issues in their respective CIPD (2018-2022). However, a great deal more needs to be done to enable the lakes as key inland blue economy resources play a more central role in the development plans of those counties. This should also apply to the counties traversed by major rivers including the Mara, Tana, Athi-Sabaki, Nzoia, Yala, Sondu Miriu, among others.

Also, there ought to be better involvement of regional economic blocks which bring together counties that are riparian to key blue economy resources such as lakes and rivers. Some of these blocks include the Lake (Victoria) Region Economic Block, the North Rift Economic Block (for Lake Turkana, Lake Baringo and Lake Bogoria), Mt Kenya and Aberdare Region Economic Block (for Lakes Nakuru, Naivasha), and the *Jumuia Ya Kaunti za Pwani(JKP)*. The economic blocks provide a fine opportunity to discuss collectively the riparian and shared interests and cross cutting issues and concerns in inland blue economy resources.

CHAPTER 6
CONCLUSION AND RECOMMENDATIONS: TOWARDS A SUSTAINABLE BLUE ECONOMY IN KENYA

Besides the improvement of the blue economy governance framework, the sector needs macro interventions from the national and county government to accelerate and sustain its growth. These include:

6.1 Integration of marine spatial planning

Marine spatial planning (MSP) is a tool to plan, manage, and improve marine environments. It contains at least three qualities: first, it is multi-objective as it includes ecological, social, economic, and governance objectives, but the overriding objective should be increased sustainability; second, it is spatially oriented. The ocean area must be clearly defined at the ecosystem level- incorporating all relevant ecosystem processes and third, it is integrated addressing many different issues and activities. The roles of the Marine Spatial Planning will include: a) management of the marine environment; b) mapping: MSP conducts coastal and marine study and develop spatial development maps in respect with the area covered; c) monitoring and Evaluation; d) weighing trade-offs between multiple and conflicting uses e) integrating MSP and land use policies and Programs; f) creation of new institutional structures as it spans several political boundaries, including states and countries; and g) stakeholder Involvement: people living or working near the ocean observe changes over their lifetime and hence accumulate knowledge regarding previous marine resources. Indigenous peoples' wisdom and practices are passed down through generations, for example in form of Indigenous laws, and traditions thereby paramount in informing MSP goals and objectives. Introducing MSP principles in the blue economy discussion will help plan better any investments and increase acceptability of projects, especially by local communities. This will help promote benefits accruing from the blue economy.

6.2 Financing the blue economy

Financing will be required if Kenya's blue economy is to achieve the intended goals. It is important to identify potential sources of financing the blue economy if the benefits are to be improved. These sources of finance include: a) governments i.e. domestic sources, official development assistance agencies, and sovereign wealth funds; b) philanthropy and non-governmental organizations; c) international financial institutions; d) other multilateral agencies including the UN's programs and organizations; e) private finance; e) other financial instruments e.g. blended finance, green bonds, results-based lending, debt financing etc. These funding will be critical in development of different blue economy subsectors and help promote the expected benefits.

6.3 Involvement of the private sector

Majority of the coastal and marine tourism businesses are owned and operated by private investors. However, to exploit the potential of the "sleeping" subsectors sustainably, the state must play its role to help attract investment in the conservation of the blue economy and create policies that establish a business case for the sector. Some strategies that can be used to achieve an effective and efficient sector that is attractive to the private sector include; a) de-risking the investments to the amount of exposure to risk for investments in coastal and marine tourism e.g. index based insurance; b) favourable policy and legal framework to incentivize the private sector; currently, the public private partnerships in the activities of the blue economy is limited; c) blended financing to improve investor confidence e.g. up-front low-interest or grant-based investments; d) integrated projects that combine activities to make projects more risk diverse and attractive to more diverse investors; e) infrastructure development for easy access and cut down the cost of operation/investment; building capacity and closing the ocean skill gap; and, f) offering fiscal incentives e.g. tax breaks or financial assistance for those private companies investing in certain areas of the blue economy sustainably.

6.4 Ecosystem management tools

According to the Mombasa Master Plan, the planned port infrastructural developments will lead to the clearing of 36 ha of mangrove in the Dongo Kundu area which is a significant loss of biodiversity and associated ecological services such as provision of fuel wood, construction materials and fishing and breeding ground for offshore organisms. Fisheries and related activities will be destroyed leading to a reduction on fish catch and incomes. The mangrove forest also acts as a natural buffer against ocean related disasters, tidal waves and provides carbon storage, with the latter assisting in mitigating climate change. In addition, land reclamation, bank protection and dredging will disturb the aquatic and tidal flora and fauna, lead to changes in water quality and increase sediment load. To mitigate against these negative cumulative impacts, an Environmental Strategic Impact Assessment needs to be undertaken and should include a community driven Ecosystem Management Plan geared towards the restoration of the original ecosystem functions. For purposes of sustainability, such a plan should include a portfolio of bankable community livelihood projects. Given the high level of vulnerability and poverty, the PAPs should be compensated adequately and in a timely manner, BMUs will have to be built, new fishing gear procured and technical training suitable for the transformation to deep sea fishing undertaken. The affected sacred Kaya forests will need to be restored in accordance with the Archeological Impact Assessment which will be apart of the ESIA.

6.5 Integrated coastal zone management scheme (ICZM) plan

This has been developed to promote the protection of these coastal resources while ensuring the economic empowerment of the local coastal communities. The scheme encourages the provision of alternative income-generating activities that have the potential to reduce the over-exploitation plaguing the sector. However, full implementation of the scheme remains a challenge due to insufficient human and financial resources. In addition to the ICZM scheme, other reforms have taken place in the coastal forest sector such as the development of the National Mangrove Ecosystem Management Plan (2010), the National Forests Program (2016-2030) and the Forest Conservation and Management Act, 2016.

6.6 Blue Economy strategy

There is need to develop an all-inclusive blue economy strategy that brings on board all the relevant stakeholders. Currently, there are ongoing efforts in government geared towards the development of a national blue economy strategy. The anticipated strategy ought to be anchored in key maritime sectors as described in this report. It should also borrow lessons from other blue economy strategies and frameworks including the regional (African) and sub-regional (East Africa) frameworks. This report includes an annotated outline of a national blue economy strategy for Kenya.

6.7 Establish better equipped Institutes for Blue Economy and Oceans Studies

Generally, there is inadequate technical capacity and research in blue economy development. Targeted development and improvement of existing coastal and marine studies and research institutions. This will assist to undertake research and offer technical assistance and capacity building in all matters relating to the ocean, and the sustainable use of its resources.

REFERENCES

Abuodha, J. O. Z. (2002). Environmental impact assessment of the proposed titanium mining project inKwale District, Kenya. *Marine Geo-resources and Geotechnology*, 20, 199-207.

AUC-NEPAD (2014). The Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa. AUC-NEPAD.

Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C., & Silliman, B. R. (2011). The value of estuarine and coastal ecosystem services. *Ecological Monographs*, 81(2), 169—193. doi:10.1890/10- 1510.1

Benkenstein A. (2018). Prospects for the Kenyan Blue Economy. SAIIA Policy insights 62. South Africa Institute of International Affairs, Johannesburg, South Africa.

Blue Economy Concept Paper (2014). Sustainable Development Knowledge Platform, United Nations(UN), January 2014.

Brummett, R. E., Williams, M.J. The evolution of aquaculture in African rural and economic development.
  Ecological Economics, 33(2000)193-203.

Burgess, N. D., & Clarke, G. P. (2000). *Coastal forests of eastern Africa*. IUCN-The World Conservation Union, Publications Services Unit.

County Government of Kilifi (2017). County Integrated Development Plan 2018-2022. Theme: Sustainable energy, mineral resources and innovative industries.

County Government of Lamu (2018). Lamu County integrated development plan (CIDP) 2018 – 2022.

EACF (2011). Final Assessment Report of Eastern Arc Mountains and Coastal Forests of Tanzania and Kenya January 2011- May 2015.

Ehler, Charles N., and Douvere Fanny. 2010. "An International Per-spective on Marine Spatial Planning Initiatives*." Environments Journal* 37 (3): 9–20

FAO (2014). FAO Country Programming Framework for Kenya 2014-2017

FAO (2015) AQUASTAT Country Profile – Kenya. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy

FAO (2018). The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals. Licence: CC BY-NC-SA 3.0 IGO, Rome: FAO.

FAO (2020): The state of world fisheries and aquaculture 2020. FAO, Rome.

Githitho, A. (2004). The Coastal Terrestrial Forests of Kenya. A report on resources, threats andinvestments. WWF.

GoK (2010). Agricultural Sector Development Strategy 2010—2020.

GoK (2016). Kenya mining investment handbook 2016. Ministry of Mining, Government of the Republicof Kenya,

GoK (2017). Lamu County 2016 short rains food security assessment report. A Joint Report by the KenyaFood Security Steering Group (KFSSG) and Lamu County Steering Group (CSG).

KFS (2017). National Mangrove Ecosystem Management Plan. Kenya Forest Service. Nairobi, Keny Huxham, M., Emerton, L., Kairo, J., Munyi, F., Abdirizak, H., Muriuki, T., & Briers, R. A. (2015). Applying climate compatible development and economic valuation to coastal management: a case study of Kenya's mangrove forests. *Journal of environmental management*, *157*, 168-181.

JICA (2018). Data Collection Survey on Blue Economy in the Republic of Kenya. Japan International Cooperation Agency https://openjicareport.jica.go.jp/pdf/12320339.pdf (accessed on 27/03/21).

Kill, J. (2016). The Kasigau Corridor REDD+ Project in Kenya: A crash dive for Althelia Climate Fund.

Kimani, E.N., Aura, M.C., Okemwa, G.M., (eds.) (2018). The Status of Kenya Fisheries: Towards the sustainable exploitation of fisheries resources for food security and economic development. Kenya Marine and Fisheries Research Institute (KMFRI), Mombasa. 135 pp.

Kiogora T.M., Raini, J.A, Edebe J., Waithaka E., (2020). Assessment of the fish species diversityand water quality in Lake Nakuru, Kenya: Ecotoxicological study of the potential role of heavymetals in fish die-offs.

Kirui, K. B., Kairo, J. G., Bosire, J., Viergever, K. M., Rudra, S., Huxham, M., & Briers, R. A. (2013). Mapping of mangrove forest land cover change along the Kenya coastline using Landsat imagery. *Ocean & Coastal Management*, *83*, 19-24.

KMFRI (2017). Kenya's Aquaculture Brief 2017: Status, Trends, Challenges and Future, Kenya Marineand Fisheries Research Institute, Mombasa.

KNBS (2020). Economic Survey 2020. Kenya National Bureau of Statistics.Nairobi, https://www.theelephant.info/documents/kenya-national-bureau-of-statistics-economic-survey-2020/ Matiku, P. (2004). The Coastal Forests of Kenya. Forest data, socio-economic issues, values, stakeholders,challenges, strategies, investment and enabling environment. A national synthesis report for thedevelopment of the WWF-EARPO Eastern Africa Coastal Forests Ecoregion Programme.

Ministry of Environment, Water and Natural Resources (2014), *Integrated Coastal Zone Management policy 2014-2023, Sessional Paper No. 13 of 2014.* http://www.environment.go.ke/wp- content/uploads/2014/01/Final-Draft-ICZM-Policy-

revised-December-2013.pdf

Mirera, O.D. (2009). Mud crab (*Scylla serrata*) culture, understanding the technology in a silvofisheriesperspective. *Western Indian Ocean Journal of Marine Science*, 8(1)(2009)127-137.

Munguti, J. M., Kim, J-D, Ogelo, E. O. (2014). An overview of Kenyan aquaculture: Current status,challenges, and opportunities for future development. *Fisheries and Aquatic Sciences*,17(1) 1-11.

Muthiga, N., Ochiewo, J., Kawaka, J., (2010). Strengthening capacity to sustainably manage seacucumber fisheries in the Western Indian Ocean. SPC Beche-de-Mer Information Bulletin Number 30.

Mwaluma, J (2002). Pen culture of the mud crab *Scylla serrata* in Mtwapa mangrove system, Kenya. *Western Indian Ocean Journal of Marine Science*, 1:127-133.

Ndegwa, S., Goehan, J. (2017). Evaluation of the Kenyan Catch Assessment Survey. IOTC-2017-WPDCS13-36 Rev. 1. 11 pp.

NEMA (2017). State of the Coast Report II: Enhancing Integrated Management of Coastal and MarineResources in Kenya. National Environment Management Authority (NEMA), Nairobi.

Ojwang WO, Abila R, Malala J, Ojuok JE, Owili M, R Omondi (2011). Critical transboundary resource:assessment of ecological and socio-economic importance of River Omo Wetland. Project Technical report submitted to the National Council of Research and Technology, Kenya..

Ochiewo, J. (2004). Changing fisheries practices and their socioeconomic implications in South Coast Kenya. *Ocean & Coastal Management 47:389-408.*

Ochiewo, J. O., Owiti, H., Swaneerain, S., Munyi, F., Waiyaki, E., Njiru, J.N., Okemwa, G., Aura, M.C.,Oketch, R., & Olela, P. (2018). Economic and Financial Impact Assessment (EFIA) of Marine Fisheries, Kenya. Mombasa: Kenya Marine and Fisheries Research Institute (KMFRI), 42 pp.

Ochiewo, J., de la-Torre Castro M., Muthama C., Munyi F., Nthuta J.M. (2010). Socio-economic Featuresof the Sea Cucumber Fishery in Southern Coast of Kenya. *Ocean and Coastal Management, 53:192-202.*

Odhiambo Ochiewo, J., Wakibia, J., Sakwa, M.M. (2020). Effects of monitoring and evaluation planningon implementation of poverty alleviation mariculture projects in the coast of Kenya. *Marine Policy*, 119:104050; https://doi.org/10.1016/j.marpol.2020.104050.

OECD (2020). Sustainable Ocean for All: Harnessing the Benefits of Sustainable Ocean

Economies forDeveloping Countries, The Development Dimension, OECD Publishing, Paris, https://doi.org/10.1787/bede6513-en

OECD (2016). The Ocean Economy in 2030. OECD Publishing, Paris, Retrieved from https://doi.org/10.1787/9789264251724-en

Okemwa, G.M., Kaunda-Arara, B., Kimani, E.N., Ogutu, B. (2016). Catch composition and sustainabilityof the marine ornamental fishery in Kenya. *Fisheries Research*, 183:19-31.

Onyando J. O. (2002) Land Cover Resource Maps of Lake Baringo Drainage Basin. Consultancy report submitted to the United Nations Office for Project Services, Nairobi, Kenya. (Unpubl.).

Pauly, D., Christensen, V., Guénette, S., Pitcher, T., Sumaila, U.R., Walters, C.J., Watson, R., Zeller, D. (2002). Towards sustainability in world's fisheries. *Nature*, 418:689-695.

Phillips, M. (2019) Mariculture overview. *Encyclopedia of ocean science (Third Edition)* 2:414-421 doi.org/10.1016/B978-012374473-9.00752-9.

Primavera, J. H., Garcia, L. M. B., Castanos, M. T., Surtida, M. B. Mangrove-friendly aquaculture. In: Proceedings of the workshop on mangrove-friendly aquaculture organized by SEAFDEC Aquaculture Department, January 11-15, 1999. Iloilo, 2000.

Raini, J.A. (2009) Impact of Land Use Changes on Water Resources and Biodiversity of Lake NakuruCatchment Basin, Kenya. *African Journal of Ecology*, 47, 39-45.

Rasowo, J. O., Orina, P., Nyonje, B., Awuor, S., Olendi, R. (2020). Harnessing Kenya's Blue Economy: prospects and challenges. *Journal of the Indian Ocean Region*, 1-25.

Rees, Sian E., Martin J. Attrill, Melanie C. Austen, Steven C. Mangi,Jo P. Richards, and Lynda D. Rodwell.2010. Is There a Win-winScenario for Marine Nature Conservation? A Case Study of Lyme Bay, England. *Ocean and Coastal Management* 53:135—45.

Ruwa, R. K. (2011). Policy and Governance Assessment of Coastal and Marine Resource Sectors In KenyaIn The Framework Of Large Marine Ecosystems'. Report to the ASCLME policy and governance coordinator, ASCLME Project.

Saeed, S. K. and Saeed, K. (2020). 'Challenges and prospects of interagency coordination in promoting and sustaining Africa's blue economy: case study of Kenya 2010-2018' (Masters Dissertation, Universityof Nairobi).

Samoilys, M., Pabari, M., Andrew, T., Maina, G.W., Church, J., Momanyi, A., Mibei, B., Monjane, M., Shah,A., Menomussangab, M., Muttad, D. (2015). Resilience of coastal systems and their human partners: Ecological and social profile of coastal systems in Kenya, Mozambique and Tanzania. IUCN ESARO.

Samoilys, M.A., Osuka, K., Maina, G.W., Obura, D. (2016). Artisanal fisheries on Kenya's coral reefs: Decadal trends reveal management needs. *Fisheries Research*, 186:177-191.

SDL, 2018. Strategic Plan 2018 – 2022. State department of Livestock

Sindiga, I. (2000). Tourism development in Kenya. *The political economy of tourism development in Africa*, 129-153.

Sutton, I. (1994). Salt in Kenya: a survey of literature. Journal of Eastern African Research & Development, 24, 163-182. Retrieved April 15, 2021, from http://www.jstor.org/stable/24326319.

Taita Taveta, 2017. Kenya County Climate Risks Profiles Series: Climate Risk Profile Taita

Taveta County. Tana River County Fiscal Strategy Paper (CFSP) 2016.

UNCTAD, (2019) Maritime Profile for Kenya.

UNCTD. (2018). Review of Maritime Transport 2018. Available at: https://unctad.org/en/PublicationsLibrary/rmt2018_en.pdf.

UNEP (2008). Kenya State of the Coast Report: Towards the Integrated Management of Kenya's Coastal and Marine Resources. National Environment Management Authority, Nairobi

UNEP (2009). Transboundary Diagnostic Analysis of Land-based Sources and Activities in the Western Indian Ocean Region.

UNEP (2015). Blue Economy: Sharing Success Stories to Inspire Change. Nairobi: United Nations Environmental Programme Regional Seas Report and Studies, 195.

UNEP-Nairobi Convention (2009). Strategic Action Programme for the Protection of the Coastal and Marine Environment of the Western Indian Ocean from Land-based Sources and Activities, Nairobi, Kenya, 140 pp.

UNEP-Nairobi Convention and WIOMSA (2015). The Regional State of the Coast Report: Western Indian Ocean. UNEP and WIOMSA, Nairobi, Kenya, 546 pp.

UNEP-Nairobi Convention/USAID/WIOMSA (2020). Guidelines on Mangrove Ecosystem Restoration for the Western Indian Ocean Region. UNEP, Nairobi, 71 pp. A digital copy of this report is available at: www.nairobiconvention.org/; www.wiomn.org; www. wiomsa.org

Waaijenberg H. (2000). Agriculture. In Hoorweg J., Foeken D. & Obudho R. eds. *Kenya Coast Handbook: Culture, resources and development in the East African littoral.* (pp.175-195). Hamburg: LIT Verlag.

Wakibia, J. G., Ochiewo, J., Bolton, J. J. (2011). Economic analysis of *Eucheumoid* algae farming in Kenya. *Western Indian Ocean Journal of Marine Sciences*, 10(1) 195-212.

WB (2010). Kenya's Tourism: Polishing the Jewel: Finance and Private Sector Development Africa Region Final Report 2010. The World Bank.

WTTC (2020). Kenya, 2020 Annual Research: Key Highlights. World travel and Tourism Council.

Wylie, L., Sutton-Grier, A. E., & Moore, A. (2016). Keys to successful blue carbon projects: lessons learned from global case studies. *Marine Policy*, *65*, 76-84.