AN ASSESSMENT OF THE STATUS OF BLUE ECONOMY SECTORS IN KENYA

Sector Report on Fisheries and Aquaculture

Presented by

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Section I: Introduction

1.1. Background and context

1.1.1 National overview

Kenya is endowed with fisheries resources within the inland freshwater bodies, the coastal waters and the Exclusive Economic Zone (EEZ) of the Indian Ocean. The marine and inland freshwater fisheries are distinct in geographical scope, operations and markets. The fisheries sector contributes about 0.5% of the national GDP and about 2% of the national export earnings (KNBS, 2020). The sector employs over 60,000 fishers directly and an estimated 1.2 million people directly and indirectly within the fishing, production, and supply chain (Kimani et al., rch fishery in Lake Victoria. Between the years 2009 and 2014, landings from capture fisheries and aquaculture (both mariculture and freshwater aquaculture) increased steadily, dropped between 2014 and 2017 and increased again between 2017 and 2019 (Figure 1).

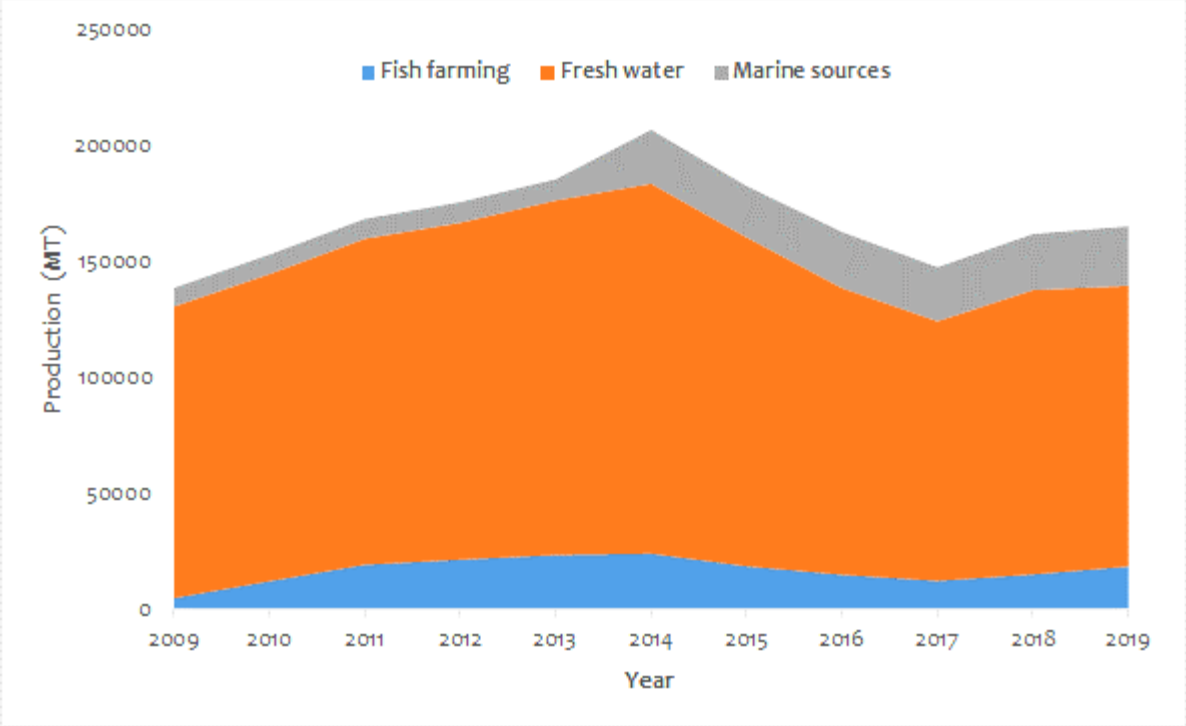

Figure 1. Total Fish production in Kenya, 2009-2019 (Source: KNBS, 2020)

The decline in the Lake Victoria fishery is driven by increasing demand for fish, leading to increased use of illegal fishing gears, as well the proliferation of water hyacinth, due to increased nutrients from runoff which has far-reaching implications on fish production and other water based economic activities in the lake. Increased production from freshwater aquaculture and mariculture has been propelled by dwindling capture fisheries. Capture

fisheries and aquaculture have been recognized as a frontier for economic development to support Kenya's long term development objectives as articulated in the Vision 2030 and contribute to the realization of the Sustainable Development Goals (SDGs) of food security and poverty reduction. Overtime, the contribution of fishing and aquaculture has grown steadily from KES 34.9 billion in 2016 to KES 48.82 billion in 2019 (Table 1). The Blue Economy initiative that encompass a range of productive sectors including capture fisheries, aquaculture, and non-fisheries maritime sectors also recognizes the important role of fisheries and aquaculture, to the economic development and food security of Kenya.

Table 1: Kenya's GDP (current prices KES millions) with contribution from fisheries

Year	2015	2016	2017	2018	2019
Gross Domestic Product (GDP) for Kenya	6,284,184.9	7,022,963.1	8,165,842.2	8,892,110.9	9,740,360
Agriculture, Forestry and Fishing	1,897,346.8	2,182,198.3	2,844,263.2	3,032,084.7	3,326,299.2
Fishing and Aquaculture	40,299.8	34,909	36,607.8	43,579.9	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

1.1.2 Coastal and deep sea fisheries

The coastal and deep sea fisheries consist of the small-scale, semi-industrial, industrial, aquarium and 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 subsequently stabilized at about 9,000 MT annually, with a value of KES1.8 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 the year2018 when the figures were revised as reported in Kimani *et al.* (2018).

The annual production estimate from the coastal and deep sea fisheries was revised to approximately 23,000 MT based on scientific Catch Assessment Surveys (CAS) as reported in Kimani *et al*. (2018). The report noted that the estimate can still be revised upwards since the catches from the 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 fish stocks take place (Ndegwa and Geehan, 2017). Approximately 80% of production is landed by small-scale fishers who are generally referred to as artisanal fishers in Kenya. 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 groups.

Finfish landings have been fluctuating over the last 40 years with the lowest landings of 1,476 MT recorded in 1995. Demersal fish landings remained fairly constant since 2007 with an annual 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 (Kaunda-Arara *et al*., 2004; Hicks and McClanahan, 2012; Samoilys *et al.*, 2016; Tuda *et al*., 2016; Kimani *et al.*, 2018), 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. Trends in shallow water prawn fishery remain 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). Sea cucumber fishery 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.

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 data from 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 subsequently 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 2) (Kimani *et al*., 2018).

Table 2: Mean CPUE (±SEM) of common fishing gears at the south coast of Kenya

Gear type	CPUE (kg/fisher/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 Kenya Marine Fisheries and Socioeconomic Development Project (KEMFSED), a World Bank funded project which aims to support efforts to leverage emerging opportunities in the Blue Economy with the objectives 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.

1.1.3 Inland fisheries

Inland water bodies produce more than 90% of the capture fisheries production in Kenya mainly from Lake Victoria, Turkana, Naivasha and Baringo (Table 3). Other smaller water bodies that also contribute some fish, but on a smaller scale, are Lakes Jipe, Chala and Kenyatta in the coast region; and hydroelectricity-generation dams on rivers Tana and Turkwel. The national fish production from inland waters has increased from 15,000 MT in the 1950s to a maximum of over 180,000 MT in the 1990s. Species contribution to the catch has changed over the years and is currently dominated by Omena (*Rastrineobola argentea*), Nile perch (*Lates niloticus*) and Nile tilapia (*Oreochromis niloticus*).

The total production steadily increased until the late 1990s when the decline began mainly due to the drop of Nile perch landings from Lake Victoria. Nile perch contributed between 80,000 MT and 120,000 MT from 1994 to 2002 which dropped to between 80,000 MT and 40,000 MT after 2002. The total landing for Nile perch has continued to drop from the late 1990s, while catches of Omena, the second most important fishery nationally, has steadily increased from the early 2000s, reaching about 60,000 MT after 2010. Nile tilapia catches have fluctuated below 20,000 MT with peaks of up to 40,000 MT in 1990 and 2011. The standing stock estimates from Lake Victoria remain relatively stable. Lake Turkana fishery is considered to be under-exploited with catches remaining low, approximately 5,000 – 8,000 MT, against the estimated potential of over 30,000 MT. The catches from the smaller water bodies (Lakes Naivasha and Baringo) remain small and highly variable depending mainly on the water levels in the lakes.

Fish continues to play an important role as a source of food and income. More than 90 percent of fish landings from the inland capture fishery come from Lake Victoria (Table 3), which has seen a sharp reduction in recent years. The declining catches indicate that the fishery may not be sustainable if not well managed (Table 3). Specifically, landings of freshwater fish fell from 122,467 MT in 2018 to 120,873 MT in 2019. Freshwater fish earnings decreased from KES21.0 billion in 2018 to KES19.0 billion in 2019, as the quantity of fish landed decreased (Table 3).While there has been no conclusive answer on the specific cause of the decline in fish catches from Kenya's portion of Lake Victoria, some studies have cited increased use of illegal fishing gears, proliferation of macrophytes particularly the water hyacinth and poor catch estimation techniques (Njiru *et al*., 2008, 2010; Kimani *et al*., 2018b; Owiti *et al*., 2018).

The observed catch decline in Kenya's portion of Lake Victoria could have far-reaching socio-economic consequences; which include loss of income and livelihoods, food and nutritional insecurity and conflicts over the limited resources at community, national and regional levels (Namisi, 2005). Kenya's population has exploded from 5 million in 1964 to 47.6 million in 2019, necessitating additional protein and food (KNBS, 2019). The demand for fish has also increased (Aura *et al*., 2018) and Kenyans now consume 4.5 kilograms of fish per year, up from 2.0 kilograms in 2008.

Table 3: Quantity and value of fish landed in Kenya's inland water bodies, 2015 - 2019

	2015	2016	2017	2018	2019*
Quantities - Tonnes: Freshwater fish					
Lake Victoria	109,902	98,666	92,727	98,150	90,743
Lake Turkana	10,605	7,926	4,021	5,430	7,031
Lake Naivasha	1,072	1,064	1,689	2,287	3,087
Lake Baringo	176	141	155	180	203
Lake Jipe	123	106	112	120	157
Tana River dams	852	444	422	630	750
Fish Farming	18,656	14,952	12,356	15,320	18,542
Other areas	312	214	332	350	360
TOTAL	141,698	123,513	111,814	122,467	120,873
Value – KES (million)	20,750	19,735	18,581	20,987	18,952

Source: (KNBS, 2020)

The fishers in Lake Victoria, Kenya mainly use Sesse boats that are pointed at both ends when using sails as a mode of propulsion or Sesse boats flat 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 (SS) for the *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 4: 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 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 data indicates that CPUE has been fluctuating with a decline of 0.4 kg per fisher per trip for gillnet 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 5: Mean (±SEM) CPUE of common fishing gears in Lake Victoria

Gear type	CPUE (kg/fisher/trip)		
	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 (2016)

1.2. Contribution of Fisheries to Livelihoods and Gross Domestic Product (GDP)

The fisheries sector plays a significant role in provision of livelihoods and income generation. Nationally, fisheries sector has an estimated national fish production of 146,543 MT (KNBS, 2019) which provides direct livelihood to over 65,250 fishermen. Overall, about 1.2 million people are engaged in the fisheries sector as fishers, traders, processors, suppliers and merchants of fishing accessories. In the last five years, there has been a slight increase in marine fish landings, a general decrease in freshwater fish catches and a stable aquaculture production. The contribution of fisheries to the Gross Domestic Product (GDP) is approximated at 0.5%(KNBS, 2020).

1.2.1 Contribution of Marine Fisheries

Marine fisheries 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 key roles 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, some are involved in catching shrimps and small fishes using mosquito nets close to the shore. Middlemen usually own fishing gear or vessels, which they rent to the fishers at a pre-determined revenue sharing agreement; in which accrued revenue is divided into three equal portions: one for middleman, one for boat and gear maintenance, and one for all fishers on the boat regardless of their number.

Coastal communities in Kenya depend on fisheries as a major source of food and income (KNBS, 2020). It is estimated that the coast has a population of 4.33 million people, many of whom depend on fisheries activities for their economic, social and cultural security. The communities depend on marine resources for food security, local trade and export to international markets. Fishing and other fisheries-related activities are therefore critical to food security and economy of the coastal communities and Kenya as a whole. There are about 27,000 people who are engaged in fishing and related activities along the Kenya Coast. 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 fishers who are not able to purchase their own fishing gears and vessels (Ochiewo et al., 2010).

Marine fisheries in Kenya are either artisanal, semi-industrial or industrial, with fishing being predominantly a male occupation and women only participating in artisanal fishing to a very limited extent by wading in the intertidal area during low tides to collect octopus (gleaning), invertebrates and small fish. Besides primary fishing, other important fisheries-related economic activities include fish trading, processing and distribution of fish catches to the local markets. 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). Fish traded in these markets are mainly obtained from the artisanal fishers who use the traditional small boats in the nearshore waters. Further, artisans who make and repair of fishing boats and fishing gears, and middlemen who own and rent out their fishing gear or boats also play a critical role in the artisanal fisheries (Ochiewo, 2004; UNEP and WIOMSA, 2015). Fish movements and changes in fish abundance along the coast have given rise to migrant fishing culture with some fishers following the migrating fish as an adaptation strategy to the complex marine environment in response to social and economic challenges. Mariculture and coastal aquaculture on the other hand is gradually taking root, especially the farming of seaweeds in the south coast of Kenya which has employed mainly women, and the farming of tilapia and catfish in some parts of the coast. The farming of other mariculture species such as milkfish, mud crab, prawns and mullets has not expanded as expected (Mirera, 2011; Odhiambo et al., 2020).

Catches from the marine waters also increased during the period resulting in corresponding increase in earnings. 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. The per capita fish consumption in Kenya is estimated to be 4.6 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.

1.2.2 Contribution of Inland Water Fisheries

Inland fisheries have been able to stimulate the growth of a number of subsidiary industries and are an important source of income and foreign exchange earner for riparian communities and lacustrine stakeholders (Aura *et al*., 2019; Nyamweya *et al*., 2020). Inland water fisheries have made substantial economic benefits to Kenya's national economy through its contribution to the Gross Domestic Product (GDP) (KNBS, 2020).Further, fisheries area rich source of protein particularly for riparian communities. It is also important for the preservation of culture, national heritage, and recreational purposes.

1.3. Impact of capture fisheries on marine and inland water environment

Some fisheries activities can degrade the marine environment, reduce potential production and food security, affect economic growth and lower the quality of life of coastal communities. Capture fisheries take out both the target species and non-target species (bycatch). The bycatches are often substantial when non-selective fishing gears such as trawl nets and beach seines are used.Loss of fishing gears and ghost fishing nets cause entanglement of aquatic organisms which could lead to ecological implications. Target species are frequently overexploited to the point where other aspects of the aquatic environment are harmed (FAO, 2016).The unwanted bycatch with low value, or which is too small to eat or inedible is often abandoned at sea. The bycatch may also include the endangered, threatened or protected species. Industrial and semi-industrial fisheries, particularly those that use nets have larger amounts of bycatch (Kimani *et al*., 2018).

Some fishing practices may also be destructive to the habitats that should sustain fish and associated populations. Destructive fishing practices include bottom trawling, beach seining,

use of monofilament nets, use of plant poison, to mention a few, that cause excessive mortality and habitat damage. The bycatch of bottom trawling is diverse and exceeds 70% of the total catch by weight. Some bycatch species are retained while most are discarded. Gillnetting, prawn trawling and long lining incidentally catch sea turtles, often causing high mortality. Trophic balance has been affected through depletion of key species, such as triggerfishes (family Balistidae) which have been overfished in Kenya hence allowing sea urchins (class Echinoidea) to multiply and overgraze seagrass beds, leading to erosion of coral reefs. Capture fisheries can also impact seabirds negatively through direct mortality and by reducing food availability through competition for resources. The level of impact of fishing on seabirds is unknown but could be significant when gillnets are used heavily in areas where foraging ranges of diving bird species are dominant (UNEP and WIOMSA, 2015).

1.4. Gaps in capacity to engage in capture fisheries

1.4.1 Inadequate data

Kenya has inadequate infrastructure, trained manpower and scientific skills to fully assess her marine resources. In the coastal and marine fisheries, there is inadequate data to support full description of the fisheries particularly in the 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.

In the inland fisheries, inadequacy of data that can effectively inform policy formulation is a major hurdle for fisheries management (Aura *et al.*, 2019). In addition, there is a communication gap between fisheries scientists and management since some of the information gathered by scientists is often not packaged appropriately to inform fisheries management. The formulation of fishery management plans and operational management methods for various fisheries and stocks is not practically linked to key research components such as stock assessment findings (Njiru *et al*., 2021).

1.4.2 Knowledge on environmental changes and global climate change

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 a 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.

1.4.3 Illegal unreported and unregulated (IUU) fishing

Illegal, unreported, and unregulated (IUU) fishing activities are cited in Kenya's 2018 economic survey and have been linked to the drop in total fish landings from 148,000 MT in 2016 to 122,805 mt in 2017 (Kimani *et al*., 2018). It is hypothesized that IUU in Kenya not only concerns resource conservation, but also food security, livelihoods, and destabilizing sensitive ecosystems due to insufficient law enforcement capacities.

1.4.4 Processing technologies

Postharvest losses in the artisanal fisheries are known to occur at all stages in the fish supply chain from capture to consumption. Enormous losses that occur in artisanal fisheries are in the form of physical losses and quality losses. Quality losses are reported to account for more than 70% of total losses (Kimani *et al*., 2018; FAO, 2010). Physical losses often occur when fish is thrown away or eaten by insects, birds or animals, while quality losses are associated with changes due to spoilage or physical damage that lower the value of fish. Such fish is still sold but at a lower price. Efforts are therefore required to maintain the quality and acceptability of fish and fisheries products to consumers (Biswas, 1990). The main processing technologies in Kenya include filleting of fish, sun-drying, salting and sun drying, smoking, deep frying, chilling or deep freezing. Filleting the whole Nile perch created a lucrative market for factory fish processors and exporters, while other products such as fish fingers, fish nuggets, fish sausages were also processed from Nile perch but required refrigeration upon production and may not have been conducive in a rural community set up that lacks basic infrastructure (Kimani *et al*., 2018). Lack of electricity in most landing sites in Kenya, and lack of proper processing technologies particularly for *Omena*, which is currently the dominant fishery in Lake Victoria, has led to post-harvest losses and low economic returns.

Section II

2. 1 Mariculture and Freshwater Aquaculture

Globally, dwindling catches from capture fisheries have necessitated the development of aquaculture so as 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). The sector provides opportunities for sustainable food production, livelihoods and income of local communities (Phillips, 2019). Aquaculture is recognized as a source of food security in Kenya's Third Medium Term Plan of Vision 2030 (MTP III) and other legislative, policy, and institutional frameworks. While capture fisheries constitute the most important source of fish in Kenya, aquaculture is increasingly expanding and is meeting part of the rising demand for fish. 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 EEZ that spans 350 nautical miles. The coastline and marine waters provide significant opportunities for sustainable mariculture. For example, 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. This 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). Clearly, there is need to promote development of mariculture in Kenya; which has remained low as in other developing countries, where it has not been able to realize sustainable increases in production (Brummett and Williams, 2000) because of high cost of production and other constraints.

2.2 Mariculture production in Kenya

Mariculture was introduced in Kenya about four decades ago (Troell *et al.*, 2011) in order to bring about development in the rural coastal areas (Mirera and Ngugi, 2009)with varying degrees of success and failures (Odhiambo *et al*., 2020). Mariculture in Kenya involves the culture of milk fish, mullets, mud crabs, seaweeds, oyster and prawns (Mwaluma, 2002; Wakibia *et al*., 2011; Mirera, 2011; 2014), Artemia and marine 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). Mariculture 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 mid 1980s 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 with crab fishers collecting juvenile and sub-adult crabs from the intertidal areas and selling to farmers at lower rates than the market size crabs. The juvenile and sub-adult crabs were then fattened to market size (>0.5 kg) in drive-in cages and pens established in mangrove forests (Mwaluma, 2002; Mirera, 2009; Mirera and Mtile, 2009; Mirera *et al*., 2014) using mangrove poles. Subsequently, this has changed and juvenile crabs are now grown in earthen ponds and plastic cages to attain market size (Moksnes *et al*., 2012). Mud crab 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 atChe Shale, north of Malindi town. The mud crabs from this private business enterprise are for export.

Oyster (*Crassostrea cucullata*) culture was carried out at Gazi Bay and Mtwapa creek in the 1990s and resulted in the production of 10 million oysters. Oysters were produced primarily for 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. Presently, there is focus on upscaling

production to other areas, increasing production per unit area and value addition under the support of several organizations including 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 (Munguti *et al.*, 2014; Odhiambo *et al.*, 2020).

2.3 Freshwater aquaculture production in Kenya

Freshwater aquaculture contributes to food production, alternative livelihoods, income generation, poverty alleviation, and social development (Ogello and Munguti, 2016).Nile tilapia is the most farmed fish species in Kenya, accounting for 80% of all aquaculture production (Table 6). It possesses a number of beneficial aquaculture characteristics, including a high tolerance for low water quality, ability to spawn in captivity, increased disease resistance, high demand in the market, and effective usage of plant-based diets (El-Greisy&ElGamal, 2012). Freshwater aquaculture was first developed in the 1920s and became popular in the 1960s (Opiyo *et al.*, 2018). Between 2006 and 2009, aquaculture production remained below 4895 MTuntil 2010, when it reached 12,153 MT.

The Kenyan government identified aquaculture as a potential option for reviving the economy in 2009, and launched the nationwide Economic Stimulus Programme-Fish Farming and Enterprise Productivity Programme (ESP-FFEPP), which sped up the sub-sector's development. The programme helped fish farmers by providing fingerlings, feed, and pond

building, resulting in an increase in the number of fish farmers, acreage under aquaculture, and output levels, which reached a high of 24,096 MT for the first time in 2014. As a result, Kenya has emerged as a regional player in aquaculture production, ranking as Africa's fourth largest producer. Kenya's aquaculture production later fell from 24,096 MT in 2014 to 12,356 MT in 2017 after the gains realized from ESP-FFEPP. The decline was attributed to insufficient water holding capacity by ponds in selected counties, such as those in the Eastern and Coastal regions; poor extension services, poor management practices, low price and limited fish farm inputs, deficient marketing structure, government/donor reliance, and the absence of value addition (Opiyo *et al*., 2018). Aquaculture production currently stands at 18,542 MT in 2019, up from 12 356 MT in 2017 (Figure 2).

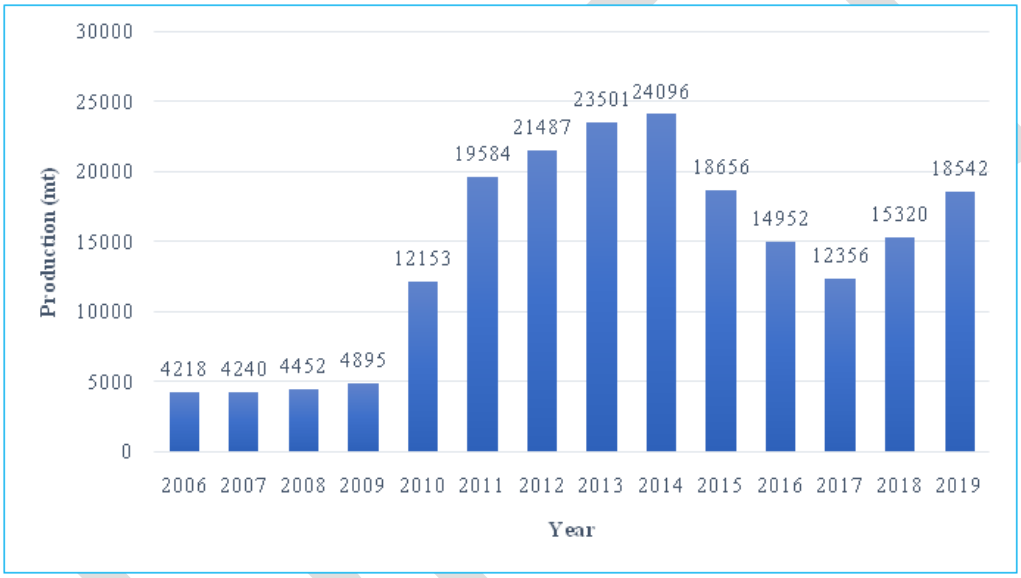

Figure 2: Trends in aquaculture production in Kenya 2006– 2019 (Source: KNBS, 2020)

Table 6: Freshwater culture fish species production (MT) in Kenya

Culture species	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Nile tilapia	9115	16602	16115	17626	18072	13991	11962	9885	12356	15100
African Catfish	2188	3984	3869	4230	4337	3358	1944	1606	1960	2400
Common Carp	729	1328	1289	1410	1446	1120	299	247	300	300
Rainbow trout	122	221	215	235	241	187	748	618	700	745
Total	12154	22135	21488	23501	24096	18656	14953	12356	15316	18545

Source: FAO, 2021

2.4 Contribution of Mariculture to livelihoods

Mariculture 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). 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 initiativesthat provide livelihood and income to the local communities. The seaweed farming has spread to 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. The culture of marine tilapia *Oreochromis niloticus* in ponds is also currently picking up due to its ability to breed in culture facilities thereby ensuring availability of seed to the framers (Mwaluma et al., 2017). It has been noted that mariculture employs mainly women (Odhiambo et al., 2020) and therefore contributes to empowering women as owners of farms or as important actors in the fisheries value chain and marketing; thus participating in societal decision making (Hetch *et al*., 2006; Wakibia *et al*., 2011).

However, apart from the seaweed farming and mud crab farming, most mariculture initiatives have stagnated at pilot phase over the past 4 decades resulting in mariculture making little contribution to livelihoods and national economy. The stagnation occurred despite the technically successful pilot results and the suitable environmental conditions for expansion, such as suitable land and warm and productive waters throughout the year. The constraints to mariculture expansion particularly, ineffective or lack of monitoring and evaluation planning and execution, donor syndrome, remoteness of most locations, distance from markets, and absence of infrastructure and technological skills (UNEP and WIOMSA, 2015)were initially underrated. Since there is growing interest in mariculture as a key Blue Economy sector in Kenya and a livelihood and income source for the rural poor coastal communities, it is important that these constraints be surmounted in order for mariculture to sustainably expand in scale and economic impact.

It is also expected that the development of small private hatcheries for mud crab and, and a major public hatchery integrated in the National Mariculture Research and Training Centre (NAMARET) at Shimoni by the Government of Kenya through KMFRI will revolutionize mariculture production. These hatcheries will address the challenges of inadequate/seasonal

availability of seed and inadequate extension services. The Kenya Marine Fisheries and Socioeconomic Development Project (KEMFSED) funded by the World Bank will further boost development of mariculture by supporting the development of NAMARET at Shimoni and providing grants to communities that would form common interest groups (CIGs) to engage in mariculture production.

2.5 Contribution of freshwater aquaculture to livelihoods

Freshwater aquaculture contributes to livelihoods, health and nutrition, employment, income and farm sustainability. Aquaculture production from small farmer systems provide high-quality animal protein and critical nutrients, that are important for nutritionally sensitive groups like pregnant and breastfeeding mothers, newborn children and pre-school children. It creates self-employment for households, including occupations for women and children, and generates revenue. Livelihoods and income are also obtained from commercial aquaculture farms, seed supply networks, market chains, aquaculture-based manufacturing and repair supporting services. Freshwater aquaculture also provides indirect benefits such as increased availability of fish in rural and urban markets, generation of income from sale of other income-generating farm products that will become available as a result of increased local consumption of fish. Integrated aquaculture such as fish farming in rice fields helps not only in integrated pest management, but also in the management of vectors with human health implications. Furthermore, in locations where there are seasonal water shortages, aquaculture ponds serve as on-farm water reserves for irrigation and animals.

2.6 Impact of Mariculture on marine environment

Impact of mariculture and coastal aquaculture on the marine environment are determined by the culture systems that covers species, intensity and technology, site characteristics, waste assimilating capacity, waste loadings, among others (Troell *et al.*, 2011). Some farmed species are carnivorous and therefore require more protein than herbivores and omnivores. Using fishmeal to feed farmed species may motivate fishers to fishmore; hence instead of reducing fishing pressure on wild stocks, mariculture may end up increasing it due to the high demand for fishmeal. Obtaining feeds for farmed mariculture and coastal aquaculture species is a worldwide issue; that require more transformative technologies to be developed. Collection of seed from the wild may result in overexploitation of wild stocks or alter community composition through harvesting of new recruits (UNEP and WIOMSA, 2015).

Clearance of mangrove areas for construction of ponds for mariculture is still practiced and may lead to loss of mangroves and result in reduction of ecosystem services such as breeding, nursery and filtration functions, if not managed. In addition, mangrove cuttings are used as pegs to hold linesand construct drying racks in seaweed farming. Mangrove cuttings are also used to construct cages for crab farming.Further, mariculture ponds that are constructed in the intertidal areas can cause eutrophication and pollution through effluents especially where farming takes place on large scale, and effluents controls are inadequate. Farming systems can cause the spread of disease or antibiotic resistant bacteria to other farms and wild stocks during water exchange. Moving genetic materials between water bodies may introduce foreign species and threaten indigenous stocks. Seaweed mariculture farms may change aesthetics and therefore impact on the marketing potential of popular tourist areas. For sustainability and harmony in the maritime space, marine spatial planning (MSP) that includes broad stakeholder participation should be carried out.

The main challenge of mariculture farming is inadequate information on the significance of mariculture to food security and the economy of coastal households. Mariculture as an alternative to capture fisheries has not taken off as expected, because of constraints related tolack of seed, ineffective design of community based mariculture, remoteness of some locations, inadequate infrastructure and inadequate technical skills. A coordinated effort by the national and county governments, private operators, and non-governmental organizations is therefore needed to overcome the constraints. It is important to first determine the details of the harmonized effort and the capacity necessary to implement it.

2.7 Impact of freshwater aquaculture on aquatic environment

Nutrient loading, escapees, and chemical (some hormonal) effluents that are associated with aquaculture, have an impact on water quality and biodiversity. The environmental impact of aquaculture is mostly determined by the farm's location and the intensity of production (which influences the discharge of waste such as pesticides, feed residues, and excreta). To achieve minimum waste discharge, sustainable aquaculture necessitates the implementation of new fish farming strategies. Due to the high reliance on fish as a source of animal protein for feed formulation, aquaculture has a significant influence on fisheries. The use of fish meal also increases competition for food that is currently consumed by humans (Naylor *et al.*, 2009), particularly Omena (*Rastrineobola argentea*). This has a detrimental influence on fisheries,

causing overfishing and decreasing recruitment, as well as creating an ecosystem imbalance. Alternative feed sources, such as plant-based protein rich in necessary and non-essential proteinogenic amino acids with high amounts of omega 3 FA, such as many species of freshwater macrophytes, can act as a protein supply and prevent overdependence on existing overfished stocks (Appenroth, 2018).

Section **III**

3.1 Governance frameworks for capture fisheries and aquaculture

Governance of the fisheries sector is undertaken through various legal, policy and institutional frameworks. These include international and regional agreements that Kenya has ratified and are then domesticated at the national level. The Constitution of Kenya 2020 at Article 2(5) provides that, "the general rules of international law shall form part of the laws of Kenya." Article 2(6) of the Constitution then stipulates that "any treaty or convention ratified by Kenya shall form part of the 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 has ratified and has provisions addressing aspects of fisheries is relevant. The discussion hereunder will 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.

3.2 International Framework

3.2.1 Convention on International Trade in Endangered species of Wild Fauna & Flora (CITES)

Kenya ratified on 13 December 1978.

*Domestic Legislations: Wildlife (Conservation and Management) Act No. 47 of 2013; The East African Customs and Management Act, 2004 (Rev. 2008); and Environment Management and Co-ordination Act, 2015.*Through international cooperation states regulate international trade in certain species of flora and fauna that are listed. Appendix I –threatened, Appendix II potentially threatened and Appendix III species in need of international trade controls. Through this listing trade in these animals is either completely prohibited or restricted. The aim of doing this is to ensure the survival of these threatened species. Kenya Wildlife Service (KWS) is the designated CITES management authority for the country. Accordingly, the service has the mandate to implement the conventions provisions. KWS has established the CITES Implementation Department within the Species Conservation and Management Division (KWS website).

3.2.2 Convention on the Conservation of Migratory Species (CMS) of Wild Animals (Bonn Convention)

Kenya ratified on 26 February 1999.

Domestic Legislation: Wildlife Conservation and Management Act, 2013. The Act provides for the protection and conservation of migratory species, their habitats and migratory routes. CMS lays the legal foundation for internationally coordinated conservation measures throughout a migratory range. These include the African Eurasian Water Birds Agreement (AEWA) and MoUs on Migratory Sharks, Sea Turtles, Raptors and Dugongs. The convention aims to promote international cooperation in the preservation of migratory species to prevent them from becoming endangered. Appendix I lists endangered migratory species; Appendix II lists migratory species of which the conservation status is unfavourable, as well as those which would significantly benefit from international agreements for their conservation and management.

3.2.3 Port State Measures Agreement (PSMA) against Illegal, Unreported and Unregulated Fishing (IUU) 2009

Kenya ratified on 23 August, 2017.

Domestic Legislations: Fisheries Management and Development Act, No. 35 of 2016. The Act created an inter-agency Monitoring Control and Surveillance (MCS) unit. *The Kenya Coast Guard Service Act, 2018; and the Maritime Zones Act, Cap. 371.* The PSMA specifically targets IUU fishing and aims to prevent, deter and eliminate it. This is to be achieved by preventing vessels engaged in IUU fishing from using ports and landing their catches. It also seeks to block the sale of fisheries products derived from IUU at the national and international markets. These measures work towards reducing the incentives of fishing vessels to operate in an illegal manner.

3.2.4 International Convention for Regulation of Whaling, 1946

Kenya ratified on 2December, 1981.

Domestic legislation: Fisheries Management and Development Act, 2016; and the Maritime Zones Act, Cap. 371. The objective of the Convention is conservation of world whale stocks, to promote orderly development of the whaling industry. State parties work towards protecting all species of whales from overfishing. This is achieved by governments agreeing to enforce regulations developed by the International Whaling Commission. Kenya is required to closely monitor the whale stocks and effectively regulate trade in endangered shark species.

3.2.5 United Nations Fish Stock Agreement (UNFSA) for Straddling and Highly Migratory Fish, 1995

Kenya ratified on 13 July 2004.

Domestic Legislation: Fisheries Management and Development Act, No. 35 of 2016; Maritime Zones Act, Cap. 371; and Legal Notices on Foreign Fishing Fleets. To ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks. Kenya has the straddling and migratory tuna and tuna-like fish species, which need protection from over exploitation.

3.2.6 Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter

1972, as amended by the London Protocol (London Convention 1972).

Kenya acceded to the London Convention 1972 on 7th January, 1976, and to the London Protocol on 14th January, 2008.

*Domestic legislations: Kenya Maritime Authority Act, 2006; and Environmental Management and Coordination (Amendment) Act, 2015.*The Convention establishes a global legal framework to protect the marine environment from human activities. It aims to contribute to international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials. The Convention does not prohibit ocean dumping and with the exception of certain limited wastes, almost any material can be dumped at sea under certain circumstances and with the requirement for it to be authorized through the grant of permits issued by national authorities of contracting parties.

3.2.7 Convention on the Continental Shelf (Geneva 1958)

Kenya acceded on 20 Jun 1969.

Domestic legislation: Maritime Zones Act, cap 371. The objective of the convention is to define and delimit the sovereign and exclusive rights of states to explore and exploit the natural resources of the continental shelf. The natural resources referred to consist of 'the mineral and other non-living resources of the seabed and subsoil together with living organisms belonging to sedentary species' (article 2(4)). In exploring and exploiting these resources states are obligated to ensure that 'any unjustifiable interference with navigation, fishing or the conservation of the living resources of the sea' does not occur (article 5).

3.2.8 Convention on Fishing and Conservation of the Living Resources of the High Seas

Kenya ratified on 20 June 1969.

Domestic Legislations: *Fisheries Management and Development Act, No. 35 of 2016;and Maritime Zones Act, Cap 371.*It aims to encourage international cooperation among states towards conservation of the living resources in the high seas.Such measures should be formulated with a view to securing a supply of food for human consumption (art. 2). Coastal States have special interests in the high seas adjacent to their territorial seas and may unilaterally adopt conservation measures for such areas which shall be valid for other States if there is an urgent need for such measures, and if the measures are based on scientific findings and do not discriminate against foreign fishermen (arts. 6 and 7).

3.2.9 The Ramsar Convention on Wetlands of International Importance

Kenya ratified on 5 June 1990.

*Domestic Legislations: Environmental Management and Co-ordination Act, 1999; and Water Act, 2016.*The Ramsar Convention encourages the designation of sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity. This approach seeks to promote the conservation of wetlands that are essential to the natural environment. They assist in acting as a buffer to floods, absorb pollutants and provide a habitat for various flora and fauna. Currently Kenya has six sites designated as wetlands of international importance.

3.2.10 United Nation Convention on the Law of the Sea (1982)

Kenya ratified on 2 March 1989.

*Domestic Legislations: Fisheries Management and Development Act, No. 35 of 2016; and Maritime Zones Act Cap 371.*UNCLOS provides a comprehensive regime governing the use of the oceans and seas and their resources. The convention establishes a framework for cooperation on conservation and management of marine living resources in the high seas. It also seeks to promote the conservation and equitable usage of the resources found in this marine environment. The convention also provides for the sovereignty, rights of passage and navigational rights.

3.2.11 Convention on Biological Biodiversity (1992)

Kenya ratified on 26 July 1994.

*Domestic Legislation: Environmental Management and Co-ordination Act, 1999; and Wildlife (Conservation and Management) Act No. 47 of 2013.*The Convention on Biological Diversity (CBD) has three objectives, namely: Conservation of biological diversity; Sustainable use of the components of biological diversity and; Fair and equitable sharing of benefits arising out of utilization of genetic resources. To implement these objectives, the convention adopts both *in-situ* and *ex-situ* conservation measures. The work plan adopted at the 4th conference of parties acknowledged the need to utilise indigenous community knowledge and involve the communities in the conservation of the marine environment and resources.

3.2.12 International Convention for the Prevention of Pollution from Ships (MARPOL)

Kenya acceded on 12 September, 1975.

The convention seeks to preserve the marine environment by addressing pollution emanating from ships. This includes oil pollution, noxious liquid substances carried in bulk; harmful substances carried by sea in packaged form; sewage and garbage. Additionally it aims to minimise the accidental discharge of these harmful substances.

3.2.13 UN 1993 FAO Fishing Vessel Compliance Agreement

Domestic legislation: Fisheries Management and Development Act, 2016; the Kenya Coast Guard Service Act, 2018; and the Maritime Zones Act, Cap. 371.The Agreement seeks to address the threat to international fisheries management posed by vessels that do not abide by fishing rules. Kenya is expected to manage flag states, develop a legal framework to manage its distant water fishing vessels.

3.2.14 Code of Conduct for Responsible Fisheries, 1995

Kenya signed in 1995.

Domestic legislation: Fisheries Management and Development Act, 2016.FAO-CCRF sets international standards and practices for responsible and effective conservation, management and development of living aquatic resources. It 'recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all stakeholders of the fishing and aquaculture industries.The code covers 'all aspects of management and development of fisheries, including capturing, processing and trade of fish products, fishing

operations, aquaculture, fisheries research and the integration of fisheries into integrated coastal area management.'

3.2.15 FAO Voluntary Guidelines for Flag State Performance

Provides guidance to strengthen and monitor compliance by flag States with their international duties and obligations regarding the flagging and control of fishing vessels.They cover the relevant responsibilities of flag States on the basis of elements contained in international law, including binding and non-binding international fisheries instruments.

3.2.16 WTO Agreement on Technical Barriers to Trade

Kenya ratified on 12 December 1994.

Domestic legislation: Trade Licensing Act, Cap 497; Companies Act, No. 17 of 2015; Trade Descriptions Act, No. 15 of 2003; Industrial Property Act, No. 3 of 2001; Cap 509 Copyright Act, No. 12 of 2001; Anti-Counterfeit Act, 2008; Trade Mark Act, 1982 (Rev. 2012) Cap 506;and Nairobi Centre for International Arbitration Act, No. 26 of 2013 (Rev. 2015). The convention seeks to strike a balance between trade liberalisation and regulation. This is achieved by addressing issues of setting standards, technical regulations, seeking harmonization, and avoiding unnecessary obstacles to trade. Nevertheless, as states seeks to liberalise trade they are permitted to take into consideration various principles such as the protection of human health and safety and environmental protection. This convention is relevant in the regulation of fisheries trade in regards to the following issues: market access, non-tariff barriers, subsidies and eco-labelling requirements.

3.3 Regional Framework

3.3.1 Southern Indian Ocean Fisheries Agreement, 2006

Kenya signed on 7 July 2006.

Domestic Legislation: Fisheries Management and Development Act, No. 35 of 2016 and Maritime Zones Act Cap 371. The Agreement seeks to promote the conservation and sustainable use and development of fisheries resources in the designated area among the contracting parties. The resources covered in the agreement include fish, molluscs, crustaceans and other sedentary species, but excludes highly migratory species and sedentary species subject to the fishery jurisdiction of coastal states.

3.3.2 The Common Market for Eastern and Southern Africa Fisheries Strategy (COMESAFS).

Kenya signed in 2008.

Kenya has benefited from this Agreement through development and implementation of common regional agricultural and fisheries policies and investments across the entire value chain.

3.3.3 Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna & Flora (1994).

Kenya Ratified on 17 January 1997.

*Domestic legislation: The Wildlife Conservation and Management Act, 2013; and East African Community Customs Management Act, 2004 (Rev. 2008).*The agreement is similar to CITES in seeking to reduce and ultimately eliminate illegal trade in wild fauna and flora. However, the Lusaka Agreement operates at a regional level; the eastern and southern Africa countries. The Agreement established an intergovernmental taskforce to support and work together with the countries towards achieving the objectives of the treaty.

3.3.4 Revised African Convention for the Conservation of Nature & Natural Resources (Algiers 1968)(Maputo 2003)

Original version Kenya ratified on 12th May, 1969; revised version signed on 17th December, 2003(Maputo). Kenya signed the agreement on 17 December 2003. The instrument is not yet domesticated in Kenya. The objects of the Convention are: to enhance environmental protection; foster the conservation and sustainable use of natural resources and harmonize and coordinate policies.

3.3.5 Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Nairobi 1985)

Kenya has ratified the convention and its three protocols.

Domestic legislation: Fisheries Management and Development Act, No. 35 of 2016, Environmental Management and Co-ordination Act, 1999. The convention has the following protocols:

i. Protocol Concerning Co-operation in Combating Marine Pollution in Cases of Emergency in the Eastern African Region , adopted in 1985

ii. Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region, adopted in 1985

iii. Protocol for the Protection of the Marine and Coastal Environment of the Western Indian Ocean from Land-Based Sources and Activities, adopted in 2010.

Entry into force May 30, 1996- ratification by Kenya on 11 Sept 1990.

Generally, the convention seeks to provide a regional legal framework to assist states in protecting, managing and developing their coastal and marine environments. States are encouraged to take measures to reduce and combat pollution caused by ships and exploration activities. The UNEP provides the institutional secretariat which assists states in discharging their obligations under the treaty. The Convention and its Protocols provides a framework for the sustainable management of the Western Indian Ocean (WIO) region, including Kenya's marine and coastal spaces. There are ongoing negotiations to adopt a Protocol on Integrated Coastal Zone Management (ICZM).

3.3.6 Indian Ocean Tuna Commission (IOTC) Agreement

Kenya ratified on 29 September 2004.

Domestic Legislation: Fisheries Management and Development Act, No. 35 of 2016. The Indian Ocean Tuna Commission (IOTC) is an intergovernmental organization mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas. The objective of the Commission is to promote the conservation and optimal utilization of tuna and tuna-like stocks covered by the IOTC Agreement, and to encourage sustainable development of fisheries.

3.4 National Framework

3.4.1 The Constitution of Kenya 2010

The definition of land is broad and it includes marine waters, specifically 'the territorial sea and the exclusive economic zone' (article 260). Further article 62 defining public land includes the following as falling within this category:

- government forests other than forests to which Article 63(2)(d)(i) applies, government game reserves, water catchment areas, national parks, government animal sanctuaries, and specially protected areas;
- all rivers, lakes and other water bodies as defined by an Act of Parliament;
- the territorial sea, the exclusive economic zone and the sea bed;
- the continental shelf;

These definitions capture the fresh waters and marine environments that support the different types of fisheries activities. In utilising these resources there is a call to ensure sustainability and conservation. The preamble to the Constitution underscores the importance of the environment as part of the country's heritage the need to conserve it for the benefit of future generations. Article 10 generally states that sustainable development as one of the national values and principles of governance. Consequently, in developing the country's resources conservation efforts are to be an integral part of the process. This applies to land based and marine resources. This national principle is reiterated in detail in articles 60 and 69 by calling upon all individuals to 'to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.' This is cascaded down to the individual level through article 42(b). This provision stipulates that it is the right of every person to have the environment protected 'for the benefit of present and future generations'. Collectively these provisions explicitly show the importance attached to natural resources and the need to ensure sustainable exploitation and conservation of the environment. To ensure sustainable use and conservation it is important for this to be done individually and collectively. To achieve this article 11(2)(b) stipulates that the state shall 'recognise the role of science and indigenous technologies'. Additionally, article 69 obligates the state to 'encourage public participation in the management, protection and conservation of the environment.' Consequently, the government, at all levels, is expected to work together with the people to ensure the sustainable use and conservation of the land and water based resources. Accordingly, the constitution is the supreme law of the country hence all other laws must be in conformity with its provisions. This includes those dealing with land and water based resources.

3.4.2 Fisheries Management and Development Act - No. 35 of 2016

The long title of the Act stipulates its aim as 'to provide for the conservation, management and development of fisheries and other aquatic resources to enhance the livelihood of communities' dependent on fishing'. Thus the act seeks to protect, manage, use and develop the aquatic resources in a manner which is consistent with ecologically sustainable development. Further, the act is the main law that implements obligations under national and international law concerning fisheries. Guiding principles of the act include conservation and protection of fisheries habitats, ensuring the effective application of the ecosystem approach to fisheries management and that biodiversity and genetic diversity in the marine environment is maintained and enhanced.

It covers aspects of fisheries conservation, management and development, the import, export and trade of fish products, licensing of vessels undertaking fishing in Kenya fishery waters, mechanisms for Monitoring Control and Surveillance (MCS). Furthermore, the Act provides for: introduction of live fish in Kenya fishery waters, prohibition to pollute Kenyan waters, periodic stock assessment of all the fishery waters, fish quality and safety, an aquaculture development plan, the prohibition to deprive community of traditional access to fisheries, transboundary aquaculture ecosystems, licensing of (semi)industrial fishing vessels, terms and conditions for licence or authorization granted under this Act, compliance with standards relating to work conditions on board fishing vessels, registration of artisanal fishing vessels, recreational fishing, trans-shipment of fish, deployment of fish aggregating devices, fish processing licences, monitoring, reporting and record keeping, (denial of) port access, inspection for foreign vessels and other measures to combat IUU fishing, vessel monitoring systems.

The Fisheries Management and Development Act, 2016 provides for the establishment of the following:

The State Department of Fisheries and Blue Economy is generally the overall in charge over the policy and regulation of the blue economy. It is also responsible for various aspects of the fisheries sector: fisheries regulation and policy, management, licensing, development marketing and technical cooperation.

The Kenya Fisheries Service coordinates and manages all matters concerning the fisheries sector.

The Fish Marketing Authority shall market fish and fisheries products from Kenya.

The Kenya Fisheries Advisory Council reviews and advises the national government on various aspects relevant to the fisheries sector. These include: policies, coordination of fishing management, allocation of fishery resources, research, education, capacity development, management plans and agreements related to fishery.

The Fish Levy Trust Fund provides supplementary funding of activities geared towards management, development and capacity building, awards, and urgent mitigation to ensure sustainability of the fisheries resource.

The Fisheries Research and Development Fund provides supplementary funding for research intended to further the development of fisheries management, capacity building, scholarships, grants, and support for the observer program.

The following regulations are drafted under the Act:

- Fisheries (beach management units) regulations 2007;
- Fish quality assurance regulations;
- Fisheries (safety of fish, fishery products & fish feed regulations 2007;
- Draft aquaculture management and development regulations;
- Fisheries (safety of fish, fishery products & fish feed) 2019;
- Fisheries (Foreign Fishing Craft) Regulations;
- Fisheries (Prohibitions) Regulations, 2003;
- Fisheries (General) Regulations;
- Fish Protection (Oysters) Rules;
- Fish Industry (Crustacean) Regulations; and
- Fish Industry (Shell and Live Coral Conservation).

The Cabinet Secretary may establish Marine Protected Areas and may declare any species of fish to be endangered or threatened with extinction and such fish may not be caught or processed. The secretary may also establish: (a) fish landing stations, (b) designated fishing ports, and (c) protected fish breeding grounds.

3.4.3 County Government Act

The County Government Act provides for the operationalization of chapter eleven of the Constitution that deals with devolution. It details the powers and functions of county governments and their responsibilities to deliver services.Amongst the functions stipulated in schedule four of the Constitution is "implementation of specific national government policies on natural resources and environmental conservation." Additionally, they are vested with powers to deal with matters of agriculture and this includes fisheries. Essentially, justification for the devolved system of government is to give powers of self-governance to the peopleand enhance their participationin making decisions affecting them. These two objectives promote public participation in matters affecting a county including the management, protection and conservation of the environment as well as the utilisation of land and water based resources.

3.4.4 Land Act No. 6 of 2012

The Land Act consolidates the laws dealing with sustainable administration and management of land and land-based resources. It reiterates the definition of land and public land as contained in article 260 and 62 respectively of the Constitution. This Act provides for the sustainable administration and management of land and land-based resources. As well as the involvement of stakeholders fulfilling this mandate. In relation to fisheries and marine resources the statute specifically prohibits the 'allocation of public land that is along watersheds, river and stream catchments, public water reservoirs, lakes, beaches, fish landing areas riparian and the territorial sea as may be prescribed'.

3.4.6 Land Control Act

The main objective of the LCA is to provide for the control of transactions in agricultural land. Controlled transactions include 'the sale, transfer, lease, mortgage, exchange, partition or other disposal of or dealing' (article 6). In undertaking these transactions consent of the relevant land control board is mandatory. Part of the land within the coastal zone is designated as agricultural land hence subject to this statute. This is relevant to fisheries and marine ecosystems.

3.4.7 Physical Planning Act of 1996

The Act provides for the preparation and implementation of physical development plans. Sections 4 and 5 of the Act states that development should be in harmony with environmental considerations. The Director of Physical Planning is empowered to prepare regional physical development plans and local physical development plans. Development of land within a certain area must be done in compliance with the physical development plan for that area. With regards to the coastal zone this statute is relevant in planning the land use so that environmental and economic interests are balanced.

3.4.8 Wildlife (Conservation & Management) Act No. 47 of 2013

The aim of the Act is 'for the protection, conservation, sustainable use and management of wildlife in Kenya'. Considering the definition of wildlife which includes '...any wild and indigenous animal, plant or microorganism or parts thereof within its constituent habitat or ecosystem on land or in water, as well as species that have been introduced into or established in Kenya', The Act is relevant in the conservation and management of fresh water and marine animals and microorganisms. Various provisions in the act either directly or indirectly are

relevant to fisheries. Section 5 of the Act provides for preparation and adoption of a National Wildlife Conservation and Management Strategy for wildlife management areas. This provision underscores the importance of involving communities in the formulation of management plans so as to ensure that they benefit from the resources within their areas. Sections 31, 32, 36 and 33 of the act set a basis for declaration of protected areas, national parks, marine conservation areas and conservation of wetlands respectively. The provisions reiterate the need for sustainable use and conservation of the available resources. Further there are various provisions in the statute that reiterate the constitutional principles of ensuring public participation. These include S 40 on Community Wildlife Associations and Wildlife Managers; in the creation of protected and conservation areas. S18 and S19 on the establishment of conservation and compensation committees. Several regulations have been adopted under the statute. These include:

- Wildlife Conservation and Management (Protection of Endangered and Threatened Ecosystems, Habitats and Species) Regulations, 2017 (L.N. No. 242 of 2017);
- Wildlife Conservation and Management (Joint Management of Protected Water Towers) Regulations, 2017 (L.N. No. 243 of 2017); and
- Wildlife Conservation and Management (Implementation of Treaties) Regulations, 2017 (L.N. No. 241 of 2017).

3.4.8 Water Act No. 43 of 2016

The aim of this statute is to regulate the ‘ownership, use and management of water resources’. The definition of a "water resource" is broad to include a ‘lake, pond, swamp, marsh, stream, watercourse, estuary, aquifer, artesian basin or other body of flowing or standing water, whether above or below the ground, and includes sea water and transboundary waters within the territorial jurisdiction of Kenya’. To undertake implementation of the statutory provisions a water resources authority is established under section 11. This authority has a number of functions, those relevant to fisheries are:The formulation of a national water resource management policy, co-ordinating with regional, national and international bodies on the management and use of water resources, formulating procedures and policies for the management and use of water resources nationally and to enforce regulations made under the act. Cumulatively the act together with the regulations made are supposed to ensure maintaining the quality of water resources as well as their conservation and management. This is important to the fisheries sector since this is a primary resource.

3.4.9 Merchant Shipping Act No. 4 of 2009

This is the main Act in regard to the maritime sector, and its aim is to provide a comprehensive regime for merchant shipping. The mandate of this Act covers different aspects relevant to merchant shipping. Of importance to fisheries is that the Act covers the prevention of pollution and maritime security and also creates numerous offences. As per the statute ships are expected to ensure that they prevent 'damage to the environment'. This means causing 'substantial physical damage to human health or to marine life or resources in coastal or inland waters or areas adjacent thereto, caused by pollution, contamination, fire, explosion or similar major incidents'. This works towards ensuring the conservation of the marine environment. Section 8 of the Act empowers the Cabinet Secretary to make regulations for the better carrying out into effect the provisions of the Act. The regulations include:

- The Merchant Shipping (Application of Safety Convention, 1974) Order, 2004;
- The Merchant Shipping (Maritime Service Providers) Regulations, 2011;
- The Merchant Shipping (Port State Control) Regulations, 2011;
- The Merchant Shipping (Fees) Regulations, 2011;
- The Merchant Shipping (Licensing of Vessels) Regulations, 2012; and
- The Merchant Shipping (Small Vessel Safety) Regulations, 2012.

3.4.10 Maritime Zones Act, Cap 371

According to the long title of the statute its aim is to regulate the 'territorial waters and the continental shelf of Kenya; to provide for the establishment and delimitation of the exclusive economic zone of Kenya; to provide for the exploration and exploitation and conservation and management of the resources of the maritime zones'. The Act provides the rules delimiting the territorial waters, continental shelf and the exclusive economic zone. Generally it also gives guidance on the exploration, exploitation and management of the natural resources, living and non-living, within these maritime zones. Additionally, through the act the minister may make regulations to enhance the object and purposes of the Act. Accordingly, the act is relevant in guiding the exploitation and management of fisheries resources within these zones.

3.4.11 Forest Conservation and Management No. 34 of 2016

The Act gives a wide definition of forest that includes mangroves, which are a category of indigenous forests found in the coastal region. The Act gives effect to article 69 of the

constitution, to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country. In addition, there are detailed Forest (Participation in Forest Management) Rules of 2009 and Participatory Forest Management Guidelines 2015 issued by Kenya Forest Service which provide guidance to communities on the management of forest resources. Forests between low and high water are categorized as public forests wherein lie mangrove forests. These provide a habitat for various marine animals. Moreover, forests capture and store water and are essential to the water cycle. Further forests 'reduce the effects of floods, prevent soil erosion, regulate the water table and assure a high quality water supply' (FAO, 2011). Accordingly, forests play a role in ensuring the supply of high quality water needed by the fisheries sector both marine and fresh water.

3.4.12 Environmental Management & Coordination Act No. 8 of 1999

The Act provides for general coordination in the management of the environment. Section 3 recognizes the principle of sustainable development and states that an important aspect of that principle is participation of the people. It also provides for the application of cultural and social principles traditionally applied by communities in managing the environment and natural resources. Nonetheless there are specific provisions dealing with marine and fishery areas. Generally S 42 provides rules to guide the protection of rivers, lakes, seas and wet lands. In section 42(3) the Cabinet Secretary is mandated to make regulations or standards for the management of management of river basins, lake basins, wetlands or coastal zones. These regulations should specifically provide for the following:

a) the development of an overall environmental management plan for a lake, river, wetland or coastal area, taking into account the relevant sectoral interest;
b) measures for the prevention or control of coastal erosion;
c) the conservation of mangrove and coral reef ecosystems;
d) plans for the harvesting of minerals within the coastal zone, including strategies for the restoration of mineral sites;
e) contingency plans for the prevention and control of all deliberate and accidental discharge of pollutions into the sea, lakes or rivers;
f) plans for the protection of wetlands;
g) the regulation of harvesting of aquatic living and non-living resources to ensure optimum sustainable yield;

h) special guidelines for access to and exploitation of living and non-living resources in the continental shelf, territorial sea and the Exclusive Economic Zone;

Section 50 of the Act is also aligned towards the conservation of marine and fisheries areas. It gives NEMA the authority, in consultation with other agencies, to inter alia; (a) identify, prepare and maintain an inventory of biological diversity in Kenya (b) determine which components of biological diversity are endangered, rare or threatened with extinction (c) identify potential threats to biological diversity and devise measures to remove or arrest their effects (d) undertake measures so as to integrate conservation and the sustainable use of ethics in government or private activities affecting biological diversity. Section 52 permits the conservation of biological resources ex-situ and their re-introduction into their native habitats and ecosystems. Section 55(2) gives National Environmental Management Authority (NEMA) th12e authority to conduct a survey and prepare an integrated coastal zone management plan. An Integrated Coastal Zone Management (ICZM) Plan for Kenya is expected to serve as a resource management tool. The ICZM Policy, 2014, is implemented through five year Action Plans and domiciled with NEMA.

- Environmental Management and Co-ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009 (Cap. 387).
- Environmental Management and Coordination (Waste Management) Regulations
- Environmental Management and Coordination (Water Quality) Regulations, 2006 (Cap. 387).

3.4.13 Science, Technology and Innovation Act No. 28 of 2013

The aim of the statute as presented is ‘to facilitate the promotion, co-ordination and regulation of the progress of science, technology and innovation of the country’. The National Commission for Science, Technology and Innovation is created under this act and given the mandate to establish research institutions, s16. As well as conduct the monitoring of the institutions created, s 23. This is relevant for the development of various industries in Kenya including fisheries. Accordingly it is by virtue of this Act that the Kenya Marine and Fisheries Research Institute (KMFRI) was established. The institution is tasked with undertaking research on ‘marine and freshwater fisheries, aquaculture, environmental and ecological studies, and marine research including chemical and physical oceanography’.

3.4.14 Coastal Development Authority Act, Cap 449

This Act establishes an Authority tasked with planning and co-ordinating the implementation of development projects in whole of the Coast Province and the exclusive economic zone. According to section 8 the functions of the Authority include:

- to co-ordinate the present abstraction and use of natural resources, especially water, within the Area and to set up effective monitoring of abstraction and usage;
- to identify, collect, collate and correlate all such data related to the use of water and other resources and also economic and related activities within the Area as may be necessary for the efficient forward planning of the Area;
- to plan and liaise with the relevant authorities as necessary in the exploration and development of the extensive fishing and marine activities an Kenya especially the exclusive economic zone.

This authority promotes public participation in the planning, use, management and conservation of the resources found within the coastal region. This includes the water and fisheries resources.

3.4.15 Kenya Coast Guard Service Act no. 11 of 2018

As per Section 5 the Kenya Coast Guard Service (KCGS) is established. The Service is to be deployed in Kenya's territorial waters to provide services. These include:

- to enforce maritime security and safety;
- to enforce pollution control;
- to enforce prevention of trafficking of illegal goods;
- to enforce sanitation measures;
- to prosecute maritime offenders;
- for port and coastal security;
- for the protection of maritime resources including fisheries;

By fulfilling this mandate the KCGS provides security within the territorial waters. This assurance makes it possible for individuals and entities to undertake various activities linked to fisheries.

3.5 Policy Documents

3.5.1 Kenya Vision 2030

Kenya's Vision 2030 is the country's development blue print covering the period from 2008 to 2030. The aim of this blueprint is to transform Kenya to a new industrializing 'middle income country providing high quality of life to its citizens'. The vision is based on three main pillars: economic, social, and political. The Blue Economy is the eighth priority sector under the economic pillars. 'Kenya's Blue Economy includes: maritime transport, fishing, aquaculture, tourism, shipbuilding and repair, maritime education and training, marine cargo logistics, maritime law, safety and security, marine salvage, international shipping, transport, energy, bio-prospecting, offshore mining, marine biotechnology, blue data, aqua-business, cargo consolidation, marine insurance, bunkering, ship handling, port agency, port related services, water sports, as well as marine and maritime governance.' The Third Medium Term Plan (MTP III) 2018–2022 of Vision 2030 identifies the Blue Economy as one of the priority areas with high potential to spur inclusive economic growth and development in Kenya.

3.5.2 Medium Term Plan III (Blue Economy) State Department of Fishery and Blue Economy 2018 – 2022

The flagship projects under this plan include:

- Development of Blue Economy Programme: This programme will involve development of a Blue Economy Master Plan;
- Fisheries and Maritime Infrastructure Development Programme;
- Exploitation of Living Resources under Blue Economy Programme;
- Aquaculture Business Development Programme;
- Kenya Marine Fisheries and Socio-Economic Development (KEMFSED) Programme: Under this programme, a functional Fishery;
- Information System will be developed; fisheries management plans for priority fisheries operationalized; and Shimoni Mariculture Research Centre established;
- Aquaculture Technology and Development and Innovation Transfer Programme – development of a Marine Aquaculture Hatchery;
- Monitoring, Control and Surveillance Programme; and
- Development of Fish Quality Laboratories Programme.

3.5.3 Draft Integrated Coastal Zone Management Policy

The aim of the policy is 'to guide the management and sustainable utilisation of coastal resources, while protecting the environment for the benefit of the many different stakeholders in the coast and for posterity' (ICZM POLICY, p 11). The ICZM policy framework is supposed to integrate and coordinate planning and management of the coastal zone and resources and to ensure sustainable development. The thematic areas covered include: Integrated Planning and Coordination; Promotion of Sustainable Economic Development; Conservation of Coastal and Marine Environment; Environmental Management and Risks; Capacity Building, Education, Awareness, and Research; Institutional Arrangements and Legal Frameworks. The policy also seeks to promote public participation by including different stakeholders in the decision making process. Generally, the ICZM provides for a balance between development and conservation requirements. This is key in ensuring conservation and sustainable development of the coastal zone.

3.5.4 National oceans and fisheries policy 2008

The overall objective of Kenya's Fisheries Policy 2008 is to "enhance the ocean's and fisheries sector's contribution to wealth creation, increase employment for youth and women, food security and revenue generation through effective private, public and community partnerships" (Policy, p5). The policy incorporates certain obligations under the CITES, CBD and CMS conventions. It covers fresh water and marine and coastal biodiversity management. There is also a specific focus on aquaculture and ocean fisheries development. The policy focuses on the promotion of aquaculture, implementation and monitoring of sustainable management and responsible fishing practices, the promotion of fish consumption and securing the rights of vulnerable and traditional fisher communities. The policy seeks to address other issues including, unsustainable utilization of fisheries resources, resource use conflicts, inadequate infrastructure, and lack of a comprehensive legal and institutional framework for effective fisheries management. The policy has further recognised the inter-jurisdictional aspects of marine fisheries and has called for collaboration and cooperation in the management of migratory/shared stocks.

3.5.5 Draft Environmental policy 2013

The aim of the draft National Environment Policy (2009) is to provide a framework for sound environmental and natural resource governance by mainstreaming environmental

considerations into sectoral policies and strengthening regional and international cooperation in environmental management. It proposes an integrated approach (ecosystem approach) in the management of natural resources. The achieve this it recommends various institutional and governance improvements.

Key objectives of the policy include:-

Provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources

- Strengthen the legal and institutional framework for effective coordination and management of the environment and natural resources.
- Ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods
- Promote and enhance cooperation, collaboration, synergy, partnerships and participation in the protection, conservation, sustainable management of the environment and natural resources.

3.5.6 Wetlands Conservation and Management Policy, 2015

The Policy recognizes the importance of the variety of wetlands found in the coastal, marine and inland areas, in the provision of goods and services which support agriculture, tourism, industry, biodiversity conservation, social economic and cultural activities. The Policy seeks to foster an integrated approach that promotes conservation and sustainable use of wetlands. The policy provides a framework for, inter alia, review of the status of wetlands and identifying priority issues, including transboundary issues, addressing legislation and government policies with a bearing on wetland management and conservation, enhancing knowledge through research and raising awareness on wetlands and their values to promote stakeholder participation, and addressing institutional and organizational arrangements to facilitate implementation of the policy.

The national wetlands conservation and management policy complements the other sectoral policies on environment and development. Adoption of the policy fulfils Kenya's obligations under the Ramsar Convention and other relevant Multilateral Environmental Agreements and Protocols.

3.5.7 Kenya Climate Smart Agriculture Strategy 2017-2026

Climate change is an impediment to sustainable development. Fisheries and aquaculture are affected through acidification of the water bodies, changes in water temperatures and circulation patterns which alter the physico-chemical properties of the fish habitats and ultimately the productivity.

3.6 Institutional Framework

3.6.1 Blue economy committee

The committee was appointed on 21 December, 2016. Its mandate was to:

- Develop and prioritize programs and projects required to unlock growth of the economic priority sectors, e.g., enabling policy infrastructure development like construction of fish ports and capacity building for fisheries industry, etc.;
- Identify land for the construction of fish ports in Shimoni, Kilifi, and Lamu; and
- Develop appropriate capacity program for exploitation of the fish industry including training, deep sea fishing vessels, cold storage facilities, and landing jetties.

The Blue Economy Committee was later converted to a Standing Committee known as the Blue Economy Implementation Standing Committee (Gazette Notice No. 6275 of 29 June, 2018).

3.6.2 Blue Economy Implementation Committee (BEIC)

The BEIC was established in January 2017. This was established under Gazette Notice No. 3 of 6 January 2017 for implementation of the priority programs proposed by the Blue Economy Committee. The BEIC was established as an extension of the Blue Economy Committee, whose members are the same. Its mandate is to:

(a) co-ordinate and oversee the implementation of the prioritized programs; and

(b) prepare and submit monthly reports to H.E. the President on the progress of implementation.

These committees were the government's efforts to show commitment to developing Kenya's Blue Economy.

3.6.3 The State Department of Fisheries, Aquaculture and Blue Economy (SDFABE)

It is one of the four state departments under the ministry of agriculture livestock, fisheries & cooperatives. It is divided into three directorates, namely Aquaculture Technology Development (DATD); Fisheries Policy, Research and Regulations; and Fisheries Resources,

Development and Marketing. Overall the SDFABE is responsible for the fisheries policy, licensing, development, marketing, technical cooperation, management, and regulation, as well as the Blue Economy policy and regulatory matters.

The functions of SDFABE functions are:

- Developing and implementing fisheries and fisheries marketing policies;
- Fishing licensing;
- Development of fisheries;
- Fish quality assurance;
- Co-ordination of development of policy, legal, regulatory and institutional framework for the fisheries industry and the blue economy;
- Enhancement of technical cooperation with partner states;
- Co-ordinating maritime spatial planning and integrated coastal zone management;
- Protection and regulation of maritime ecosystems;
- Management and licensing of local and foreign fishing trawlers in Kenya waters;
- Protection of the maritime resources in EEZ;
- Overall policy for exploitation of agro-based maritime resources;
- Policy on development of fishing ports and associated infrastructure; and
- Capacity building for sustainable exploitation of agro-based maritime resources

  Source [SDFABE website, https://kilimo.go.ke/state-department-for-fisheries-aquaculture-and-the-blue-economy/ (17/04/21)]

3.6.4 Kenya Marine and Fisheries Research Institute (KMFRI) is a state-owned corporation established by an Act of Parliament. KMFRI is mandated to undertake research on 'marine and freshwater fisheries, aquaculture, environmental and ecological studies, and marine research including chemical and physical oceanography' (KMFRI website). This includes:

- Conduct multidisciplinary and collaborative research on fish ecology, population dynamics, stock assessment and general aquatic ecology;
- Collect and disseminate scientific information on fisheries and other aquatic resources and related natural products;
- Study and identify suitable species for culture including development, adoption and transfer of rearing technology and procedure;

- Study chemical and physical processes that affect productivity of aquatic ecosystems;
- Monitor water quality and pollution in fresh and marine water environments;
- Carry out socio-economic research on aspects relevant to fisheries, environment and other aquatic resources;
- Establish a marine and freshwater collection for research and training purposes;
- Offer training facilities to aquatic scientists;
- Conduct research on fish quality control, post-harvest preservation and value addition technologies; and
- Conduct research on blue economy.

The key aspect of research is reiterated in the institution's strategic plan 2018-2022 by planning to conduct innovative research for the Blue Economy.

3.6.5 The National Aquaculture Research Development and Training Centre (NARDTC)

It is responsible for training and extension, regulation of standards in feed and fingerlings and aquaculture curriculum development. The NARDTC is located in Sagana (Sagana Aquaculture Centre). The activities undertaken at this centre include establishment and authentication of hatcheries, monitoring of quality seed production and certification, monitoring of quality feed production and certification, establishment of cottage fish feeds, development of feed guidelines, standards and SOPs for seed, feed and fish quality, training of farmers and hatchery managers.

3.6.6 Kenya Wildlife Service

The overall mandate of the Kenya Wildlife Service (KWS) is to 'provide for overall protection, conservation, sustainable use and management of wildlife in Kenya.' KWS's functions include the conservation and management of national parks, 20 wildlife conservation areas and sanctuaries under its jurisdiction. These include marine parks and conservation areas.

3.6.7 National Environment Management Authority (NEMA).

This is the principal agency for implementing all government policies on the environment and supervise and coordinate all aspects of environmental matters. The Act elaborates tools and procedures to enable NEMA to carry out the above task.

3.6.8 National maritime centre (Bandari College)

The government through Legal Notice No. 233 of 28th November 2018 decided to transform Bandari College into Bandari Maritime Academy a regional maritime centre for skills development for the Blue Economy. This through providing training for various courses relevant to the blue economy.

3.6.9 Kenya Maritime Authority

This is a semi-autonomous government agency created under the Kenya Maritime Authority Act No. 5 of 2006. The Authority has several mandates including:

- administering and enforcing the provisions of the Merchant Shipping Act, 2009;
- co-ordinating the implementation of policies relating to maritime affairs and promote the integration of such policies into the national development plan; and
- advise government on legislative and other measures necessary for the implementation of relevant international conventions, treaties, and agreements to which Kenya is a party.

Simply it is to coordinate and provide regulatory oversight over the Kenyan maritime industry. The Authority is to oversee the registration and licensing of vessels, that these ships maintain the required vessel standards and oversee navigation safety.

3.6.10 Kenya Ports Authority (KPA)

The Authority is created under section three of cap 391, Kenya Ports Authority Act. The powers of the Authority as stipulated in section 12 include to 'to maintain, operate, improve and regulate the ports'. It is also mandated to build new ones. Accordingly, KPA has control over fishing ports.

3.6.11 Kenya Forest Service

Established under section 7, Forest Conservation & Management Act, 2016. Its mandate includes: conserving, protecting and managing all public forests;prepare and implement management plans for all public forests; receive and consider applications for licenses or permits in relation to forest resources or management of forest. Accordingly, the management of forests in water catchment areas and the mangrove forests falls within the institutions mandate.

3.6.12 Kenya Fishing Industries Corporation

The corporation is established vide Legal Notice number 214 of 23 November 2018. The functions of the corporation include:

(a)exploit fishery resources in the Kenya fishery waters and high seas by promoting the establishment, development and efficiency of businesses engaged in the fishing and fishing related activities;

(b) develop and operate facilities and establishments for the exploitation of fishery resources:

(c) acquire, hold or dispose of assets including equipment and accessories necessary for the capture, preservation, processing, selling and marketing of fish and fish products;

(d) formulate mechanisms necessary for the implementation of a, b & c.

Section IV

4.1 REGULATORY & GOVERNANCE CHALLENGES

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 the fisheries resources. There is also an overlap in the requirements on the issuance of permits and licences. 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 is exacerbated by lack of co-ordination between the relevant agencies.

There are gaps, omissions and loopholes in the current legal and policy framework governing the fisheries industry, for example, the fish feed certification, mechanisms to monitor compliance to fish feed production (Munguti *et al*, 2014). Generally, the regulations and policies are outdated and hence they are not in line with international requirements, the constitution and other relevant laws and policies. The other evident gaps include the lack of an integrated national ocean law, lack of an ocean fisheries and mariculture policy and law and specific legal framework dealing with exploration of ocean fisheries and deep sea fisheries management (JICA, 2018; Okemwa, 2019). 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 problems elucidated above are aggravated by the ineffective enforcement of fisheries laws and regulations. This is caused by lack of sufficient number of staff to ensure enforcement, lack of involvement 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 to ensure 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, which 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 lacking sufficient skilled manpower and lack of resources to facilitate capacity development among the staff (Rasowo *et al*, 2020; JICA, 2018). Hence, the institutions are unable to consistently improve the skills of its staff or train new manpower. Ultimately this has an effect on implementation. These mandated institutions will be unable to reliably, efficiently and effectively implement their mandates. Additionally, to ensure effective and efficient implementation it is necessary to update the institutional structure of some of the existing fisheries agencies. This is to align them with the current realities facing the sector.

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

As discussed above 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. Considering that 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 therefore becomes necessary to have a regional institutional framework for collaboration in some of the trans-boundary water bodies.

Section V

5.1 Conclusions and recommendations

The coastal communities depend on fisheries activities for their food security and income. Primary fishing is mainly carried out by men while fish trade, processing and distribution are dominated by women. Fish catches often fluctuate significantly between months with the highest catches each year occurring between January and March when fishing for deeper water stocks take place. Overall, about 80% of the fish catches is landed by small-scale/artisanal fishers who use simple fishing technology; mainly the traditional fishing boats and gear that confine them to nearshore waters. If catches are to be enhanced, the fishing technology used by the artisanal scale fishers would need to be upgraded. The remaining 20% of the fish and other fishery products are landed by semi-industrial and industrial fishers.

The catches landed from the artisanal-scale reef finfish fishery and Lake Victoria are declining due to overfishing. This has resulted in dwindling sizes of fish landed, decreasing species richness and changes in species composition. Presently, most of the catches landed by the artisanal fishers consist of a high proportion of juvenile fish thus implying growing problem of overfishing. In the Indian Ocean, recruitment overfishing has also been reported on the three most abundant reef species in demersal catches namely *Lethrinus lentjan, Siganus sutor,* and *Leptoscarus vaigiensis*. Appropriate measures should therefore be put in place to address overfishing within the coral reefs and Lake Victoria. Overfishing has also been identified onsmall and medium pelagic fisheries in the Indian Ocean with large temporal variations, some marine aquarium fishery species with high spatial variations, and a few tuna species. Overfishing if unchecked, would impact negatively onfood security, economic growth and the quality of life of coastal communities in the long run.

Mariculture has registered some growthwith seaweed farming attracting a number of villages. However, it has not realized its potential with most mariculture initiatives stagnating at the pilot phase for many yearsdue to challenges of seed and feed, 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. A coordinated effort by the national and county governments, private operators, and non-

governmental organizations is therefore needed to address the constraints and unlock the full potential of mariculture.

Robust governance frameworks for capture fisheries, freshwater aquaculture and mariculture exist with the Fisheries Management and Development Act, 2016 providing the necessary primary legal framework. Acomprehensive institutional framework has been developed to ensure effective management and development of capture fisheries and mariculture, with the main institutions being the State Department of Fisheries, Aquaculture and Blue Economy, Kenya Fisheries Service, Kenya Fish Marketing Authority, Fish Levy Trust Fund, Kenya Fishing Industry Corporation and the KMFRI. While KMFRI has built comprehensive capacity with a long experience in overall Blue Economy research, the institutions that were recently established by the Fisheries Management and Development Act, 2016 are still in the process of building the necessary capacity to enable them discharge their mandates effectively. They are however being supported by the State Department of Fisheries and are expected to have sufficient capacity soon. The Fisheries Departments at the various County Governments are also in the process of building the necessary capacity to enable them deliver their mandate effectively.

Some aquaculture technologies that may need to be promoted towards development of Blue Economy through mariculture and freshwater aquaculture include cage culture in the ocean, lakes and rivers, re-circulatory aquaculture systems, aquaponics, pens, breeding, re-stocking of commercially important indigenous species, and tailor-made production for the live-fish market.

Finally, in order to have effective development planning and to support the sustainable management of fisheries resources, timely scientific data and information on the capture fisheries, aquaculture and associated ecosystems is essential.

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