

COASTAL AND DEEP SEA FISHERIES, MARICULTURE AND AQUACULTURE IN KENYA

Presented at the write shop on assessment of the contribution of maritime sectors to Kenya's Blue Economy: values, potentials and governance frameworks: 2nd-4th August 2021

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Outline of presentation

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- Contribution of Fisheries to livelihoods and Gross Domestic Product (GDP)
- Impact of capture fisheries on marine environment
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- Mariculture and Coastal Aquaculture production in Kenya
- Contribution of Mariculture to livelihoods
- Impact of Mariculture & Coastal Aquaculture on marine environment
- Governance frameworks for capture fisheries & mariculture
- Conclusions and recommendations

Background and context

- Blue Economy (BE) resources support productive sectors incl.
 - ✓ capture fisheries, freshwater aquaculture & mariculture
 - ✓ non-fisheries maritime sectors
- Fisheries provide livelihoods, income, and food and nutrition security.

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

	2015	2016	2017	2018	2019
Kenya's GDP	6,284,184.9	7,022,963.1	8,165,842.2	8,892,110.9	9,740,360
Agriculture, Forestry and Fishing	1,897,346.8	2,182,198.3	2,844,263.2	3,032,084.7	3,326,299.2 (1/3 of GDP)
Fishing and Aquaculture	40,299.8	34,909	36,607.8	43,579.9	48,815 (0.05% of GDP)
Fisheries proportion of GDP	0.06	0.05	0.05	0.05	0.05

- Opening up of offshore tuna fisheries will increase contribution to GDP.
- However, COVID-19 pandemic will impact negatively on economic growth.

Background and context

- The coastal and deep sea fisheries consist of the small-scale, semi-industrial, industrial, aquarium and recreational fisheries.
- It contributes over 10% of the total annual national fishery production in Kenya, which is $\approx 146,500$ MT.
- The annual production estimate from coastal and deep sea fisheries is approximately 23,000 MT
- There has been under reporting of catch statistics due to non-reporting of auto-consumption, spoilages, & non-declared landings

Background and context

- Approximately 80% of coastal and deep sea fisheries production is landed by small-scale fishers.
- The rest of the fish and other fishery products are landed by semi-industrial and industrial fishers.
- Demersal reef fish contribute $\approx 50\%$ to the production.
- Pelagic species $\approx 35\%$
- Other landings are:
 - ▣ Molluscs $\approx 9\%$
 - ▣ Crustaceans $\approx 3\%$
 - ▣ Sea cucumbers, cephalopods (octopus & squids), elasmobranchs (sharks & rays) and unclassified species $\approx 3\%$.

Background and context

- Finfish landings have been fluctuating over the last 40 years.
- Demersal landings remained fairly constant since 2007.
- Shallow water lobster, crab & octopus are optimally exploited.
- The small-scale reef finfish fishery has experienced overfishing but offshore fisheries are not fully exploited due low fishing technology.
- Tuna and large pelagic species have experienced overfishing for a few species while the stock status of most species has remained largely unknown with large variations in catches.

Table 2: Composition of mean CPUE of common fishing gears at the south coast of Kenya

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

A decline of 1-2 kg per fisher per trip among the commonly used fishing gears from the year 2008

Background and context

- Management of capture fisheries is expected to improve with the support of the new World Bank funded project, KEMFSEDP, which aims to:
 - ▣ support efforts to leverage emerging opportunities in the Blue Economy with the objective of improving management of priority fisheries and mariculture and
 - ▣ increasing access to complementary livelihood activities in coastal communities.

Contribution of Fisheries to livelihoods and Gross Domestic Product (GDP)

- Marine fisheries are an important source of livelihood
- There are over 13,400 small-scale fishers
- The main actors in the primary fishing are mainly men. Women play a key role in processing, marketing of fish & gleaning in the intertidal areas during the low spring tides
- Middlemen who own fishing gear or vessels rent them to fishers at a pre-determined revenue sharing agreements which divides the revenue in to three equal portions: one for middleman, one for boat and gear maintenance, and one for all fishers on the boat regardless of their number.

Contribution of mariculture to livelihoods and Gross Domestic Product (GDP)

- Mariculture and coastal aquaculture is gradually taking root especially seaweed farming in the south coast of Kenya which has employed mainly women
- The farming of other mariculture species such as milkfish, mud crab, prawns and mullets has not expanded as expected

Impact of capture fisheries on marine environment

- Some fisheries activities can degrade the marine environment, reduce potential production and food security, affect economic growth and lower the quality of life of coastal communities.
- Capture fisheries takes out both the target species and the bycatches of non-target species, which are often substantial when non-selective fishing gears are used.
- The unwanted bycatch is often abandoned at sea. The bycatch may also include endangered, threatened or protected species. Industrial and semi-industrial fisheries, particularly those that use nets have larger amounts of bycatch.
- Some fishing practices e.g. bottom trawling, beach seining, use of monofilament nets, use of plant poison, may be destructive to habitats that should sustain fish and associated populations. The bycatch of bottom trawling is diverse and exceeds 70% of the total catch by weight.
- Capture fisheries can also impact seabirds through direct mortality and by reducing food availability through competition for resources. The level of impact could be significant when gillnets are used in areas where foraging ranges of diving bird species are dominant.

Gaps in capacity to engage in capture fisheries

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

Mariculture and Coastal Aquaculture

- Globally, aquaculture has grown quite fast globally with an annual growth of 5.8 percent during the period 2001-2016.
- The contribution of aquaculture to global fisheries production has risen from 25.7 percent in the year 2000 to 46.8 percent in the year 2016.
- Development of mariculture in has remained low in Africa because of high cost of production and other constraints.
- In Kenya, there is a great potential in aquaculture due to diverse water resources ranging from brackish to fresh and marine waters which can be harnessed for aquaculture development.
- Kenya is also endowed with a 640 km coastline, a territorial sea extending 12 nautical miles and an Exclusive Economic Zone that spans 350 nautical miles.
- The large expanses of brackish water at the River Tana delta and Athi-Sabaki River estuary, other rivers and small water bodies can also be utilized for coastal aquaculture. The potential can be tapped as part of Blue Economy development.

Mariculture and Coastal Aquaculture production in Kenya

- Mariculture was introduced in Kenya about four decades ago with varying degrees of success and failures.
- It involves the culture of seaweeds, milk fish, mullets, mud crabs, oyster and prawns, Artemia and marine tilapia, with the mariculture projects involving production systems operated by self-help groups.
- It has recently made some progress particularly w.r.t seaweed farming in Kwale County & mud crab fattening in Kilifi County.
- Despite mariculture registering some growth, it has not realized its full potential due to inadequate or seasonal availability of seed & feed, inadequate extension services, ineffective monitoring and evaluation planning and execution, donor syndrome created among project beneficiaries by establishment of small-scale projects that do not have full ownership, lack of capital investments, lack of or inadequate access to market and limited technological capacity, and small scale operations that do not allow economies of scale.

Impact of Mariculture and Coastal Aquaculture on marine environment

- Impact of mariculture and coastal aquaculture on the marine environment are determined by the culture systems that covers species, intensity and technology, site characteristics, waste assimilating capacity, waste loadings, among others.
- Some farmed species are carnivorous and therefore require more protein than herbivores and omnivores. Using fishmeal to feed farmed species may motivate fishers to fish more; hence instead of reducing fishing pressure on wild stocks, mariculture may end up increasing it due to the high demand for fishmeal. Collection of seed from the wild may result in overexploitation of wild stocks or alter community composition through harvesting of new recruits.
- Clearance of mangrove areas for construction of ponds for mariculture may lead to loss of mangroves & result in reduction of ecosystem services such as breeding, nursery & filtration functions.
- Mangrove cuttings are used as pegs to hold lines and construct drying racks in seaweed farming.
- Mariculture ponds that are constructed in intertidal areas can cause eutrophication & pollution through effluents if farming takes place on large scale, and effluents controls are inadequate.
- Moving genetic materials between water bodies may introduce foreign species and threaten indigenous stocks.
- Seaweed mariculture farms may change aesthetics & impact on the marketing potential of popular tourist areas.

Governance frameworks for capture fisheries and mariculture

- Governance of fisheries sector is undertaken through various legal, policy and institutional frameworks.
- The Constitution of Kenya 2020 at Article 2(5) provides that, “the general rules of international law shall form part of the laws of Kenya.”
- Consequently any Convention that Kenya has ratified & has provisions addressing aspects of fisheries is relevant.
- The governance frameworks have been grouped into International and domestic levels.

International Conventions

Convention	Provision	Ratification/ Accent
Convention on International Trade in Endangered species of Wild Fauna & Flora	Through international cooperation states regulate international trade in certain species of flora and fauna that are listed - Appendix I –threatened, Appendix II potentially threatened & Appendix III species in need of international trade controls – trade prohibited or restricted.	Kenya ratified on 13 December 1978
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	Lays legal foundation for internationally coordinated conservation measures throughout a migratory range. It aims to promote international cooperation in the preservation of migratory species to prevent them from becoming endangered.	Kenya ratified on 26 February 1999

International Conventions

Convention	Aim/Objective	Ratification/ Accent
Port State Measures Agreement against Illegal, Unreported & Unregulated Fishing (IUU) 2009	To prevent, deter and eliminate IUU	Kenya ratified on 23 August 2017
International Convention for Regulation of Whaling, 1946	To conserve world whale stocks, to promote orderly development of the whaling industry	Kenya ratified on 2 Dec. 1981
United Nations Fish Stock Agreement (UNFSA) for Straddling and Highly Migratory Fish, 1995	To ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks	Kenya ratified on 13 July 2004
Convention on the Continental Shelf (Geneva 1958)	To define & delimit the sovereign & exclusive rights of states to explore & exploit the natural resources of the continental shelf	Kenya acceded on 20 June 1969

International Conventions

Convention	Aim/Objective	Ratification/ Accent
Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972, as amended by the London Protocol (London Convention 1972)	To contribute to international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials	Kenya acceded to the London Convention 1972 on 7th January, 1976, and to the London Protocol on 14th January, 2008
Convention on Fishing and Conservation of the Living Resources of the High Seas	To encourage international cooperation among states towards conservation of the living resources in the high seas	Kenya ratified on 20 June 1969
The Ramsar Convention on Wetlands of International Importance	Encourages the designation of sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity	Kenya ratified on 5 June 1990

International Conventions

Convention	Provision	Ratification/ Accent
United Nation Convention on the Law of the Sea - UNCLOS (1982)	Establishes a framework for cooperation on conservation and management of marine living resources in the high seas	Ratified on 2 March 1989
Convention on Biological Biodiversity (1992)	Conservation of biological diversity; Sustainable use of the component of biological diversity and; Fair and equitable sharing of benefits arising out of utilization of genetic resources	Ratified on 26 July 1994
International Convention for the Prevention of Pollution from Ships (MARPOL)	Seeks to preserve the marine environment by addressing pollution emanating from ships	Acceded on 12 Sept. 1975
UN 1993 FAO Fishing Vessel Compliance Agreement	Seeks to address the threat to international fisheries management posed by vessels that do not abide by fishing rules	

International Conventions

Convention	Provision	Ratification/ Accent
Code of Conduct for Responsible Fisheries, 1995	Sets international standards and practices for responsible and effective conservation, management and development of living aquatic resources	Signed in 1995
FAO Voluntary Guidelines for Flag State Performance	Provides guidance to strengthen and monitor compliance by flag States with their international duties and obligations regarding the flagging and control of fishing vessels	
WTO Agreement on Technical Barriers to Trade	seeks to strike a balance between trade liberalisation and regulation.	Ratified on 12 December 1994

Regional Agreements

- Southern Indian Ocean Fisheries Agreement, 2006, signed on 7 July 2006
- The Common Market for Eastern and Southern Africa Fisheries Strategy (COMESAFS), signed in 2008
- Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna & Flora (1994), Ratified on 17 January 1997
- Revised African Convention for the Conservation of Nature & Natural Resources (Algiers 1968), ratified on 12th May, 1969; revised version signed on 17th December, 2003
- Indian Ocean Tuna Commission (IOTC) Agreement, ratified on 29 September 2004
- Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Nairobi 1985)

National Legislations

S/No	Legislation	Provision
1	The Constitution of Kenya 2010	Defines land to include marine waters, specifically 'the territorial sea and the exclusive economic zone' (art. 260)
2	Fisheries Mgt. and Development Act - No. 35 of 2016	Provides for the conservation, management and devt. of fisheries and other aquatic resources to enhance the livelihood of communities' dependent on fishing
3	Environmental Management & Coordination Act No. 8 of 1999	General coordination in the management of the environment & has specific provisions dealing with marine and fishery areas, including rivers, lakes, seas and wet lands (S 42)
4	County Government Act	Implementation of specific national government policies on natural resources and env. conservation including fisheries
5	Land Act No. 6 of 2012	Prohibits 'allocation of public land that is along watersheds, river and stream catchments, public water reservoirs, lakes, beaches, fish landing areas riparian and the territorial sea.

National Legislations

S/No	Legislation	Provision
6	Physical Planning Act of 1996	Preparation and implementation of physical development plans. It includes planning land use in coastal zone to balance env. and economic interests
7	Wildlife (Conservation & Management) Act No. 47 of 2013	Protection, conservation, sustainable use and management of wildlife in Kenya. Wildlife defined to include organisms in their ecosystems on land or in water
8	Water Act No. 43 of 2016	Regulation of ownership, use and management of water resources. "water resource" is broad to include a 'lake, pond, swamp, marsh, stream, watercourse, estuary, aquifer, artesian basin or other body of flowing or standing water, & includes sea water and transboundary waters within the territorial jurisdiction of Kenya
9	Merchant Shipping Act No. 4 of 2009	A comprehensive regime for merchant shipping. It covers prevention of pollution & maritime security which is relevant to fisheries

National Legislations

S/No	Legislation	Provision
10	Maritime Zones Act, Cap 371	Provides the rules delimiting the territorial waters, continental shelf and the exclusive economic zone & gives guidance on exploration, exploitation & mgt of natural resources, living & non-living incl. fisheries resources within these maritime zones
11	Forest Conserv. and Mgt. No. 34 of 2016	Defines forest to include mangroves, which are a category of indigenous forests found in the intertidal area, & provide a habitat for various marine animals
12	Science, Technology and Innovation Act No. 28 of 2013	Affirmed establishment of KMFRI with a mandate of undertaking research on 'marine and freshwater fisheries, aquaculture, environmental and ecological studies, and marine research including chemical and physical oceanography'
13	Coastal Devt. Authority Act Cap 449	Established an Authority tasked with planning and co-ordinating implementation of development projects in the Coast and the exclusive economic zone
14	Kenya Coast Guard Service Act no. 11 of 2018	Established Kenya Coast Guard Service (KCGS) to be deployed in Kenya's territorial waters to provide enforcement services

Policy Framework

S/No	Policy	Provision
1	Kenya Vision 2030	Kenya's Vision 2030 is the country's development blue print covering the period from 2008 to 2030. The Blue Economy which includes fisheries & aquaculture is the eighth priority sector under the economic pillars
2	Medium Term Plan III (2018 – 2022)	Prioritizes Blue Economy sector flagship projects
3	National oceans and fisheries policy 2008	Enhance the ocean's and fisheries sector's contribution to wealth creation, increase employment for youth and women, food security and revenue generation through effective private, public and community partnerships
4	Wetlands Conservation & Mgt. Policy, 2015	Seeks to foster an integrated approach that promotes conservation and sustainable use of wetlands.
5	Kenya Climate Smart Agriculture Strategy 2017-2026	Recognizes the effects of climate change on fisheries, aquaculture and sustainable development

Institutional Framework

- The State Department of Fisheries, Aquaculture and Blue Economy
- Blue economy committee which was converted to Blue Economy Implementation Committee (BEIC) and finally to TOBEO
- Kenya Fisheries Service
- Kenya Marine and Fisheries Research Institute (KMFRI)
- Kenya Wildlife Service
- National Environment Management Authority (NEMA)
- National maritime centre (Bandari College)
- Kenya Maritime Authority
- Kenya Ports Authority (KPA)
- Kenya Forest Service
- Kenya Fishing Industries Corporation

Regulatory & Governance Challenges

- Overlap in various laws e.g.
 - ▣ different statutes create different criminal offences and penalties over the fisheries resources.
 - ▣ overlap in requirements on the issuance of permits and licences.
 - ▣ These problems lead to confusion in implementation or lack of it hence prosecution may not be undertaken since none of the agencies involved take a lead role.
 - ▣ This is exacerbated by lack of co-ordination between the relevant agencies

Regulatory & Governance Challenges

- There are gaps, omissions and loopholes in the current legal and policy framework governing the fisheries industry e.g. the fish feed certification, mechanisms to monitor compliance to fish feed production.
- Other evident gaps include:
 - ▣ lack of an integrated national ocean law
 - ▣ lack of an ocean fisheries and mariculture policy and law and specific legal framework dealing with exploitation of ocean fisheries and deep sea fisheries management
 - ▣ Laws & policies addressing the utilisation of ocean resources are contained in various fragmented pieces of legislation
 - ▣ Developments of regulations required to support specific laws take too long. This leads to loopholes which can be exploited since the relevant guidelines are lacking.

Regulatory & Governance Challenges

- The above problems are aggravated by the ineffective enforcement of fisheries laws and regulations due to insufficient number of enforcement staff & lack of involvement of the stakeholders who are expected to play a role in implementation
- There is need therefore to bring together all the relevant stakeholders in order to ensure effective implementation
- Since development of the blue economy is now gaining momentum it is necessary to review the existing policy and regulatory frameworks then work towards their integration. The regulatory review can be preceded by a blue economy survey this will provide data that can assist in drafting of a comprehensive regulatory framework that captures relevant aspects.

Conclusions and recommendations

- Annual official capture fisheries production statistics has been grossly under-estimated. There is need to adopt reconstructed estimates
- Catches landed from artisanal-scale reef finfish fishery are declining due to overfishing within the reefs. Appropriate measures should be put in place to address overfishing within the coral reefs
- Mariculture has registered some growth with seaweed farming attracting a number of villages. However, it has not realized its potential with most mariculture initiatives stagnating at the pilot phase for many years due to challenges of seed and feed, ineffective monitoring and evaluation planning and execution embedded in their operations to keep project activities on track.
- A coordinated effort by the national and county governments, private operators, and NGOs is needed to address the constraints

Conclusions and recommendations

- A comprehensive institutional framework has been developed to ensure effective management and development of capture fisheries and mariculture based on the Fisheries Management and Development Act, 2016, which is the primary law on fisheries & aquac.
- Aquaculture technologies that may need to be promoted towards development of BE through mariculture and coastal aquaculture include cage culture in the ocean, coastal lakes and rivers, ... and tailor-made production for the live-fish market.

THANKS