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Enhancing equitable economic growth by promoting sustainable fisheries in the EA-SA-IO region

SITUATIONAL ANALYSIS: MARINE FISHERIES OF KENYA

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COMESA Non-Key Expert

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KENYA AT A GLANCE

Area (Km^2)	582,646
Population (million) latest census/yr. 2019	47,564,296[1]
Coastline (Km)	640
Fish production Marine (MT) (2019)	23,700[2]
Fish Production Inland (MT) (2019)	102,331[2]
Fish Production Aquaculture (MT) (2019)	18,542[2]
People employed in SSF	1,200,000
People employed in industrial fisheries	NA
Fish Exports (MT)	8,819
Fish Imports (MT)	22,815
GDP (US$ Million 2019)	87,875
Annual fish consumption per capita (kg)	4.7

BACKGROUND

Kenya is situated within the East African coast and is the largest economy within EAC, with a landmass of 582,646 km2, comprising 97.8 percent land and 2.2 percent water surface. It lies between latitudes 5° North and 5° South and between longitudes 34° and 42° East. The equator runs across at almost the middle of the country, and shares borders with Ethiopia to the North, South Sudan to the North West, Uganda to the West, Tanzania to the South, Somalia to the North East and the Indian Ocean to the South East. It has a population of 47,564,296 as per the National Population and Housing census of 20191.

Although most of its land area (80 %) is arid or semi-arid, and only 20 percent is arable, Kenya's economy is predominantly agricultural with a strong industrial base. The performance of the Kenyan economy since the country gained independence has been mixed. Recent years have seen an averaged 5.6 percent GDP growth rate from 2015-2019[3]. The size of the economy was estimated at US$87.78 billion in 2018[4].

[1] Kenya National Bureau of Statistics. 2019 Kenya Population and Housing Census
[2] Kenya Fisheries Statistics Bulletin data, 2019
[3] Kenya National Bureau of Statistics (KNBS). 2018. Economic Survey 2018
[4] The World Bank Country profile for Kenya

From the demand side, growth has mainly been driven by an increase in private consumption and rapid growth in capital investment. From the supply side, the major drivers of the economy have been agriculture, forestry, and fishing; construction wholesale and retail trade; education; and finance and insurance. Its Gross National Income (GNI) per capita PPP (current international $), is estimated as $4,230. Contribution of agriculture, forestry and fishing to Gross Domestic Product (GDP) was about 34.2 percent in 2019[5]. The fisheries and aquaculture sub-sectors contribute about 0.5 percent to the GDP, or 1.4 percent of agricultural GDP and 2 percent of the national export earnings[6]. Fisheries employs over 60,000 fishers directly and provides indirect employment opportunities to 1.2 million people directly and indirectly within the fishing, production and supply chain.

Currently, Kenya is classified as a Lower Middle-Income Country (LMIC)[7] after joining this category in 2014. The country is also globally ranked as a medium development country with a Human Development Index (HDI) of 0.579 and was ranked 148 out of 189 countries according to the 2019 UNDP Human Development Report[8]. Life expectancy was 66.3 years in 2019.The proportion of the population living below the national poverty line fell from 46.8 percent in 2005/06 to 36.1 percent in 2015/16 based on national poverty headcount rate[9]. Most of the poverty decline is attributable to progress in rural areas, where poverty declined from around 50 percent in 2005/06 to 38.8 percent ten years later. However, income inequalities are still high at a Gini Index of 40.8 percent.

Chronic malnutrition amongst children between 6 and 59 months is estimated to be 26 percent[10]. In the analysis period of February-March 2020, 1.3 million people (9 % of the population analysed) are estimated to have faced crisis (IPC Phase 3) or worse acute food insecurity, of which 296,500 people faced emergency (IPC Phase 4) acute food insecurity[11]. Rapid population growth, climate change, stagnating agricultural production, gender inequalities and underperforming food systems are the most significant challenges to food and nutrition security. Food insecurity is exacerbated by failing rains when needed, given that most agriculture in Kenya is rain-fed.

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[5] Central Bank of Kenya. 2019. Annual GDP Statistics. https://www.centralbank.go.ke/annual-gdp/

[6] Kimani EN, Aura MC, Okemwa GM (eds.) (2018) The Status of Kenya Fisheries: Towards the sustainable exploitation of fisheries resources for food security and economic development. Kenya Marine and Fisheries Research Institute (KMFRI), Mombasa. 135 pp

[7] United Nations Development Programme (UNDP) Kenya Annual Report 2018

[8] United Nations Development Programme (UNDP) Human Development Report 2019

[9] The World Bank. 2020. Poverty and Equity Brief for Kenya

[10] United Nations World Food Programme.2020. Kenya Country Brief

[11] Kenya: Acute Food Insecurity Situation. Integrated Food Security Phase Classification. http://www.ipcinfo.org/

FISHERIES RESOURCES, PRODUCTION, STATUS AND POTENTIAL

OVERVIEW OF FISHERIES RESOURCES POTENTIAL AND STATUS

The fisheries resources of Kenya are distributed within the inland freshwater bodies and the Exclusive Economic Zone (EEZ) within the Indian Ocean. Of all the sources of freshwater fisheries, Lake Victoria has the most significant quantities traded internationally or regionally. The lake's production for the three riparian countries (Kenya, Tanzania and Uganda) represent one percent of world capture fish and 8 percent of world inland capture. Although Kenya's side of the lake only covers 6 percent of the total water mass, in 2019 it contributed about 62% (90,743 tonnes) of Kenya's fish production. The other freshwater resources include; Lakes Turkana, Naivasha, Baringo, Rivers Tana, Athi-Sabaki, Nzoia, Yala, Kenyatta, Kanyaboli and Jipe, and man-made dams along River Tana on major rivers. There are hundreds of fish species in these freshwater masses, but the main species of economic importance to international and regional trade include; Nile perch (*Lates niloticus*), and Nile tilapia (*Oreochromis niloticus*) and dagaa (*Rastrienobola argentea*).

Marine fish production is from the territorial waters and the Exclusive Economic Zone (EEZ), spanning approximately 230,000 km^2 with potential extension of its continental shelf beyond the 200 nm by approximately 103,302 km^2 pending Kenya's submission to UNCLOS. A wide variety of fish species are harvested from these waters including; finfish (pelagics and demersals), crustaceans (prawns, lobsters and crabs) and molluscs (squids and octopus). However, marine fisheries only accounted for 18 percent (25,670 tonnes) of national production (146,543 tonnes) in 2019 as per State Department of Fisheries figures.

Aquaculture has grown rapidly in Kenya over the last one decade and plays an increasingly important role in national fish supply. Freshwater fish account for close to 98% of Kenya's reported aquaculture production. Kenya is now ranked 4^{th} major producer of aquaculture in Africa. Production from aquaculture systems recorded a growth from 4,218 tonnes in 2006 to peak at 24,096 tonnes in 2014, but currently at 18,542 tonnes in 2019, representing 13 percent of total national fish production. The rapid growth is mainly associated with the intervention of the government through the intersectoral Economic Stimulus Programme (ESP) in 2009 with progressive support over the years. Under the ESP programme, a nationwide fish

farming mass campaign was launched by government in 2009, increasing pond area from 220 ha to 468 ha by building 7,760 new fishponds. The main species produced include Nile tilapia (75 %), African catfish, common carp and rainbow trout. Mariculture is not yet practised on a wide scale, but farming of crab, mullets and prawns is undertaken. Seaweed farming has also taken root in Kenya's south coast.

Fish consumption has been declining from a modest 6.0 kg/person/yr in 2000 to 4.7 kg/person/yr. in 2019 due to declining production and an increasing population. National fishery catches increased to almost 200,000 tonnes in the 1990s followed by a subsequent drop to 146,543 tonnes in 2019, mainly due to the decline of the Nile perch fishery in Lake Victoria.

Overview of the marine artisanal and semi industrial fisheries sector

Kenya's fishery production is dominated by small-scale operators. Fishing in marine waters consists of 13,417 fishers operating about 3,000 vessels, while 17 percent of fishers are foot fishers[12]. The vessels are mainly low-tech with 73.4 percent being canoes, 22.1 percent are large wooden boats (*Mashua*) and only 3.1 percent are reinforced plastic boats. The vessel length for the larger vessels (Reinforced plastic boats, *Mashua* and *mtori*) averages at 7.5 m, while the smaller vessels (canoes) averages at 4m. Most vessels are non-motorised, where paddles account for 41.8 percent, sails 35 percent and pole locally known as *Pondo* at 2.1 percent. Other forms of craft propulsion recorded include outboard engines (19.7%), and Inboard engines (1.4%). Only 6% of the marine operational fishing crafts have navigational aids to support their fishing operations and for safety e.g. the compass, GPS and the fish finders.

The fishery is multi-gear where gears in use include; gillnet including monofilament nets, longlines, hand lines and basket traps as the main fishing gears. Other gears include; beach seines, reef seines, harpoons, pointed sticks, trolling lines, prawn seines, ring nets, spear guns, cast nets, hand gathering, hook stick, scoop nets. Spearguns, beach seines and monofilament nets, though illegal are still in use. Analysis of gears shows that there has been a general decline in use of beach seines by 32 percent since 2012, as well as basket traps and gillnets, whereas there has been an increase in use of monofilament nets[6].

The fishery is also multispecies with numerous species (over 190 species within 49 fish families). Demersal reef fish (e.g. rabbitfish, emperors, parrotfish, goatfish,

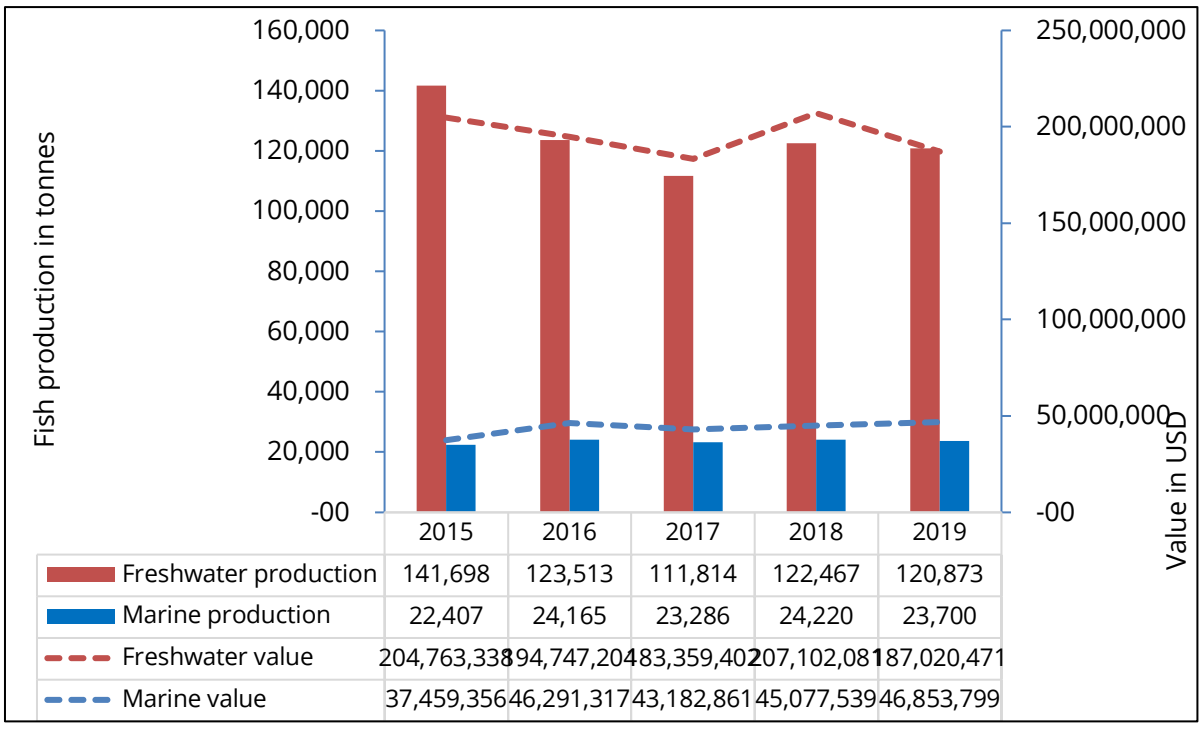
[12] Kenya marine artisanal fisheries frame survey report. 2016

surgeonfish, snappers, groupers and sweetlips) contribute about 45 percent of marine catches. Of these, over 90 percent of demersal catches are accounted by 15 to 17 species and only three species groups (Lethrinidae, Siganidae and Scaridae) represent over 60 percent of the finfish catches. Pelagic species account for (35%), molluscs (9%) and crustaceans (3%). Other species groups include sea cucumbers, cephalopods (octopus and squids), and elasmobranchs (sharks and rays). Penaeid prawn stocks are also fished in Kenyan marine waters and are mainly concentrated within the Malindi-Ungwana Bay, within an area about 35,300 km^2, where prawn trawling takes place.

Fisheries production in Kenya in the last five years has not changed much. Freshwater capture fisheries production has oscillated between 99,458 and 123,042 tonnes, but with a gentle decline in the last two years (Table 1, Figure 1). Aquaculture has also been marked by similar patterns but shows signs of increasing to 18,542 tonnes in 2019. Value for both freshwater capture fisheries and aquaculture have shown similar oscillating patterns, but with a significant drop in 2019. Marine fisheries have experienced stagnated production in the last five years, but with slight increase in value.

Table 1. Kenya's fish production and value in the last five years

Variable		2015	2016	2017	2018	2019
Aquaculture	Tonnage	18,656	14,952	12,356	15,320	18,542
Freshwater capture	Tonnage	123,042	108,561	99,458	107,147	102,331
Freshwater capture fisheries + aquaculture	Tonnage	141,698	123,513	111,814	122,467	120,873
	Value in USD	204,763,338	194,747,204	183,359,402	207,102,081	187,020,471
Marine fish	Tonnage	22,407	24,165	23,286	24,220	23,700
	Value in USD	37,459,356	46,291,317	43,182,861	45,077,539	46,853,799
Total	Tonnage	164,105	147,678	135,100	146,687	144,573
	Value in USD	242,222,694	241,038,520	226,542,263	252,179,619	233,874,270



	2015	2016	2017	2018	2019
Freshwater production	141,698	123,513	111,814	122,467	120,873
Marine production	22,407	24,165	23,286	24,220	23,700
Freshwater value	204,763,338	194,747,204	183,359,402	207,102,081	187,020,471
Marine value	37,459,356	46,291,317	43,182,861	45,077,539	46,853,799

Figure 1. Trends in Kenya's fish production and value. Note: Freshwater production includes aquaculture production and value in this chart

Overview of Industrial Fisheries

Industrial fishing in Kenya is dominated by Distant Waters Fishing Nations (DWFN) vessels. These include tuna purse seiners and longliners licensed to fish in Kenya's EEZ. About 3 - 4 shallow water trawlers, 30 - 40 purse seiners and 4 - 9 longliners are licensed to fish in Kenya's EEZ annually. The DWFN vessel catches are often underreported and fluctuate significantly between months, with the highest catches each year occurring between January to March when fishing for deeper water stocks takes place. Their catches are estimated to range between 1,200 and 3,400 tonnes/month, with an average catch of 2,000 mt per month. Majority of the licensed vessels are from Spain (37%) and France/Mayotte (32%), while the rest are from Korea, Oman, Mauritius, Seychelles and Taiwan. These vessels' main target species are the tuna and large pelagics. Tuna catches are higher during the South East Monsoon (SEM) months from April to July, while effort is lowest in August, September and October.

Kenya has recently encouraged flagging of a local fleet as part of a fleet development programme. Currently, there are 13 local commercial and semi-commercial fishing vessels belonging to 9 companies, where 6 are prawn trawlers, 4 are finfish fishing vessels and 3 are longliners [15]. These companies mostly are also processors and exporters. This suggests preference of an integrated value chain

business model. Catches from Kenyan commercial vessels for the last three years are shown below (Table 2). Finfish forms the highest proportion of catch from commercial vessels. These vessels caught 1,094 tonnes/yr on average in the last three years (2017-2019).

Table 2. Marine production from Kenya's commercial vessels

Year	No. of Voyages	Prawns (tonnes)	Fin fish (tonnes)	Octopus (tonnes)	Squids (tonnes)	Cuttlefish (tonnes)	Lobsters (tonnes)	Crabs (tonnes)
2017	25	87.42	470.56	0.04	3.81	7.25	18.90	36.70
2018	26	140.83	477.46	0.00	4.16	5.56	4.21	1.37
2019	90	176.92	1,771.33	0.03	7.74	2.09	6.15	58.53
Mean	5	135.05	906.45	0.03	5.23	4.97	9.76	32.20

Status of fish stocks

The catches of small-scale nearshore demersal finfish fisheries show a general increase over the last four decades, but with a lot of fluctuations. However, catches remained fairly constant since 2007, averaging at about 4,100/yr. tonnes[6]. A structured sample-based monitoring approach in 2014 and 2015 in 22 representative landing sites resulted in a total production estimate of 13,302 and 10,135 tonnes/yr. in 2014 and 2015 respectively. The Catch Per Unit Effort (CPUE) has however been on the decline (<5Kg/fisher/day) for major gears; small gill nets, basket traps, hand lines, spearguns and beach seines. Therefore, although total production seems to have been increasing, CPUE has been declining, given also that fishers have been increasing.

Growth overfishing is likely occurring in the nearshore fisheries given that juvenile fish constitute up to 60 percent of the catches. This presents a wicked problem where fishers due to the current declines, reduce mesh and hook sizes further to improve gear efficiency, and thereby exacerbating the problem of overfishing. Kawaka et al., (2015) recommends gillnets of mesh sizes of 4 -7 inches to optimize capture of higher trophic level species and reduce juvenile retention[13]. Nearshore overfishing has also presented other ecological problems such as changes in the species composition of catches from dominance of top predators such as groupers

[13] Kawaka J, Samoilys M, Osuka K. 2015. Evaluation of Kenya's coastal gillnet fishery for management recommendations. CORDIO Technical Report

and snappers to lower trophic level species. However, some species such as *Siganus sutor* have shown a resistance to overfishing due to its life history characteristics.

The stocks of crustaceans have also been variable. Stock assessments of prawns in 2011 indicated that the Maximum Sustainable Yield (MSY) for in the Malindi-Ungwana Bay to be between 392 – 446 tonnes/yr[14]. The annual total prawn production peaked at an all-time high of 1,300 tonnes between 1998 and 2001 but has since been experiencing sustained general decline to less than 400 tonnes. Notably, prawn trawling was closed from 2006-2010, in order to develop a management plan, triggered by concerns of conflict and high bycatch (up to 80%). Discards accounted for up to 107 fish species (63%) of the 170 species retained from the catch[6]. After gazettement of the Prawn Fishery Management Plan (PFMP, 2010) in 2011, which contained stringent measures, several trawlers did not return. Since then, much of the production has been sustained by the 900 artisanal fishers targeting prawns, and therefore an opportunity for them.

Lobsters are caught along the entire coastline by an estimated 690 fishers, with majority (511) of them in Lamu[6]. The annual total lobster landings from 1990 to 2013 were below 200 tonnes/yr. but spiked to between 250 and 408 tonnes/yr between 2014 and 2017. This is credited to opening of a marketing opportunity for live lobsters. Legal restrictions of minimum legal size of 250g (equivalent to 65 mm carapace length) seem to have been effective by increasing the size of landed lobsters *(P. ornatus, P. longipes and P. penicillatus)*. Stock assessment indicates that the lobster fishery is not yet overfished, and estimates fishing mortality of 0.62 with a maximum sustainable yield at F_{MSY} of 0.72.

Crab fishing is also undertaken along the entire Kenyan coast by at least 2,000 fishers using simple methods such as hand gathering, sticks and scoop nets. Production shows an increasing trend from 90 tonnes in 1990 to more than 250 tonnes in 2013 and can be explained by the increased local consumption driven by tourism. Lamu County contributes the highest production. While the stock shows stability, individual crab weight has declined from an average of 0.5-1.5 kg, 20-30 years ago to the current weight of 0.25 - 0.9 kg[6].

Pelagic fisheries constitute small, medium and large pelagic species, whose catches range between 977 and 2,096 tonnes/yr[6]. Of this, small and medium species account for about 85 percent of the total pelagic landings, and mostly caught by the ringnets (small-scale purse seiners), that contribute about 12 percent of marine landings. Besides ringnets, that target medium pelagics such as coastal tunas, there are also other gears such as handlines, trolling lines and longlines that are used by

[14] Fulanda B, Ohtomi J, Mueni E, Kimani E (2011) Fishery trends, resource–use and management system in the Ungwana Bay fishery Kenya*. Ocean and Coastal Management 54: 401-414*

the estimated 600 small-scale fishers, and land about 277 – 400 tonnes of coastal tunas annually. The estimated potential of small pelagic stock is approximately 20,200 tonnes. Based on the CPUE of between 9.4 and 15.4 kg fisher/day, the annual production from ringnets is extrapolated to about 1,082 tonnes/yr, which is far below the estimated potential of small pelagic stock.

Large pelagics are among the most valuable fisheries in the Western Indian Ocean region. Tuna production in the region accounts for 20 percent of the global production, worth US$ 2-3 billion annually. The key species caught include skipjack, yellowfin, bigeye and albacore that accounted for 992,000 tonnes in 2016, with an average of 950,700 Mt for the five years between 2012 and 2016[6]. The potential for offshore catches from Kenya's Exclusive Economic Zone (EEZ) has been estimated at between 150,000 and 300,000 tonnes. Tuna catches in the WIO are dominated by three species: Skipjack *(Katsuwomis pelamis),* about 38 percent of catches, yellowfin *(Thunnus albacares)* 26 percent and Kawakawa *(Euthynnus affinis)* 10 percent. In the Indian Ocean, the Southern bluefin and yellowfin stocks are overfished and undergoing overfishing, while skipjack, albacore and bigeye tuna are still stable. Other species with uncertain status are the neritic tunas such as Kawakawa *(E. affinis)* and frigate tuna *(Auxis thazard).*

The sea cucumber (beche-de-mer) fishery in Kenya includes the 17 species harvested mainly by artisanal fishers within intertidal and sub-tidal zones. Fishing is mainly as target species or bycatch from other forms of fishing and gleaning. Fishing methods are mainly skin diving, snorkelling and hand collection. Introduction of SCUBA diving as a method of collection drastically increased efficiency leading to decline in catches to a level of concern, particularly for the high-value species; *Holothuria scabra* and *Holothuria fuscogilva*[6]. The annual production trend has been decreasing and shows an average of 43 tonnes/yr. for the last two decades, but with a remarkable decline to only 6 tonnes in 2016. Sea cucumbers are mainly exported to Hong Kong and China, which are the main markets accounting for 98 percent of export volumes from Kenya.

Cephalopods (cuttlefish, octopus and squid) form an important non-conventional fishery in Kenya. Main gears used include; spearguns, harpoons, hooked sticks, pointed sticks and hand gathering within reefs and shallow inshore waters. The annual production of octopus in Kenya based on extrapolation from catch assessment, is about 2,000 tonnes, although previous actual catches averaged at about 400 tonnes of octopus and 70 - 190 tonnes of squid[6]. The octopus production trend shows a gradual increase from 14 tonnes in 1982 to peak values of 460 tonnes and 493 tonnes in 1995 and 1997 respectively. The high peaks in landings are speculated to be from cross-border trading from Tanzania at Shimoni and Vanga entry points, where substantial amounts are exported to Kenya. The main market destination for Kenya's cephalopods are Italy (79%), Greece (11%), Spain (3%).

The status of octopus stocks in Kenya remains unknown, but are under intense fishing pressure and resulting to only smaller sizes being caught.

Ornamental fisheries and products contribute significantly to aquarium trade exports from Kenya. These include fish, corals, sea anemones, crustaceans, echinoderms and polychaetes, mostly captured from coral reefs. Fishing is done by the 145 licensed fishers and an unknown number of unlicensed freelance fishers through snorkeling, SCUBA diving or the recently introduced "hookah diving" using compressed air piped from a boat. This is an increase by about 45 percent compared to the year 2000, and thus increasing fishing effort substantially. Only a few areas suitable for ornamental fisheries, with over 70 percent of the catches emanating from only eight fishing grounds. Diversity of target finfish species has increased from about 48 in the 1980s to over 260 in 2015[6]. The number of live fish exported annually has also increased from an average of 150,000 in the 1990s to around 297,367 individuals in 2019, as well as 133,844 pieces of invertebrates[15]. Incomes amongst ornamental fishers are higher compared to other fishing activities, where they earn USD 90-400/month, with an average of USD 165/month. The lucrative nature of the fishery has seen the number of pieces caught and exported, decline since 2009. However, the fishery has steep entry barriers due to its specialization skills and high required capital, thus perhaps containing the number of fishers involved.

Kenya has a vibrant recreational fishery sector, where marlin, sailfish, swordfish, tuna, kingfish, wahoo, and giant trevally among others are targeted. The presence of six types of billfish species (blue marlin, black marlin, swordfish, striped marlin, sailfish, and the short-billed spearfish) makes Kenya a major billfish fishing destination. Recent campaigns by the African Billfish Foundation (ABF) have seen release and tagging of up to 95 percent of billfish caught by anglers, as a way to conserve billfishes[6]. Some of the tags used are electronic and help in transmitting real-time data about the released fish. In the 1990s, there were about 60 sports fishing vessels, compared to today's 100 vessels. Between 1990 and 2008, sport fishing vessels reported a total of 22,000 trips. During this period, the annual number of fishing trips per vessel ranged between 90 and 220, today the number of trips undertaken by the greatly declined to 60 -120 days. Main reasons for the decreases are due to decline in the abundance of main sport fishing species such as sailfish and tuna, declining tourism and emerging of other destinations.

As discussed above, the status of many fisheries stocks varies from optimally exploited to overfished for some species and localities. Fisheries that show definite signs of decline include sharks, the semi-industrial prawn trawl fishery and sea cucumber fishery[6]. Kenya's marine sample-based catch assessment across all fisheries has been used to support quantitative stock assessments on selected indicator species. The status of some of the indicator species is shown below (Table 3).

Given the declining trends of nearshore fisheries, urgent implementation of a number of measures is needed including; improve Monitoring, Control and Surveillance (MCS) to improve enforcement and eliminate use of restricted gears (beach seines, spearguns and monofilament gillnets); complete the process of development of management plans for key fisheries and implement them, enhance voluntary compliance of regulations by communities through awareness campaigns and exchange programs; introduce environment friendly fishing technology and gear modifications, upscale and monitor their use; promote community-controlled temporary and seasonal gear closures as well as Community Conserved Areas.

Table 3. Status of selected indicator species in Kenya's marine fisheries

Fishery	Indicator species	Status
Small scale reef finfish fisheries	Siganus sutor, Leptoscarus vaigiensis and Lethrinus lentjan	Overfished and declining.
Tuna and large pelagic species	Katsuwonis pelamis, Thunnus albacares, Euthynnus affinis, Thunnus obesus, Xiphias gladius and Tetrapturus audix	*K.pelamis* over overfished and the rest are within MSY
Shallow water prawns indicator	Penaeus indicus, P. monodon, P. semisulcatus, Metapenaeus Monoceros	Uncertain
Shallow water lobster	Panulirus ornatus, P. longipes, P. versicolor, P. Homarus, P. penicillatus	Optimally exploited
Small and medium pelagics	Rastrelliger kanagurta, Sphyraena flavicauda, S. jello, S. obtusata and Hemiramphus far	Overfishing
Mud crab	Scylla serrata	Optimally exploited
Marine aquarium	Amphiprion allardi	Marine aquarium
Marine aquarium	Amphiprion allardi, A. akallopisos, Pomacnthus imperator, P. chrysurus, P. maculosus	Overfishing of some species
Sea cucumber	Holothuria scabra, H. nobilis, H. fuscogilva	Overfished
Octopus	Octopus cyanea	Optimally exploited

Source: Kimani EN, Aura MC, Okemwa GM (eds.). 2018.The Status of Kenya Fisheries. KMFRI

FISH QUALITY ASSURANCE, PROCESSING AND MARKETING

Quality Assurance

Majority of the fish catch in Kenya is consumed fresh, while the rest is frozen, sundried or smoked. Therefore, elaborate supply chain interventions such as dedicated fish transport is limited. The scale of fish quality accompanying measures such as ice supply and freezing during distribution and marketing is still very low. Only 16 percent of landing sites in marine fisheries readily have access to ice supply, some of it from private suppliers, especially seafood exporting companies that facilitate the value chain. According to the frame survey of 2016, there were only nine cold rooms with seven in operation along the entire coastline of 640km[12].

There were only 14 percent of landing sites with permanent structures used for fresh fish handling immediately after landing of the fish. This suggests implications for fish handling and hygiene standards. Amount of fish lost due to post-harvest losses (PHL) is difficult to estimate since no official data exists, but it is not considerable given that most fish is consumed fresh. However, the pertinent issue is the loss of quality and value rather than total food loss. Although post-harvest losses can be considered low, fish handling and hygiene practices are still very low amongst actors, particularly fishers. Training in fish QA and implementation of QA standards are therefore required across the country.

Fish Inspection and Quality Assurance (FIQA) functions in Kenya are under the Kenya Fisheries Service, with regional presence at major water bodies. For marine fisheries, the Mombasa National Fisheries Office is responsible for the coordination of activities relating to Fish Inspection and Quality Assurance (FIQA) in the region that includes the six coastal counties; Kwale, Mombasa, Kilifi, Tana River, Lamu and Taita Taveta. FIQA functions are performed by 14 beach inspectors and 9 fish inspectors for the entire coastal region[15]. Therefore, it appears that the staff are thinly spread over large spatial coverage. The beach inspectors are responsible for upstream controls whereas the fish inspectors are responsible for downstream controls. Inspection of fish factories is conducted on a monthly basis, while offshore vessels are inspected on arrival. Beach inspections of fish landing, handling and processing facilities at the landing sites, including artisanal vessels is undertaken every two months.

[15] Kenyan Fisheries Service. 2019. Annual Fish Inspection and Quality Assurance report, Coast region

The overall objective of FIQA functions is to promote quality assurance, value addition and marketing of fish and fishery products. Specific objectives are to; ensure safety and health of fish and fishery products to safeguard consumers health; create consumer confidence in fish and fishery products; improve sanitary conditions at fish-landing sites, markets, fish processing plants and vessels; reduce post-harvest losses; ensure fair and responsible trade in fish and fishery products; guarantee a high reputation of fish as food and promote the entire fish industry; expand national, regional and international marketing opportunities and foreign exchange earnings through value addition and stabilization of fish and fishery products.

Laboratory testing is undertaken by external laboratories and available for use by the fish processors for microbiological and physico-chemical analyses in products, water and swabs. Three companies that conduct the external laboratories services are licensed and two are duly accredited by South African National Accreditation System (SANAS). Kenya Fisheries Service also has new labs in Nairobi, Mombasa and Kisumu, but they are yet to be fully operational.

Fish preservation and processing

There are three scales of fish processing in Kenya; artisanal, small-scale and industrial. Fisheries processing in Kenya at the artisanal level which mainly involves food fish cannot be disentangled from preservation since it is mostly a means of preservation to reduce spoilage upon landing. The several handling and preservation practices employed by traders and processors at this level include; deep-frying (27%), icing (24%), freezing (20%), gutting (4%), drying (4%), smoking (3%), seawater (2%), salting (2%) and others (2%) while the rest (12%) is not treated at all. Fish processing amongst artisanal operators mainly involves women (97%)[16]. Filleting and packaging at this level is very minimal.

Handling of fresh fish for the domestic market is mainly through preservation in ice in traditional baskets or insulated boxes during transportation. There are very few dedicated transportation vehicles with insulation, hence most is transported through public transport which does not meet quality standards. Similarly, sun drying is done unhygienically on the ground with very few drying racks in place. KMFRI has however promoted several innovations such as drying and smoking kilns to improve preservation and processing.

[16] Kimani, P., Wamukota, A., Otieno, J., Mwatete, C., (2020). Factors influencing financial performance in marine small-scale fisheries in Kenya. *(In press in Journal of Marine Policy)*

In small-scale fish processing and export, it involves considerable business organization including relatively higher level of processing, type of product dealt with and elaborate linkages to markets, particularly international markets. The small-scale processors and exporters are few (10) and largely deal with non-edible fishery products exported to the Far East. They deal with a variety of products such as dried fish maws, dried sea cucumbers, dried shark fins and marine shells.

There is also seaweed farming and processing in Southern Kenya in Kibuyuni, Gazi, Nyumba Sita and Mkwiro villages, started under an EU funded project (IOC-ReCoMaP) and later taken up by the government through KMFRI. Although it was started in 2009, production has remained low (50-100 tonnes) annually. Low-scale processing to make soap and lotions occurs at Kibuyuni village. In general, value addition across the whole fishery is below par and needs to be improved by triggering improvement of quality, processing, packaging, labelling, branding and certification of fish products, which are still very low. This would improve the fortunes of actors, especially the fishers, artisanal and small-scale processors.

Industrial fish processing is still at a low scale. There about six industrial processors and exporters dealing with marine fisheries (Table 4). Previously a tuna processing and canning factory (Wananchi Marine Product Ltd.) with installed processing capacity of 105 tonnes/day was operating as the largest fish processor in the coast, until it closed down about five years ago. This was largely blamed on lack of tuna supplies for processing, since most offshore vessels lacked bunkering services in Mombasa. The factory has since been taken over the government under a newly created government corporation; Kenya Fishing Industries Corporation (KFIC).

Table 4.Marine industrial fish processors and exporters in operation in 2019

At the S/No. Establishment	Main Products
1. Sea Harvest (K) Ltd	Frozen octopus and marine fin fish
2. Transafrica Fisheries Ltd	Frozen octopus and marine fin fish
3. Crustacean Processors	Frozen octopus
4. Diamond Seafood (K) Ltd	Frozen octopus and marine fin fish
5. Brinkley Ltd Frozen	Octopus and marine fin fish
3 Huawen Food (K) EPZ Ltd	Cooked dried frozen anchovies

Source: Fish Inspection and Quality Assurance annual report for 2019

5.3. Kenya's fisheries exports, imports and marketing

There are about 20 exporters of live crustaceans, notably mud crabs, deep sea crabs and lobsters. There are also 14 approved exporters of marine aquarium fishery products (finfish and invertebrates). Kenya's top fisheries exports by volume in the last two years (2018-2019) are the mixed fish categories accounting for about 55 percent, while molluscs (squid and octopus) were second highest exports and accounted for 16 percent of exports (Table 5). Other top exports include the Nile perch, crustaceans, live fish, processed products and ornamental fish. Exports by value closely mirror the same positioning, except for the processed fish products which have a higher value. Some fish exports are actually re-exports to the region, for example herrings and salmon re-exported to Rwanda, but in small quantities.

Table 5. Kenya's fish and fishery products exports, quantity and value (2018-2019)

	2018		2019	
Species	Quantity (tonnes)	Value (USD)	Quantity (tonnes)	Value (USD)
Other fish	4,268.56	14,330,251	4,867.96	11,698,735
Molluscs	1,186.66	6,283,343	1,398.92	5,641,802
Nile perch	696.22	318,096	866.88	3,374,357
Crustaceans	534.56	2,780,869	532.55	2,914,903
Live, fresh or chilled	287.11	359,404	332.29	467,906
Fish products	219.99	5,218,065	344.68	8,065,342
Live ornamental	46.23	26,125	109.96	61,876
Trout	5.30	6,568	1.28	1,318
Salmon	2.09	5,957	-	-
Tilapia	1.60	13,598	55.75	14,921
Tuna	1.10	5,368	13.63	44,645
Swordfish	0.23	3,977	213.93	1,166,186
Sardines	0.18	729	0.18	414
Herrings	0.17	298	-	-
Salmon	0.16	4,576	-	-

Mackerel	0.06	207	0.37	936
Anchovies	0.00	3	-	-
Sea cucumbers	-	-	0.18	7,306
Sharks	-	-	80.88	160,063
Total	7,250	29,357,435	8,819	33,620,707

Source: Fisheries annual export and import statistics. Kenya Fisheries Service

Kenya exports or re-exports its products to about 89 countries. The main markets include; the EU (particularly Italy, Spain, Portugal, Netherlands, France, Malta and Greece), South Africa, China, Taiwan, Korea and Japan. The non-edible products are mainly destined to the Far East particularly (China, India and the Philippines), as well as Croatia, Chad and Sudan. Out of the 89 countries that Kenya exports to, only 20 are African. The top African destination markets include; Uganda, DRC, Namibia, Rwanda and Tanzania. The top exports to the region include Nile perch and mackerels. Exports to Uganda, in the last two years averaged 782 tonnes, value at USD 1.8 m. The main reasons for exporting Nile perch is for processing there. Nile perch fish traders have previously cited un-competitive markets in Kenya as the main reasons for fish exports to Uganda. This has also been as a result of closure or collapse of many fish processing factories, leaving only two operators around the Lake region and one in Nairobi[17].

Kenya also imports a considerable amount of fish and fish products to fill in shortfalls in production and for other purposes (Table 6). By 2019, there were 13 licensed fish importers. In the last two years, the five top fish products imported by volume include; mixed fish categories, mackerels, sardines, tilapia and tuna (mainly skipjack tuna). The value is also reflective of the volumes. In 2019, tilapia imports topped as the third largest import by volume (3,015.68 tonnes) and value (USD 4,344,350), all coming China. While some products are not substitutable, most imports can be replaced by enhancing national production, for example farming of tilapia to cover for shortfalls.

[17] Responsible Fisheries Business Chain (RFBC) Project of GIZ. 2019. Report on the Nile perch value-chain analysis for the local and regional trade in East Africa

Table 6. Kenya's fish and fishery products imports, quantity and value (2018-2019)

	2018		2019	
Species	Quantity (tonnes)	Value (USD)	Species	Quantity (tonnes)
Other Fish	16,427.50	16,841,138	10,851.20	12,505,261
Mackerel	8,763.39	9,731,359	7,608.66	8,386,703
Sardines	409.46	229,590	335.31	217,641
Tilapia	404.61	1,306,034	3,015.68	4,344,350
Tuna	196.17	506,971	743.54	1,261,418
Salmon	78.95	93,818	156.09	296,053
Crustaceans	73.77	529,824	62.33	405,041
Molluscs	8.17	49,059	10.94	51,057
Fish products	7.59	9,669	4.92	21,397
Live ornamental	3.43	12,011	6.04	23,607
Live, fresh or chilled	3.04	13,103	2.33	16,427
Trout	2.90	9,892	3.05	41,073
Anchovies	2.89	13,128	3.23	17,146
Salmon	1.07	8,202	-	-
Herrings	0.09	663	0.89	3,678
Hake	-	-	0.21	1,514
Halibut	-	-	0.45	1,060
Nile Perch	-	-	9.71	31,449
Sea cucumbers	-	-	0.15	442
Swordfish	-	-	0.03	237
Mackerel	-	-	0.04	47
Toothfish	-	-	0.11	125
Grand Total	26,383	29,354,459	22,815	27,625,729

Source: Fisheries annual export and import statistics. Kenya Fisheries Service

Exports and import statistics for the last three years (2017-2019) indicate a general increasing trend in volumes. Import volumes stood at 22,815 tonnes in 2019, which was a slight decline by 14 percent compared to 2018 (Figure 2). However, exports showed an increasing trend, although overall the imports were higher by volume and hence narrowing the deficit in 2019 to 13,995 tonnes from 19,133 in 2018. Imports by value stood at USD 27,625,729 in 2019, which was a slight decline by 6 percent compared to 2018 (Figure 3). However, exports showed an increasing trend consistently from 2017 by 51 percent to reach USD 33,620,707 in 2019. Therefore, import-export account was in Kenya's favour in terms of value. This suggests that Kenya imports cheaper fish and fish products and exports higher valued fish and fish products. Enhanced production can improve this account further and substantially save the country foreign exchange from imports of fish that can be produced locally.

Apart from the elaborate export and imports businesses, local small-scale fish trade is also conducted under a free-market economy where fish prices are dictated by supply and demand forces to some extent. However, the situation is complicated by fish distribution channels, which involve a series of middlemen in between[16]. Although presence of middlemen negatively affects fishers' net return and consumer prices, they also facilitate fishing through provision of equipment and operational support. This practice leaves fishers with little role in the value chain and allows dominance and control of marketing by middlemen. Once fish has gone through the distribution chain, it arrives at final markets, where it is mostly sold in about 300 licensed fish shops along the whole coastline.

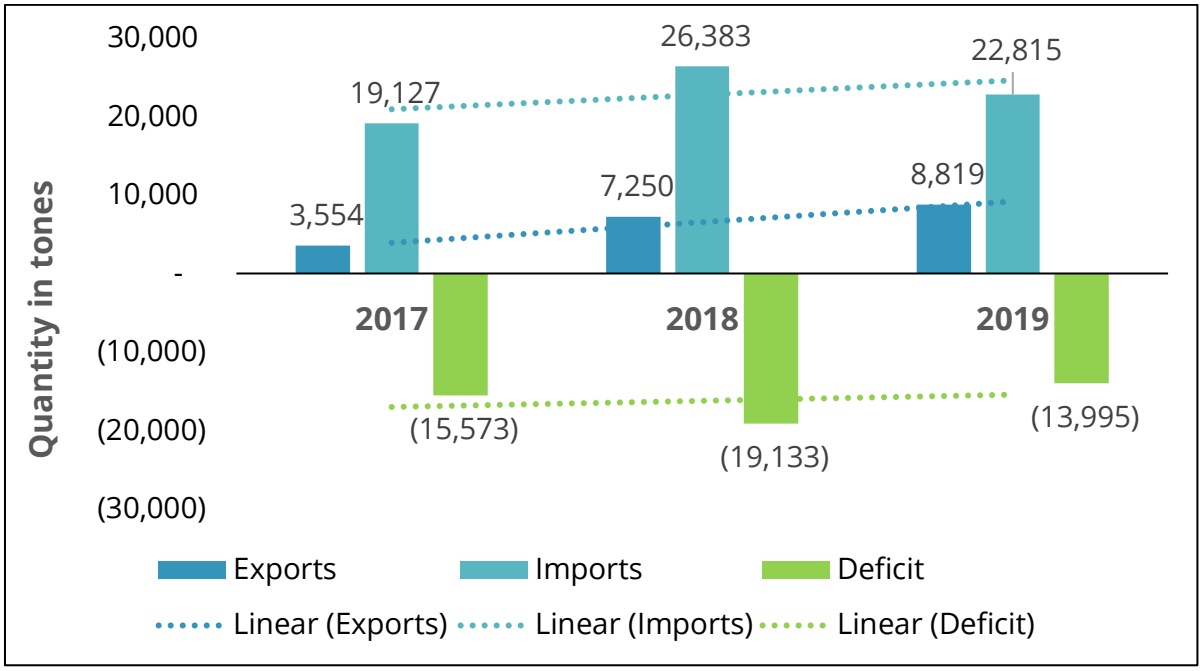


Figure 2. Kenya's quantity of exports, imports and deficit in tonnes.

Source: Fisheries annual export and import statistics. Kenya Fisheries Servic

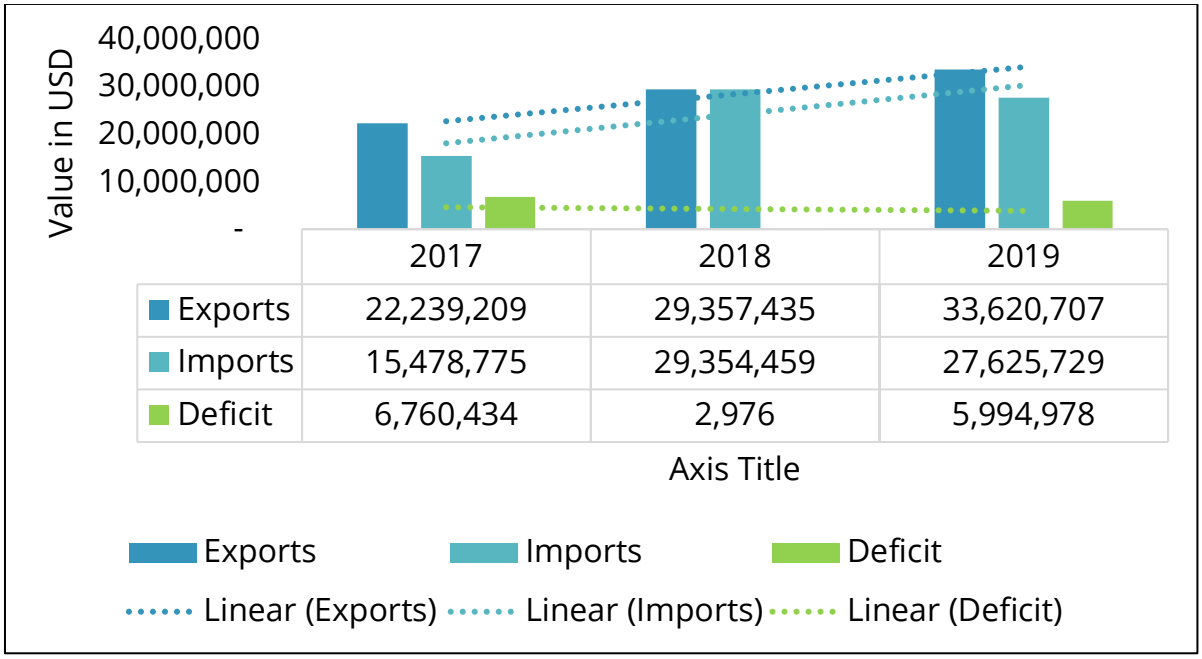


Figure 3. Kenya's value of exports, imports and deficit in USD.

Source: Fisheries annual export and import statistics. Kenya Fisheries Service

FISHERIES GOVERNANCE

Fisheries institutional, research and administration arrangements

The Constitution of Kenya (2010) sets out a devolved administration arrangement. In this regard fisheries management is vested at different levels; (a) National Government, (b) County government and (c) community level. At the national level, the State Department of Fisheries, Aquaculture and the Blue Economy domiciled in the Ministry of Agriculture, Livestock and Fisheries, is charged with setting the policy direction of fisheries. The Ministry is the Competent Authority for fish and fishery products, negotiations and ratification of international agreements on trade and fisheries conservation and management. The Department hosts several institutions at the national level directly charged with fisheries management functions created under the new fisheries Act of 2016[18].Kenya Fisheries Service is primarily charged with conservation, management and development of Kenya's fisheries resources. It

18 Kenya Fisheries Management and Development Act No. 35. of 2016

is flanked by directorates (capture fisheries, aquaculture, statistics, conservation and training) and has training institutes such as the Sagana aquaculture training centre. The Kenya Wildlife Service is in charge of Marine Protected Areas which are total no-take zones and the marine reserves where there is fishing under gear restriction and prohibition of certain methods.

Responsibility for research in fisheries is primarily undertaken by Kenya Marine and Fisheries Research Institute (KMFRI). KMFRI is a State Corporation established in 1979 by the Science and Technology Act, Cap 250 of the Laws of Kenya, and later repealed and replaced by the Science, Technology and Innovation Act No. 28 of 2013, which recognizes KMFRI as a national research institution under section 56, fourth schedule. The fisheries Act in section 9 (g) mandates Kenya Fisheries Service to consult with KMFRI, to approve and co-ordinate research activities relating to fisheries. The Institute has several research centres and stations under both freshwater and marine fisheries. Freshwater fisheries research stations include; Kisumu, Kegati, Sagana, Naivasha, Sangoro, Baringo and Turkana. Marine fisheries stations include;Mombasa and Gazi. The Institute is also constructing the Marine Hatchery and Laboratories at Shimoni, to be known as the National Mariculture Resource and Training Centre (NAMARET), where training of mariculture techniques, technology development, pilot production and activities will be conducted.

There are also a host of University conducting marine fisheries and resources related research including; Pwani University, University of Nairobi, Kenyatta University, Technical University of Mombasa and South Eastern Kenya University. Several NGOs are also involved in marine research including; CORDIO.EA, COMRED and WCS just to mention a few.

Kenya also participates in international fisheries and resource management arrangements. It is a member of the Nairobi Convention for the Western Indian Ocean which is a Coastal Seas Programme of UNEP based in Nairobi. It was created to protect the marine resources of the Western Indian Ocean region. Nairobi Convention is running several regional projects including; Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities (WIO-SAP) and The Western Indian Ocean Large Marine Ecosystems Strategic Action Programme Policy Harmonization and Institutional Reforms (WIO LME SAPPHIRE).

Kenya is also a member of the Committee on Fisheries (COFI), and thus a signatory to the Code of Conduct for Responsible Fisheries (CCRF). Kenya is a participating member in several Regional Fishery Bodies (RFBs) including; Committee on Inland Fisheries and Aquaculture of Africa (CIFAA), Indian Ocean Tuna Commission (IOTC), International Whaling Commission (IWC), Lake Victoria Fisheries Organization (LVFO) and Southwest Indian Ocean Fisheries Commission (SWIOFC), South West

Indian Ocean Fisheries Agreement (SIOFA), and Committee of Fisheries and Aquaculture of Africa (CAMFA) amongst others.

Fisheries policy

Kenya's fisheries management has since 2008 been guided by the National Oceans and Fisheries Policy (2008) (Revised 2018). The review of the policy was guided by the provisions of Code of Conduct for Responsible Fishing (CCRF), Lake Victoria Fisheries Organization (LVFO) Council of Ministers directives, the Constitution and other national, regional and international instruments. The revised policy takes into cognizance the Constitution and the two levels of governance, the Fisheries Management Development Act 2016 and the key institutions created. It highlights the different stakeholders in fisheries and aquaculture, regional and international treaties, protocols and agreements that the policy seeks to domesticate. The document also reviews fisheries resources in the inland water fisheries, coastal and marine fisheries and aquaculture.

The policy seeks to address myriad challenges facing fisheries, which it states as; unsustainable utilization of fisheries resource; weak fisheries governance; inadequate capacity to manage and utilize fishery resources in the ocean; marketing of fish and fishery products; low investment in fisheries and aquaculture infrastructure; insufficient capacity and skills in fisheries and aquaculture; weak linkages between research and management; inadequate security and safety; gender and equity; protection of fishers rights; insurance and financial resources; climate change and environmental issues; conflicts; and cross cutting social issues like HIV/AIDS and drug abuse.

The vision of Fisheries Policy is thus stated as; "An innovative, sustainable and commercially oriented fisheries and aquaculture". The mission is; "To facilitate sustainable transformation of fisheries and aquaculture to a viable commercial enterprise for accelerated socio-economic development". The goal is to; "To contribute to wellbeing of the people and national economic growth through sustainable management and development of fisheries and aquaculture".

The policy pays attention to 14 key principles: good governance (inclusivity, accountability and transparency); Ecosystems Approach to Fisheries management (EAF); pro-poor; the precautionary principle; basing policy decisions on best available scientific knowledge; Public Private Partnership (PPP); sustainability and environmental integrity; principle of subsidiarity; equity; polluter pay principle; consultation, cooperation and collaboration; participation of fisheries resource users; co-management; and demand driven research.

The policy focuses on key result areas linked to the 13 policy statements, namely: fisheries conservation and management; Monitoring, Control and Surveillance; sustainable aquaculture; research and development; fish quality assurance,

utilization and trade; national, international and regional cooperation; legislation and government structure; infrastructure development, investment and finance; human resource; climate change; information, data and communication; and cross cutting issues.

Fisheries Legal Framework, Enforcement and Compliance

Kenya's fisheries management is anchored in several statutes and at different levels. Article 69 of The Constitution of Kenya (2010) obligates the State to ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, encourages public participation, and promote equitable benefit-sharing. Article 10 and chapter five emphasize on sustainable development of the marine environment and care of land and the environment. The Fourth Schedule, Parts 1 and 2 of provides for devolution including the sharing of power and resources between national and county governments. In this regard, the national government is bestowed with powers to formulate policy and regulations as well as some implementation powers in the management and conservation of water resources including fisheries. The county governments are responsible for the implementation of specific national government policies.

The principal fisheries management and development law is the Fisheries Management and Development Act (FMDA) No. 35 of 2016. It was promulgated in 2016 after repeal of the previous law Fisheries Act Cap (378) of 1989, which was earlier amended in 1991, 2007 and 2012. Principles that guide fishery management include; precautionary principle, adaptive management, and the ecosystem approach to fisheries (EAF), area-based management, co-management, integrated coastal zone management (ICZM) and eco-certification. Other laws applicable in fisheries management include; the Kenya Coast Guard Service Act no.11of 2018, Maritimes Zones Act (CAP 371) of 1989; the Water Act 016, Wildlife Conservation and Management Act 2013; Climate Change Act no.1 of 2016; the Environment Management and Coordination Act 1999; Merchants Shipping Act; 2009 (Revised 2012); The Land Act 2012; Land Registration Act, 2012; the Intergovernmental Relations Act, 2012 and Transition to Devolved Government Act, 2012.

Kenya's 2010 constitution (Government of Kenya, 2010), provides for every treaty entered by the country, to be part of its laws. Thus, international treaties, conventions and agreements signed and assented to are deemed to be part of Kenyan fisheries management laws. The key international instruments include; United Nations Convention on the Law of the Sea (UNCLOS) of 1982, FAO Compliance Agreement of 1993 to Promote Compliance with International

Conservation and Management Measures by Fishing Vessels on the High Seas, United Nations Fish Stock Agreements (UNFSA) of 1995, Code of Conduct for Responsible Fisheries (CCRF) of 1995, International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) of 1999 and Port State Measures Agreement (PSMA) of 2009 and Convention on Biological Diversity and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The principal Act FMDA (2016) is extensive and quite comprehensive compared to the repealed Act Cap 378 of 1989 and consist of 20 parts and 211 sections. The key parts include provisions for; fisheries conservation, management and development; import, export and trade and marketing of fish and fish products; fish quality and safety; aquaculture; information, data and records; licensing and registration; compliance with the Act, licenses, authorizations and requirements for fishing vessels; requirements for foreign fishing vessels or vessels fishing under charter arrangements; monitoring, control and surveillance; jurisdiction, prosecution, forfeiture, liabilities and other actions. Under the part on fisheries conservation, management and development, the Act pays considerable attention to; fisheries development measures, implementation of international conservation and management measures, establishment of Beach Management Units, development of fisheries management measures and plans for fisheries resources (closed seasons and or areas for species; prohibited fishing areas; limitations on the types of gear; limitations on the types and/or number of fishing vessels; limitations on the types and/or number of fishing vessels of fish; regulate the landing of fish; regulate trade in endangered species; prohibit the possession, trade in or manufacture of prohibited gear).

FMDA (2016) is complemented by Beach Management Regulations of 2007 (under review, 2020 to conform to the Act) and the Fish, Fishery Products and Fish Feed Safety and Quality Regulations of 2007 (under review, 2020). The former guides in engagement of communities in fisheries management at the landing site level, while the latter regulates standards to maintain and promote quality of fish and fisheries products. The country is also preparing fisheries management and development (marine and inland fisheries) regulations (2019).

In terms of enforcement of and compliance against Illegal, Unreported and Unregulated (IUU) fishing, Kenya now has an enhanced Monitoring, Control and Surveillance (MCS) mechanism for fisheries under the Kenya Coast Guard Service Act (2018). The concept of establishing KCGS was to pool resources held within various Government agencies which have statutory responsibility over Kenya's maritime domain. This domain has both state and non-State actors involved in various activities including exploration and exploitation of marine living and non-living resources; maritime commercial activities; defence and security; conservation

and management of the marine resources; and enforcement of customs, fiscal, immigration, shipping, and sanitary laws. Thus, besides pooling of assets, KCGS has enforcement staff seconded from various relevant maritime agencies.

The main mandate of KCGS is enforcement of laws and regulations applicable in Kenya's territorial and inland waters, in particular, those relating to maritime security and safety; fisheries protection, pollution control; sanitation; customs; narcotic drugs; prohibited plants; psychotropic substances; illegal firearms and ammunitions; and protection of maritime resources. KCGS is empowered to arrest and prosecute persons suspected of committing offences in Kenya's territorial and inland waters. In addition, KCGS undertakes emergency response such as maritime search and rescue and response to marine spills. Kenya is also a signatory to FAO Port State Measures Agreement (PSMA) to prevent IUU fishing, and thus enforces international law.

Management Plans & Certification

Fishery management plans are enshrined under Section 5 of FMDA (2016). In the marine waters, only the Prawn Fisheries Management Plan has been gazetted, while the Ringnet Fishery Management Plan, the Small and medium pelagics management plan and the Lobster Fishery Management Plan have been drafted but not approved and gazetted. The few management plans, strategies and certification processes are discussed below:

1. **Prawn Fishery Management Plan[19]:** The high proportion of discards among others, led to the development of the Prawn Fishery Management Plan (PFMP, 2010) and gazetted in 2011. Among its major provisions were revised delineation of fishing zone from beyond 5 nm to 3 nm offshore, a seasonal closure (November to March), a ban on night trawling, and mandatory use of Turtle Excluder Devices (TEDs). The fishing effort was also controlled by restricting the vessel types to a single otter trawl, stern trawl or paired beam-trawl and limiting the number of trawlers to a maximum of four of ≤ 300 Gross Registered Tonnage (GRT) below the 5 nm. Larger trawl vessels were restricted to deeper waters. Observed PFMP benefits after gazettement include conflict reduction from damage of small-scale fishing gear, increased artisanal fish catches, higher retention of bycatch and reduction of discards

[19] Government of Kenya. 2010. The prawn fishery management plan

2. **Small-scale Purse Seine (Ringnet) Fishery Management Plan[20]:** Although the ringnet fishery is seen as one of those gears that can increase benefits from the blue economy substantially, it has faced a lot of opposition previously. In some places local fishers do not accept it, and thus only concentrated in some parts of Kenya's South coast. Some ranks of conservationists also accuse its operators of infringing in Marine Protected Areas (MPAs) and shallow waters where they outcompete or destroy artisanal fishers' gears. This caused agitation among different groups, leading to a stakeholder process of development of a draft ringent management plan in 2015, although yet to be approved. The plan was developed after stakeholder consultative meetings held over a 10-year period (2005 - 2016). Key provisions of the plan among others include; control of fishing effort in terms of specific small scale purse seine fishing license; limiting size of small scale purse seine fishing vessels to a minimum of 12 m; net size limit to a minimum length of 200 m, and a minimum stretched width of 20 m; limit number of nets used during a fishing operation; fishing time limited from 6 a.m. to 6 p.m ; specify Total Allowable Catch (TAC) and develop guidelines for allocating catch quotas including Individual Transferable Quotas (ITQs); introduce a minimum mesh size for small scale purse seine nets as guided by scientific research; introduce capture size limits for key target species based on the best available science; and zoning of critical fish habitats including nearshore coral reef areas, fish spawning and breeding areas was also specified, in the plan with restricted use of the gear to depth limits of 30-50m.Notably the Management Plan applies to harvesting of medium and large pelagic fish, but does not cover small pelagics (mainly sardines).

3. **Tuna Fishery Strategy[21]:** Kenya seeks to build capacity for offshore tuna fishing, currently undertaken by distant water fishing nations. The strategy proposes a number of strategic objectives including; maintain tuna stocks at sustainable levels and minimize negative tuna fishing impacts on the marine ecosystem; transform artisanal tuna fisheries to modern commercially oriented fisheries and attract increased landings from DWFN fleet; enhance effective tuna fisheries governance that takes into account national, regional and international requirements; and reduce the impact of HIV / AIDS pandemic and gender inequalities in the Tuna fisheries industry. Although the strategy has not been evaluated to weigh on progress, nevertheless a lot of strides have been undertaken to help the country come closer to exploiting

[20] Government of Kenya. 2015. The small scale purse seine fishery management plan
[21] Government of Kenya. 2013. Kenya tuna fisheries development and management strategy

tun resources. For example, MCS improvement measures and review of fisheries policy and law have been undertaken in the last four years. However, the strategy is due for review.

4. **Small and medium pelagics management plan[22]:** the management plan is anchored in the Ecosystem Approach to Fisheries (EAF), the Convention on Biological Diversity (CBD) and the Code of Conduct for Fisheries (FAO, 1995). The plan has several operational objectives meant to ensure that; effective rights based management introduced; an economic development strategy for the fishery in place; traditional knowledge is an integral component of management; an adaptation strategy for climate change is in place ; substantive and effective data informed by agreed assessment and management practices; gear used is appropriate and does not result in substantial damage to the ecosystem; there is adequate staff to implement the management plan; effective Monitoring, Control and Surveillance (MCS) is in place; an effective fees and levies structure exists with clear guidelines for the use of available funds; and adequate financial planning exists for the implementation of the management plan. The plan however is still awaiting final approval. It is also difficult to tell what extent the provisions of the plan have been implemented.

5. **Lobster management plan and certification process[23, 24]:** this management plan is complete awaiting approval, and includes a harvest strategy. Key provisions of the plan among others include; introduce a lobster fishing license; prohibit retention and landing of lobsters of Minimum Carapace Length (MCL) of 70 mm CL for *P. ornatus*; 65mm CL for *P. versicolor, P. homarus* and *P. penicilatus*; and 60mm for *P. longipes*; control fishing effort and introduce Total Allowable Catch (TAC)system; regulate the number of lobster fishing licenses; introduce closed-season and/or closed-areas for the lobster fishery based on scientific research recommendations; and develop a traceability system for lobster catches along the supply chain. The plan also prohibits use of SCUBA diving gear including hookah, spear guns and monofilament nets. The plan however is still awaiting final approval. There has also been a process for improvement of the fishery through a

[22] Government of Kenya. 2013. A management plan for fisheries targeting small and medium sized pelagic fish

[23] Government of Kenya. 2016.The Malindi-Ungwana Bay Area co-management plan (2016 – 2021)

[24] Government of Kenya. 2017. The lobster fishery management plan

Fishery Improvement Project towards attaining an Marine Stewardship Council certification (MSC).

6. **Area Based Joint Co-Management Plans[25]:** there has been several area-based co-management plans drafted, although large swathes are still lacking them. The plans provide a framework for addressing the challenges and threats facing the coastal and marine fisheries. They were drafted by BMUs individually and jointly include; The six Lamu Joint Co-Management Area Plans, the Malindi-Ungwana Bay Fishery Joint Co-Management Area Plan (2016 – 2021) and the Shimoni-Vanga Joint Co-Management Area Plan (2016 – 2020). The latter two were endorsed in 2016.

COUNTRY'S COMPETITIVE ADVANTAGES AND INVESTMENT OPPORTUNITIES

Competitive advantage

Kenya has several competitive advantages that make it a powerhouse for economic development:

1. **Gateway to Eastern Africa:** Kenya is considered as a gateway to Eastern Africa region due to its proximity to Indian Ocean waters and also neighbours several landlocked countries; Ethiopia, Uganda and South Sudan. It also has a transportation corridor that links it to other countries that are not neighbours, including; DRC, Rwanda and Burundi. All these forms a market for fish and fisheries products as well as serving as a transportation and shipping route for their own fisheries products.

2. **Relative stable political environment:** Kenya is a multi-party democracy since 1992. This does not only provide space for political checks on the regime in power, but also enhances democratic space to air differentiated viewpoints.

[25] Government of Kenya. 2016.The Shimoni-Vanga Joint Fisheries Co-Management Area Plan, 2016-2021

Following promulgation of Kenya's new constitution in 2010, elections have since 2013 provided for devolved power and resources to 47 counties (local governments) which has helped to reduce detrimental political competition.

3. **Stable economy:** Kenya's economy has been stable for several years now with a marked annual growth rate of 5-6 percent. The macro-economic indicators have also been stable, with a strong monetary policy that has been capped at Central Bank Rate (CBR) of below 10 percent for many years. Inflation has also been tamed for many years, only averaging between 5-8 percent

4. **Well-developed infrastructure:** Kenya leads its peers in terms of infrastructure development. It has the largest shipping port in East Africa with a potential of 20 million Twenty-foot Equivalent Unit (TEUs) but handled 1.425 million TEUs in 2019 representing a 7.3 per cent growth over the previous year. It has also commissioned a newly constructed Standard Gauge Railway (SGR) from Mombasa port to Nairobi -Naivasha and has plans to extend to Malaba (Kenya-Uganda border). The road network is relatively well developed especially for the highways connecting major cities and regions. Other major infrastructure includes international airports in Nairobi, Mombasa, Kisumu, Eldoret and Isiolo. The country is also constricting the Lamu cargo port and the Shimoni fishing port.

5. **Mariculture development potential:** Kenya has access to diverse fresh and marine water resources that include ocean waters, wetlands, rivers and water reservoirs that favours the farming of a wide variety of fish species and other aquatic species. The potential area for fish farming stands at 1.4 million hectares of which only 3.9 percent (about 55,000 hectares) is utilized.

6. **Revamped institutions, policy and legal framework:** The blue economy has been given new impetus through revamping of institutions and creation of new ones in the last five years such as the Fisheries Council, Kenya Fisheries Service, Kenya Fish Marketing Authority and Kenya Fish Levy Trust Fund formed under the Fisheries Management and Development Act of 2016. Others are the Kenya Fishing Industries Corporation formed under Legal Notice 214 of 2018 and the Kenya Coast Guard Service formed under Kenya Coast Guard Act of 2018. These revamped arrangements provide a framework for fisheries financing, protection, production, processing and marketing and hence improves Kenya's fisheries competitiveness. FMDA (2018) also emphasizes development and business approach to fisheries.

Business Opportunities

Kenya offers opportunities for investments in fisheries borne by the high demand by domestic and the tourism sector, low fish per capita consumption that leaves room for increments, existence of a large regional market and low capacity for fishing offshore that needs to be tapped. Key areas of investments include:

1. **Supply of fishing inputs including vessels:** Kenya seeks to invest in offshore fisheries as outlined in the draft tuna strategy of 2013. However, the fisheries are currently utilized by distant water fishing nations for lack of local capacity. The country seeks to increase its stakes in the fishery by building capacity for offshore fishing. This will include demand for vessels and associated accessories.

2. **Mariculture investment opportunities:** there are still numerous investment opportunities in mariculture such as deployment of fish cages, crab farming, prawn farming and sea cucumber farming, seaweed farming and processing. It has been shown that this potential exists. Other areas of investments include brood stock and seed improvement; innovation and technology transfer; fish feed manufacturing; processing, value addition and packaging.

3. **Recreational fisheries development:** although recreational fisheries have been in existence, there is still scope for further development of Kenya recreational fisheries to international standards. There is also scope for development of accommodation facilities, selling/leasing of fishing equipment.

4. **Transhipment facilities and support infrastructure:** there are opportunities for investment in deep sea fishing logistics including technical support, development of dedicated fish ports necessary to enable the handling of fish landed in Kenya and establishment of bunkering services for offshore fishing vessels. Currently vessels fishing in Kenya's EEZ have to sail all the way to Seychelles for this service.

5. T**echnical training on seagoing skills:** there are opportunities for training technical staff and private sector on seamanship and deep-sea fishing technology in order to develop capable and sufficient national seagoing capability. However, the government has started training of fishers at the newly revamped Bandari Maritime Academy on seafaring courses. There is also a private institution; the Indian Ocean Maritime Training Centre (IOMTC) that offers Standards of Training, Certification and Watchkeeping (STCW) Basic Safety Course and boat operations.

6. **Development of ornamental fisheries:** there is potential for development of marine aquariums, farming of ornamental fishes, fabrication of aquariums and accessories and production of ornamental fish feeds.

INVESTMENT INITIATIVES RELEVANT TO FISHERIES

Government spending and Investments

Public investment expenditures for the year 2019/2020 budget allocations for the State Department for Fisheries, Aquaculture & the Blue Economy was USD65,777,424 (USD48,303,197 for the development budget and USD17,474,227 for the recurrent budget)[26]. This was just 16 percent of total budget for the agriculture sector. The agricultural budget itself was 2 percent of total national budget, while fisheries sub-sector budget was 0.2 percent of total national budget. These allocations are far below the CAADP Maputo Declaration on Agriculture and Food Security in Africa in regard to commitments made by African states to allocate 10 percent of public expenditure to agriculture.

Major recent or ongoing investments include plans to establish a fishing port in Shimoni. The Government is also refurbishing the Liwatoni Fisheries Complex under a newly created government corporation; Kenya Fishing Industries Corporation (KFIC), which is anticipated to create 4,000 new jobs. Kenya Fisheries Services together with the Kenya Maritime Authority are training local fishers to undertake various roles aboard foreign owned fishing vessels licensed to fish in Kenya's EEZ. The country also procured an Offshore Patrol Vessel (OPV) MV Doria manned by the Kenya Coast Guard Service. Also, the government through Legal Notice No. 233 of 2018 transformed the Bandari Maritime Academy into Regional Maritime Centre of Excellence for skills development for the Blue Economy. In 2020, a total of 1,000 youths were selected for training through a government sponsorship in "seafaring and fishing" related courses.

Some marine fisheries investments made by the National and County governments and undertaken in 2019 or ongoing at the landing site level include; construction or renovation of five fish markets and infrastructure, two sites with installation of seaweed drying racks, four new cold rooms, one boat repair boatyard and installation of three new ice making plants.

[26] https://www.treasury.go.ke/budget.html

Previously, there has been several attempts at development of Fish Aggregating Devices (FADs), which were meant to enable small-scale fishers access pelagic fish stocks that are otherwise be beyond their reach. The first attempts were through the South West Indian Ocean Fisheries Project (SWIOFP) in 2012. Another attempt was made between 2014 and 2015 by KMFRI in Msambweni using simple materials, with support of National Commission for Science Technology and Innovation (NACOSTI). Yet another attempt was made through the Kenya Coastal Development Project (KCDP). All these attempts did not succeed. IOC-SmartFish also came in with similar ideas, after conducting an evaluation of past failures, which largely were blamed on lack of understanding and low involvement of fishers leading to vandalism. Using recommendations from the evaluation, IOC-SmartFish in collaboration with KMFRI, COMRED and Kenya Fisheries Service made another attempt at deployment of FADs at Gazi and Msambweni areas. This time there was success from vandalism. However, in October of 2017, strong currents washed away the FADs. If FADs are to be attempted again in Kenya, advanced engineering is needed to design appropriate structures that can withstand strong currents as well as raise awareness to secure a buy-in from fishers to avoid vandalism.

The above investments are still deficient of the required needs by the fisheries sub-sector. Most landing sites in coastal Kenya are still poorly developed, lacking critical infrastructure such as fish depots, cold rooms, jetties/pontoons, potable water facilities, electricity supply, toilet facilities, equipment repair facilities and roads. By 2016, only nine cold rooms existed along the whole coastline, with only seven being functional[27]. Out of the 197 landings sites along the whole coastline, only 11 percent had electricity, 15 percent with potable water, 10 percent with engine repair facilities, 7.6 percent with jetties and 41 percent with all-weather roads. Only 20 percent of landing sites had been fenced, suggesting implications for maintenance of hygienic standards and fish quality.

Special incentives for investors

The Government of Kenya promotes private investments by providing several fiscal and non-fiscal incentives. The Kenya Revenue Authority (KRA) implements the issuance of the fiscal (tax) incentives in collaboration with other regulators and facilitators such as the Capital Market Authority (CMA) , Export Processing Zones Authority (EPZA) (for issuance of the EPZ incentives) among others as provided under the Income Tax Act, Laws of Kenya. These incentives are mainly in form of

[27] Government of Kenya. 2016. Marine artisanal fisheries frame survey report

capital allowances or deductions offered for capital expenditures[28, 29]. They are made at the point of computing the gains or profits of a person/company for any year of income. They include:

1. **Capital allowances on wear and tear:** these allowances are charged on capital expenditure on machinery and equipment where they are classified into five classes with allowances ranging between 12.7 and 37.5 percent.

2. **Investment deduction:** an investor who incurs capital expenditure on building and/or machinery used for manufacture is entitled to an investment deduction equal to 100 percent of the cost.

3. **Industrial building deduction**: this is an allowance granted to an investor who incurs capital expenditure on a building used as an industrial building at the rate of 10% of the cost (net of investment deduction, if any) .

4. **Public expenditures incentives:** expenditures of a capital nature incurred in that year of income (with the prior approval by the Minister) for construction of a public school, hospital, road or any similar infrastructure will be an allowable deduction.

5. **Special Economic Zones incentives:** capital expenditure on buildings and machinery for use in a Special Economic Zone (SEZ) shall be entitled to investment deduction equal to one hundred percent of the capital expenditure. In addition, corporate tax at rate of 10 percent for first 10 years, 15 percent for the next 10 years, 5 percent withholding tax rates on payments made to non-residents (royalties, interest, management fees) and dividends paid to non- residents by the SEZ entity are exempt from tax.

6. **Export Processing Zones incentives:** a 10-year corporate income tax holiday is available to designated enterprises manufacturing goods for exports only (under the Export Processing Zones) and a 25 percent tax rate for a further 10 years, 10 year withholding tax holiday on dividends and other remittances to non-resident parties (except for EPZ commercial license enterprises) and 100 percent investment deduction on new investment in EPZ buildings and machinery.

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[28] http://www.invest.go.ke/starting-a-business-in-kenya/investment-incentives/#1512020257971-575a25c5-e99e

[29] https://www.kra.go.ke/en/ngos/incentives-investors-certificate/investing-in-kenya/incentives-investors

Social Security Scheme/safety net

Kenya's social security and protection is anchored in law and implemented using different instruments. The National Social Security Fund (NSSF) Act of 2013, provides for contributions to be made into the Fund and payment of benefits out of it. Working with stakeholders, the government has established comprehensive social security arrangements that extend legal coverage to all workers in the formal and informal sectors and their dependents. By law every employer employing at least one employee or more shall register with the Fund as a contributing employer and shall, register his employee or employees, as members of the Fund. Both the employer and employee contribute six percent of employee's monthly pensionable earnings. The NSSF Act also provides for self- employed persons wishing to be members of the Fund, to register as voluntary contributors. Many fisheries actors would fall under this category due to the informal nature of their businesses. However, many fishing crews may also fall under the employee category, but hardly is this recognized as formal employment. In both cases, awareness concerning social security provisions and options is very low in the fisheries sub-sector.

As part of the social safety nets for its people, the Government under the National Hospital Insurance Fund (NHIF) Act of 2012 has revamped the fund as a fully-fledged comprehensive national Health Insurance scheme. It covers all Kenyans, where employers are required by law to remit monthly deductions, while self-employed persons that can afford contribute a monthly payment voluntarily at graduated scales. The health scheme also includes establishment of a medical frame work to provide access to essential health care benefit package, maternal care and HIV related diseases for those unable to contribute to the national fund; adopt the required measures to extend an improved range of benefits compulsorily provided for by NHIF, including outpatient care, specialized treatment and quality assurance, sickness benefits and mandated post –retirement health cover. Like NSSF contributions, actors in the fisheries sub-sector contributions to the NHIF is also very low, besides the low level of awareness concerning health insurance provisions and options.

There are also other Social Protection (SP) measures defined under other policies and actions, which seek to; enhance the capacity and opportunities for the poor and vulnerable to improve and sustain their livelihoods and welfare; enable income-earners and their dependents to maintain a reasonable level of income through decent work and to ensure access to affordable health care, social security and social assistance. Current delivery instruments of SP within the social assistance, include cash transfers, food distribution, school-based feeding programmes, price subsidies, public works and microfinance amongst others. Under SP, much focus and attention has been placed on the cash transfer social assistance programs through

the establishment of the National Safety Net Program (NSNP) in 2013. The Government currently has four major cash transfer programmes that have nationwide coverage. Between them, they provide benefits to over 500,000 vulnerable households. They include the Cash Transfer for Orphans and Vulnerable Children (CT-OVC), Older Persons Cash Transfer (for persons > 65 years), Persons with Severe Disabilities Cash Transfer and Hunger Safety Net Programme. Under these programmes the beneficiaries receive between USD 20 and 25.50/month. It is difficult to know how many people in the fisheries sub-sector are covered under these programmes.

THE MAIN CHALLENGES FACING THE FISHERIES SECTOR

1. **Declining fish stocks**: this is a concern for most of the fisheries in Kenya based on the trends presented. The prominent causes for the declines include; overfishing and unreported and unregulated fishing activities.

2. **Inadequate enforcement:** There is still weak enforcement measures of existing fisheries regulations.

3. **Limited capacity to utilize fisheries resources off-shore, EEZ and High seas:** this is borne from the low investment in deep sea fishing, lack of incentives from the government to support development of the fishery, under exploitation of fisheries resources in the offshore and EEZ and lack of an Integrated ocean management plan (Marine Spatial Plan).

4. **Inadequate capacity and skills:** low absorption of fishing technology and techniques for local communities; limited processing and value addition; lack of fisheries training and skill development institution; inadequate human capacity, skills and technology in navigation and lifesaving; and inadequate capacity to manage the marine fishery and Kenya's EEZ

5. **Environmental degradation:** some fisheries have serious environmental impacts. For example, there are concerns over the ecosystem impacts emanating from a loss of biodiversity through depletion of vulnerable target species and habitat degradation from ornamental fisheries. The fishery is highly selective for juveniles of sizes < 10 cm, certain sexes of fish species, rare species and unusual hybrids. Small sizes are usually targeted due to the low transport cost for exporters.

6. **Lack of fisheries specific management measures for some fisheries:** There are no management measures for the cephalopod fishery, the ornamental fishery, lobster fishery. Most of these fisheries use a general fishing license, although a fishery specific licensing scheme would help to provide better information on the fishing effort, information that can be useful for the management of the fisheries.

7. **Lack of adequate safety at sea measures:** This is a serious concern for many fishers and particularly the aquarium fishery. To maximize catches, some fishers take risks when diving resulting in injuries and even fatalities due to decompression sickness resulting from a lack of proper training on safety controls during diving.

8. **Resource use conflicts**: this is common, particularly amongst some fisheries, for example the marine aquarium, ringnet fishery, spearguns with other fishers, resource managers, environmentalists and the marine tourism industry. Aquarium fishers are also perceived to be more financially advantaged and stable compared to artisanal other fishers. This perceived disparity in economic benefits is a root cause of social disputes concerning access to fishing grounds and inequitable benefits sharing.

9. **Poor marketing system and market information including exports:** generally, Kenya's international fisheries trade is under-valued due to lack of information on pricing and costs incurred along the chain of custody. For example data from ornamental fisheries largely emanates from unvalidated declarations from exporters. This problem is perverse as well in the tuna offshore fisheries where they are not landed in Kenya. However, the government now requires that 30 percent of tuna is landed in Kenya by vessels fishing in its EEZ. There is also limited access to market information where it exists.

10. **Competing interests among the different fisheries:** Targeting of the different fisheries over the same fishing grounds and species hinders optimal performance of other sectors. For example, recreational and ornamental fisheries compete for the same fishing grounds or species with artisanal and commercial fisheries.

11. **Poor fish handling and maintenance of quality**: there is still inadequate investments in infrastructure such as cold storage facilities, low training in

fish handling and hygiene as well as marketing and lack of accredited laboratories for the fisheries sector. This leads to improper handling throughout the distribution chain and limited access to lucrative markets.

12. **Low uptake of value addition:** despite the existence of an emerging middle class and large expatriate presence that can afford value added premium products, there is still low level of value addition and poor market incentives to support fish and fisheries product development.

13. **Limited access and uptake of insurance and financial services:** although Kenya's financial and insurance industry is well advanced, there is still limited uptake by fisheries operators due to inadequate information on the fisheries sector by the industry and perceived high risks in the sector and lack of information to operators.

14. **Inadequate investment in fisheries and aquaculture infrastructure:** poor access roads, poor and inadequate infrastructure (e.g., fishing port facilities, model landing stations, market infrastructure, electricity, potable water supply and cold chain facilities), inadequate operational facilities and equipment, and auxiliary facilities and services along the value chain (e.g., boat anchoring, boat and net making facilities, waste disposal, credit facilities).

15. **Weak fisheries governance:** there is still weak governance, borne from limited implementation and enforcement of existing policies and legislations and misunderstandings on jurisdiction and scope on governance, policy and institutional mandate affecting fisheries sector and inadequate fisheries regulations.

16. **Weakness in aquaculture supply side:** low aquaculture development has largely been attributed to inadequate supply of certified quality fish seed (fingerlings), essentially due to lack of hatcheries and species-specific feeds as well as the high cost of inputs for the small-scale fish farmers.

17. **Low adoption of aquaculture technologies:**inadequate quality inputs (seeds and feeds), inefficient production technologies and inadequate extension services.

18. **Inadequate attention business development**: lack of a systematic commercial and fisheries business development approach especially in areas of aquaculture development, fish marketing and quality assurance.

19. **Climate change impacts:** there is widespread lack of systematic data, information and dissemination mechanism on climate impacts.

20. **Weak research and extension linkages:** the dissemination of research information is not effective, inadequate demand driven research, the linkage between research and extension services at both local and national levels is weak

BIODIVERSITY/CLIMATE IMPACTS & ADAPTATION/RESEARCH

Kenya being in Sub-Saharan Africa faces constant climate variability and change challenges. Climate change poses a serious challenge to its social and economic development including; economy, human life and on the environment. Kenya is very vulnerable since its key economic drivers (agriculture, livestock, tourism, forestry, and fisheries) are climate sensitive. Its vulnerability is magnified due to its low adaptive capacity to climate change. Kenya's climate change and variability in the past has been marked by droughts, floods and increasing temperatures over the last few decades. There have also been abnormal climate related events, with the 1998 El-Nino being the most prominent. This event alone caused coral mortality of upto 80 percent in some places of Kenya's coast. Most areas have recovered, but some are yet to recover. For example, coral diversity was reduced to 23 genera with a coral cover of 5.1 percent within Malindi Marine Park and 2.1 percent within the Malindi Marine Reserve[30].

Fisheries has also experienced the impacts of climate variability and change when large-scale events such as the El-Nino have occurred. A historical analysis of satellite data and modelling shows that there was displacement of the Kenya's prominent North Kenya Banks (NKB) upwelling front in 1998. The upwelling, which occurs during the Northeast Monsoon, from December to February along the Kenyan coast is topographically enhanced over the NKBs. It is as a result of the confluence zone between the Somali Current and East African Coastal Current (referred to as the Somali-Zanzibar Confluence Zone). The upwelling at the confluence zone is

[30] Lambo, A. L and Ormond, R. F. G. (2006). Continued post-bleaching decline and changed benthic community of a Kenyan coral reef. Marine Pollution Bulletin, 52, 1617–1624

marked by elevated productivity in terms of enhanced phytoplankton, zooplankton and subsequently small pelagics and further up the food chain. In the 1998 El-Nino event, the Somali-Zanzibar Confluence Zone was pushed further from Kenya to slightly South of Zanzibar where it was enhanced. This in turn led to lowered productivity and lower catches in Kenyan waters. This demonstrates what might happen in the event of continued climatic related perturbations to marine systems[31, 32].

Having experienced the ravages of climate change, Kenya endeavours to contribute towards climate change reduction and is a signatory to the UN Framework Convention on Climate Change and Kyoto Protocol to the Convention. Based on the recent Global Paris Agreement on combating climate change, Kenya's target is one of the few that the Climate Action Tracker[33] rates as "2°C compatible". This rating indicates that Kenya's current policies are within the range of what is considered to be a fair share of global effort; however, these plans are not yet fully consistent with the Paris Agreement. Kenya has a conditional Intended Nationally Determined Contribution (INDC) of reduction of its Green House Gas (GHG) emissions by 30 percent by 2030 compared to a Business As Usual Scenario (BAUS) of 143 $MtCO_2e$. This is equivalent to 46 percent above 2015 emission levels excluding from Land use, land-use change, and forestry (LULUCF). The country is already on track to meet or overachieve its Paris Agreement pledge, but plans to improve it in 2020, along with submitting a long-term low carbon development strategy.

Kenya also has the National Climate Change Response Strategy (NCCRS) and Climate Change Action Plan (CCAP) in place to help meet its NDCs[34]. In fisheries the CCAP proposes a raft of actions to be pursued including; undertaking risk and vulnerability assessment of the fisheries value chain; enhancing the capacity of the Ministry and KMFRI on the impacts of climate change on fisheries, fishing communities and the private sector; upscale sustainable aquaculture initiatives; develop and implement a pilot project on climate resilient fish species and the related value chain; strengthen monitoring capacity and capability to prevent overfishing and IUUs; promote the up-scaling of climate resilient

[31] Jebri, F. et.al. (2020). Interannual monsoon wind variability as a key driver of East African small pelagic fisheries. *Scientific Reports*

[32] Jacobs, Z. L., et.al.(2019). Shelf-Break Upwelling and Productivity Over the North Kenya Banks: The Importance of Large-Scale Ocean Dynamics. *Journal of Geophysical Research: Oceans*

[33] https://climateactiontracker.org/countries/kenya/

[34] Government of Kenya. 2016. Kenya National Adaptation Plan 2015-2030. Enhanced climate resilience towards the attainment of Vision 2030 and beyond

strategies/technologies in fisheries and climate resilient fish varieties; and expand the fishing zones in both inland and coastal waters. It is however not apparent there is an ongoing dedicated and specific research that deliberately targets fisheries and marine systems. Current research as reported above is not within a systematic programme.

ONGOINGPROGRAMMES/ PROJECTS/ DONORS OPERATING IN THE FISHERIES SECTOR

No	Donor	Project title / Description	Value	Period/ Remark
1.	EU	ECOFISH seeks to contribute towards sustainable fisheries to the blue economy of Eastern Africa, Southern Africa and the Indian Ocean region (ESSA-IO)	€28,000,000	2019 to 2024, Kenya participating in the regional project
2.	World Bank	Kenya Marine Fisheries and Socio-Economic Development Project (KEMFSED)- the Project Development Objective is to improve management of priority fisheries and mariculture and increase access to complementary livelihood activities in coastal communities	$ 100,000,000	2020 to 2025
3.	IFAD and Government of Kenya	The Aquaculture Business Development Programme (ABDP) - the project supports aquaculture development and targets counties with high concentrations of aquaculture activity, high production, existing infrastructure (processing, marketing and research), adequate	$ 143,273,000	2017 to 2026

		water resources and marketing potential		
4.	WIO Governments and GEF	SAPPHIRE- the project aims to support and assist formally mandated government institutions and intergovernmental bodies in the region to implement related activities to ensure sustainability of efforts and actions toward long-term management of WIO LMEs as well as the sustainability of associated institutional arrangements and partnerships.	$ 326,565,994	2017 to 2023, Kenya participating in the regional project
5.	WIO Governments and GEF	WIO-SAP- the project is intended 'to reduce impacts from land-based sources and activities and sustainably manage critical coastal and marine ecosystems through the implementation of the WIO-SAP priorities	$88,553,341	2017 to 2023, Kenya participating in the regional project
6.	The Norwegian Agency for Development Cooperation (NORAD)	CORDIO.EA Project-The project seeks to increase the area of marine ecosystems under effective management and sustainable use is increased in Kenya, Mozambique and Tanzania. Expected outcomes: i. Research based knowledge on marine biodiversity and ecosystem services is used in planning, monitoring and decision-making processes in Kenya, Tanzania and Mozambique ii. Coral reef risk assessments (incl. the Red List of Ecosystems for coral reefs of the WIO) inform research, strategic planning	$ 2,000,000	Jul 2018-June 2023

		and policy-making processes in Kenya, Tanzania and Mozambique iii. Increased adoption of climate smart practices in CBNRM in target communities Kenya (Msambweni and Kilifi), Tanzania (Pemba) and Mozambique (Metuge_Moz district) iv. Capacity and sustainability for high quality research supporting management of marine eco-systems is increased.		
7.	International Climate Initiative (IKI)	CORDIO.EA Project - Long term effective, equitable and inclusive conservation of coastal and marine biodiversity and ecosystem services in the Western Indian Ocean. Expected outcomes: By 2022, the effective management of coastal, island and marine biodiversity and ecosystem ser- vices in Mozambique, Seychelles, Kenya and Tanzania is improved through adoption of locally relevant protected or conservation area governance frameworks by national governments and non- state actors.	€ 581,254	Jul 2018-June 2023

8.	United Nations Environment Programme (UNEP)	CORDIO.EA Project -Project to increase sustainability of coral reef fisheries by building representation and role of women in fisheries. Objectives include: i. to reduce demand for juvenile fish through awareness, raising the ability of women to purchase better quality fish and engaging in other income generating activities. ii. to reinforce models of equitable access to and sharing of benefits from natural resource management iii. to facilitate learning among women through sharing of best practices.	$ 79,970	October 2020-August 2022
9.	GEF	The project by the Small Grants Programme (SGP) of UNDP project seeks to enhance the socio-ecological resilience of selected landscapes and seascapes through community-based initiatives. COMRED is undertaking functions of strategic partner in the Shimoni-Vanga seascape on behalf of SGP. At least 15 community projects have been funded to conserve marine environment, improve livelihoods through fish value addition, MCS and restoration of degraded coral and mangrove habitats	USD 500,000	2018-2021

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