THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF LIVESTOCK AND FISHERIES

FISHERIES SECTOR MASTER PLAN

(2021/22–2036/37)

Prepared by the Ministry of Livestock and Fisheries

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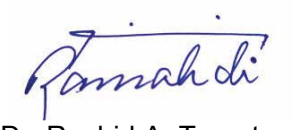
FOREWORD

The Fisheries Sector in Tanzania is comprised of capture fisheries and aquaculture value chains. The sector has been growing at an average annual rate of 1.5% and play important roles in food security and socio-economic wellbeing. Current per capita fish consumption is 8.5 kg and contributes 30% of daily animal protein intake. It also contributes 1.7% of the GDP and provides direct employment 195,435 fishers and 30,064 aquafarmers. In addition, about 4.5 million people (6.89% of total population) are indirect employment in various ancillary activities along the two value chains. The sector activities are dominated by small scale operations undertaken by artisanal fishers and subsistence aquafarmers which are responsible for over 95% of the fish production. There are several challenges which face the sector limiting its contribution to economy. These include limited extension services, limited access to finance, high post-harvest losses and limited value addition, limited access to appropriate fishing and aquaculture technologies, environmental degradation of aquatic ecosystems, illegal, unreported and unregulated fishing, illegal cross border trade, low public and private investment. To address these challenges, the Government embarked on implementing the first Fisheries Sector Master Plan (2002–2015). Several achievements were recorded including increased fish catch, increased public awareness of aquaculture, major public investments in infrastructure notably Ferry and Kirumba International fish markets which catalyzed cross-border trade of fish and fish products. However, increased demand for fish and fish products due population growth put pressure on fisheries resources. This calls for more effective fisheries management and increased aquaculture production.

Development of the second Fisheries Sector Master Plan (2021/22–2036/37) has been based on principles of the Ecosystem Approach to Fisheries and Aquaculture (EAF & A). It involved extensive consultations with stakeholders to identify, prioritize and propose solutions to critical issues affecting capture fisheries and aquaculture value chains. The plan is therefore comprised of two major parts namely; capture fisheries and aquaculture to ensure effective development and management of the two value chains. This master plan will provide an overall strategic framework and guidance for sustainable management and development of fisheries and aquaculture in mainland Tanzania in the next 15 years. It is comprehensive enough to achieve national, continental and global goals in food and nutritional security, poverty reduction, job creation, resilience against climate change impacts and conservation of aquatic ecosystems. The implementation of this Master Plan will involve fisheries sector stakeholders from both public and private sectors, development partners and financial institutions. I urge all stakeholders to concentrate their efforts in implementing interventions proposed in the master plan to transform the sector and significantly increase its contribution to the national economy.

Last but not least, I wish to convey my heartfelt gratitude to all individuals and entities who played different roles in the course of developing this master plan. In particular, I am grateful to FAO for providing technical and financial support, and the World Bank through the SWIOFish project for supporting workshops for stakeholders along the Indian ocean.



Dr. Rashid A. Tamatamah
Permanent Secretary (Fisheries),
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EXECUTIVE SUMMARY

The fisheries sector in Tanzania combines capture fisheries and aquaculture. Tanzania is one of the greatest fisheries nations in Africa, ranking in the top 10 countries in terms of total capture fisheries production. The fishery industry is dominated with small-scale fishers and aquafarmers, contributing more than 95% of the country's total catch. The Fish catch from inland water and marine ranged from 375,533 tonnes in 2005 to 473,592 tonnes in 2020, with an annual average of 395,006 tonnes. The increase in catch was due to a significant reduction of illegal harvesting methods, following various enforcement campaigns that were undertaken by the government and its counterparts and an improved recording system.

The fishery industry is among the most important economic sub sectors in Tanzania and it remains a key source of employment, food security, and revenue for the country. The number of fishers engaged directly in fishing is about 200,000, while about 4,500,000 people obtain their livelihood from the sector through fishery-related activities. The contribution of the sector to the Gross Domestic Product (GDP) for the past five years has been fluctuating between 1.6% and 1.8%, which is still low compared to the available fisheries resource potential (Ministry of Livestock and Fisheries, 2021).

On the other hand, mainland Tanzania has enormous untapped potential for aquaculture development. It has water (both freshwater and marine), land, a legal framework that supports aquaculture and a favourable climate. Despite the availability of the huge aquaculture potential, the subsector does not make a major contribution to the nation's economic development mainly because of inadequate affordable quality seeds and feed, poor aquaculture management practices, and unreliable financial capital. The current aquaculture production of 18,717 metric tonnes (less than 4% of the overall fish production) is very low. Thus, concerted efforts are needed to develop aquaculture to the required level in order to bridge the gap between demand and supply.

The government seeks to utilize the capture fisheries and aquaculture potential and opportunities to ensure the creation of jobs and wealth, food security as well as the increasing contribution of the subsectors to economic development. At present Tanzania has a robust legal and policy framework for aquaculture research and development. However, these statutory instruments have not been fully utilized to realize the needed development. There are several research and training institutions, as well as Aquaculture Development Centres which, if fully exploited, could make significant contributions to research, management, training and extension. Given the potential and opportunities available, it is imperative that the government and other stakeholders redouble their efforts to promote and develop aquaculture.

The government of Tanzania launched its first Fisheries Sector Master Plan (2002–2015) in 2002.Unfortunately, the first fisheries master plan, which was

phased out in 2015, did not include the major aspects of aquaculture development. During that time, more emphasis was placed on the management of capture fisheries and on a few cross-cutting issues. However, there was only one programme on aquaculture extension. In light of this, the current FMP (2021/22–2036/37) is notable for incorporating the key issues of aquaculture development.

This FSMP (2021/22–2036/37) provides a strategic framework for the long-term management and sustainable development of the sector. The FSMP is also an essential link to the National Fisheries Policy (2015), National Plan of Action for Small Scale Fisheries (NPoA-SSF) Guidelines (2021), and other local and global initiatives including the application of the Voluntary Guidelines on the Responsible Governance of Tenure (VGGT) in the institutional framework for improved governance and management geared towards the sustainable development of the capture fisheries and aquaculture resources. Broadly, the focus of the FSMP is on promoting 'blue economy', attracting investments, infrastructure development, value addition, the creation of an enabling environment and empowerment, improved technology, the promotion of underutilized resources, institutional capacity building, the utilization of untapped resources in the EEZ, industrial development, marketing, research and information sharing, aquaculture production and productivity, conservation of aquatic ecosystems, and combating IUU.

The current FSMP (2021/22–2036/37) comprises 17 thematic areas, with capture fisheries consisting of 8 thematic areas and aquaculture 9 thematic areas. The capture fisheries thematic areas include; (i) maintenance of the ecological systems and biodiversity, (ii) improved research, monitoring and a reporting system, (iii) empowerment of fishers and fish workers, (iv) institutional capacity building, (v) compliance and enforcement of management measures (vi) fisheries infrastructure development, (vii) exclusive economic zone (EEZ) and high seas fishing opportunities, and (viii) cross-cutting issues. While, the aquaculture thematic areas include; (i) supply of inputs for commercial aquaculture, (ii) improving research and training, (iii) improving extension services, (iv) Post-harvest handling, value addition and marketing of aquaculture products, (v) promoting investment, (vi) aquatic environmental health and spatial planning, (vii) aquaculture production technologies, (viii) ornamental fish culture and trade, and (ix) aquaculture cross-cutting issues.

The thematic areas for capture fisheries and aquaculture were developed on the basis of the identified issues and developed operational objectives. The thematic areas translate the relevant socio-economic and ecological values, high level priorities, policy statements and laws into a form that has a direct and practical bearing on the management and development of the fisheries sector.

The FSMP includes key interventions with clear operational objectives, outcomes and outputs. If these thematic areas are addressed properly in the next fifteen years, it is anticipated that the fisheries sector in Tanzania would attain sustainable fisheries resources management which supports fisheries

sector development, blue economy growth, improved livelihood, nutrition and food security.

Specifically, the following benefits will be realized from the implementation of the FSMP (2021/22–2036/37);

(i) the overall fisheries sector growth and an increase in its contribution to the GDP of 10% per annum;
(ii) increase in the overall fisheries production by at least 35% from the current total production;
(iii) increase in the volume of fish and fishery products processed and exported by 30%;
(iv) investment funds and financing mechanisms for supporting the growth of small-scale fishers and the development of small holder aquaculture enterprises;
(v) increased fish production from EEZ, Lake Victoria, Lake Tanganyika and minor waters for domestic and external markets;
(vi) improved maintenance of fish biodiversity and ecosystems through applied research and technology;
(vii) fisheries co-management, ecosystem approach to fisheries management and spatial planning strengthened and applied in all water bodies;
(viii) increased investment in fisheries infrastructures for handling, processing, storage and marketing to reduce post-harvest loss and application of appropriate technologies for value addition; and
(ix) improved fish and fishery marketing, conservation and extension services.

It is worth noting that the above benefits would be achieved if the following measures are adhered to:

(i) The implementation and coordination of the FSMP interventions mainstreamed in existing government framework. The coordination process should include the MLF in collaboration with other agricultural sector related ministries, institutions, development partners, agencies and other stakeholders such as; fishers, aquafarmers, traders, processors and their associations.
(ii) Monitoring of the FSMP progress undertaken through a Permanent Monitoring Committee established by the Ministry responsible for Fisheries; the committee would meet regularly to monitor the implementation progress of the FSMP, and coordinate development of the projects aimed to implement the proposed strategic interventions.

The implementation of the FSMP is estimated to cost USD 65,355,000 for capture fishery and USD 69,310,000 for aquaculture.

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PART I

LIST OF ABBREVIATIONS AND ACRONYMS

ADCs	:	Aquaculture Development Centres
AIDS		Acquired Immunodeficiency Syndrome
AIS	:	Automatic Identification System
ASARECA	:	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASDP II	:	Agricultural Sector Development Programme phase II
AU	:	African Union
AU – IBAR	:	African Union – Inter-African Bureau for Animal Resources
AU – NEPAD	:	African Union – New Partnership for Africa's Development
AfDB	:	African Development Bank
BMPs	:	Best Management Practices
BMUs	:	Beach Management Units
CAADP	:	Comprehensive Africa Agriculture Development Programme
CBD	:	Convention on Biological Diversity
CFMAs	:	Collaborative Fisheries Management Areas
CITES	:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	:	Convention on Conservation of Migratory Species of Wild Animals
CSO	:	Civil Society Organization
CSRP	:	Civil Service Reform Programme
DAq		Department of Aquaculture
DWFN	:	Distant Water Fishing Nations
EAC	:	East African Community
EAA		Ecosystem Approach to Aquaculture
EAF	:	Ecosystem Approach to Fisheries
EAMFRO	:	East African Marine Fisheries Research Organization
EEZ	:	Exclusive Economic Zone
EIA	:	Environmental Impact Assessment
EU	:	European Union
FADs	:	Fish Aggregating Devices
FAO	:	Food and Agriculture Organization of the United Nations
FCR		Feed Conversation Ratio
FETA	:	Fisheries Education and Training Agency
FMSP	:	Fisheries Sector Management Plan
FYDP II	:	Five-Year Development Plan II
DFOs	:	District Fisheries Officers
DSFA	:	Deep Sea Fishing Authority
GDP	:	Gross Domestic Product
HIV/AIDS	:	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IAA		Integrated Aquaculture-Agriculture
ILO	:	International Labour Organization
IOTC	:	Indian Ocean Tuna Commission
IUU	:	Illegal, Unreported and Unregulated Fishing
JICA	:	Japanese International Cooperation Agency

KMFRI	:	Kenya Marine Fisheries Research Institute
LGAs	:	Local Government Authorities
MCS	:	Monitoring, Control and Surveillance
LTA	:	Lake Tanganyika Authority
LVFO	:	Lake Victoria Fisheries Organization
M&E	:	Monitoring and Evaluation
MIT	:	Ministry of Industry and Trade
MLF	:	Ministry of Livestock and Fisheries
MoFP	:	Ministry of Finance and Planning
MPIC	:	Master Plan Implementation Committee
MPRU	:	Marine Parks and Reserves Unit
MSY	:	Maximum Sustainable Yield
NADs	:	National Aquaculture Development Strategic Plans
NaFIRRI	:	National Fisheries Resources Research Institute, Uganda
NAIS	:	National Aquaculture Information System
NEMC		National Environment Management Council
NEPAD	:	New Partnership for Africa's Development
NFAMPIC	:	National Fisheries and Aquaculture Master Plan Implementation Committee
NFQCL	:	National Five-Year Development Plan
NFYDP	:	Non-Governmental Organizations
NFQCLAB	:	National Fish Quality Control Laboratory
NMATT	:	National Multi-Agency Task Team
NGOs	:	Non-Governmental Organizations
NPC	:	National Project Coordinator
NPoA	:	National Plan of Action
NSGRP	:	National Strategy for Growth and Reduction of Poverty
NSSF	:	National Social Security Fund
NTA	:	National Technical Award
OSHA	:	Occupational Safety and Health Authority
OSCs	:	One Stop Centres
PO-PSMGG	:	President's Office Public Service Management and Good Governance
PO-RALG	:	President's Office, Regional Administration and Local Government Tanzania
PPP	:	Public–Private Partnership
PSM	:	Port State Measures
PSRC	:	Parastatal Sector Reform Commission
RAS	:	Recirculation Aquaculture System
SADC	:	Southern African Development Community
SEA	:	Strategic Environmental Assessment
SSF	:	Small Scale Fisheries
SDGs		Sustainable Development Goals
SPADA		Special Programme for Aquaculture Development in Africa

SSA		Sub-Saharan Africa
STDs		Sexually Transmitted Diseases
SWIOFish	:	South West Indian Ocean Fisheries Governance and Shared Growth
SWOC	:	Strengths, Weaknesses, Opportunities and Challenges
TAAT	:	Technologies for African Agricultural Transformation
TAFICO	:	Tanzania Fisheries Corporation
TAFIRI	:	Tanzania Fisheries Research Institute
TDV 2025	:	Tanzania Development Vision 2025
TFDA	:	Tanzania Foods and Drugs Authority
ToRs	:	Terms of Reference
UN	:	United Nations
UNCLOS	:	United Nations Convention on the Law of the Sea
USD	:	United States Dollar
URT	:	United Republic of Tanzania
VGGT		Voluntary Guidelines on the Responsible Governance of Tenure
VLCs	:	Village Liaison Committees
WIO	:	Western Indian Ocean
WIOMSA	:	Western Indian Ocean Marine Science Association
ZAEDP	:	Zambia Aquaculture Enterprise Development Project

PART 1

CAPTURE FISHERIES

CHAPTER 1

1.0 INTRODUCTION

1.1 Background Information

The United Republic of Tanzania (URT) is a coastal state located in the Western Indian Ocean (WIO) region. It is situated in Equatorial East Africa and lies just south of the Equator, between 1°00'–11°45' S and 29°21'–40°25' E. The country's total surface area is 945,040 km^2, 881,000 km^2 on the mainland and 2,650 km^2 on the islands of Zanzibar (Figure 1). The URT was formed as a sovereign state in 1964 after uniting the Republic of Tanganyika and the People's Republic of Zanzibar. The country is covered by various water bodies, including major and small lakes, a diverse river system, numerous wetlands and a coastline of 1,424 km, which stretches from the northern border with Kenya to the southern border with Mozambique. It covers a territorial sea of 64,000 km^2 and an Exclusive Economic Zone (EEZ) of 200 nautical miles, with an area of 223,000 km^2. Most of the inland water areas are found in the riparian shared water bodies of the East African Great Lakes, namely Lake Victoria (the second largest freshwater body in the world with 68,800 km^2 (shared by Tanzania 51%, Uganda 43%, and Kenya 6%); Lake Tanganyika (the second deepest after Lake Baikal in Siberia, Russia and the world's longest freshwater lake) 32,900 km^2 (shared by Tanzania 41%, Democratic Republic of the Congo 45%, Burundi 8% and Zambia 6%); and Lake Nyasa shared by Tanzania, Mozambique and Malawi.

Tanzania is one among the greatest fisheries nations in Africa, ranking in the top 10 countries in terms of total capture fisheries production (URT, 2015). The fisheries sector in Tanzania combines capture fisheries, aquaculture and the conservation of the critical habitats in areas gazetted as Marine Protected Areas (MPAs). The fishery activities range from artisanal fishing, a category of fisheries that is small scale, using a relatively small amount of capital in all the freshwater bodies as well as the territorial waters in the Indian Ocean; to industrial fishing (large scale), composed of prawn fishing in the territorial sea and fishing in the EEZ.

The small-scale fishery activities contribute more than 95% of the country's total catches and play a significant role in socio-economic development by providing substantial employment, income, food security, animal protein, foreign exchange and improved livelihoods for the fishing communities. The fisheries sector is among the important economic sub-sectors, contributing approximately 1.7% to the national Gross Domestic Product (GDP), the per capita fish consumption is 8.5 kilogram, and about 30% of animal protein consumption in Tanzania is from fish. It grows at an average of 1.5% per annum (MLF, 2020). The sector provides both direct and indirect employment to people who earn a living by doing various fisheries-related activities. It is also a source of foreign earnings; an average 10.5% of annual fish landings are exported to various regional and international markets. A big share of these products comes from inland waters. The main export product is the Nile perch (*Lates niloticus*) from Lake Victoria.

Figure 1: Map of Tanzania showing the location of different water bodies.

Map No. 3667 Rev. 6 UNITED NATIONS
January 2006

Department of Peacekeeping Operations
Cartographic Section

The first fisheries master plan was developed in 2002 with support from the Japan International Cooperation Agency (JICA), despite the fact that Tanzania is blessed with abundant fishery resources (marine and fresh waters) and the fact that the fisheries sector is one of the important sub-sectors of the economy. The first master plan (2002–2015) was phased out in 2015. The phasing out of the previous master plan created room for its review and for the development of this master plan. The review of the previous master plan and the development of the FSMP (2021–2036) began in 2020 with financial and technical support from the Food and Agriculture Organization of the United Nations (FAO).

1.2 Purpose, Rationale and Scope of the Fisheries Sector Master Plan

1.2.1 Purpose of the FSMP

The development of the FSMP underscores the seriousness and commitment of Tanzania to manage its natural resources on a sustainable basis and for the benefit of current and future generations. The FSMP is intended to address the existing challenges and emerging issues. It is also a link to the National Plan of Action (NPoA) for Small Scale Fisheries (SSF) Guidelines and the National Fisheries Policy (2015), for improved fisheries governance and sustainable development of the fisheries resources.

The FSMP provides a strategic framework for the long-term management and sustainable development of the sector, and an opportunity for the sector leaders to look ahead, adopt a new vision and directions, set goals and map out plans for the future. It is intended to improve the management and development of the fisheries sector and to increase food security, employment opportunities, economic growth and wealth through poverty alleviation and by safeguarding the environment. The FSMP guides the overall character, physical forms, growth, management and development of the fisheries sector, and acts as a reminder of what the Ministry of Livestock and Fisheries and its stakeholders have agreed to accomplish within the specified period. It is also intended to provide guidance to anyone intending to work with or in the fisheries sector in mainland Tanzania, including potential investors, donors, development partners and NGOs.

1.2.2 Rationale for developing the FSMP

The development of the FSMP (2021–2036) has been driven by the recognition of the need for a planning framework that underpins the government's commitment to manage and develop fisheries. The rationale for developing this FSMP stems from the following factors:

(i) Phasing out of the previous fisheries Master Plan (2002–2015): The master plan came to an end in 2015. Hence, there was a need to review it and develop a new master plan to guide the management and development of this important sector.

(ii) Change of policies and other national and global development initiatives: This is due to local and international changes, including policies, strategies, the micro- and macro-economic, and institutional set-up as well as environmental changes, which have made it difficult to coordinate and manage responsibilities in the fisheries sector to achieve sustainable utilization of the resources. Other changes include climate change, which has affected the development of the fisheries sector.

(iii) The need to implement the Fisheries Policy of 2015: The fisheries sector requires a dynamic master plan for the implementation of the recently developed fisheries policy.

(iv) The need to operationalize the mandates and functions of the Fisheries Division: For the Fisheries Division to take up the opportunities offered by a number of stakeholders within its jurisdiction, it is important for the Division to identify thematic areas which will be used to link the sector with other key players in the areas of common interests.

(v) The need to implement the third Tanzania Five-Year Development Plan 2021/22–2025/26 and Tanzania Development Vision (TDV) 2025: The fisheries sector and associated institutions are, like other organizations, obliged to implement the country's development agenda, articulated in the TDV. Both plans have considered the overall national development goals and policy objectives, sectoral initiatives, the National Strategy for Growth and Reduction of Poverty (NSGRP II) and the key benchmarks of the Long-Term Perspective Plan (2011/12–2025/26).

(vi) The need to conform to public-sector reforms and the election manifesto of the ruling party (CCM): Strategic initiatives are needed to transform the fisheries sector so that it can embrace both the public-sector reform programmes and the election manifesto of the ruling party.

(vii) The need to accommodate Regional and International Protocols, Agreements and Conventions, the Sustainable Development Goals (SDGs) as well as other policies related to fisheries and environmental conservation: One of the priorities of the nation is to build a fisheries sector which will comply with the global agenda and enable Tanzanians to get their livelihoods without compromising the ability of future generations to meet their needs.

(viii) The need to conform to the National Plan of Action (NPoA) for Small-Scale Fisheries (SSF): This is aimed at reducing poverty, creating decent employment, social protection of small-scale fishers and improving the livelihoods of the fishing communities (fishers and fish workers). Tanzania has already developed and inaugurated its National Plan of Action to implement Guidelines for Small-Scale Fisheries which will be implemented in the next five years (2021/22–2025/26). The implementation of these NPoA-SSF Guidelines will enable the country to achieve responsible SSF and sustainable development of the sector,

which will enable the fishers to secure more significant socio-economic benefits from well managed fisheries resources.

(ix) The need to transform the fisheries sector by modernization, through intensification of the blue economy potentials in both marine and fresh waters, while adhering to environmental sustainability.

1.2.3 Scope of the FSMP

The FSMP will only be implemented in mainland Tanzania because the fisheries sector is not among the Union matters that are implemented or taken care of by both parts of the Union, namely mainland Tanzania and Zanzibar.

The FSMP is intended to ensure that there is sustainable management of fisheries resources by striking a balance between conservation and resource utilization to attain sustainable development. Its management approach is participatory, in the sense that various stakeholders are involved at different levels of management such as undertaking of various activities, decision making, benefit sharing, monitoring and evaluation. While the development of the sector will involve both the public sector and the private sector, the focus of the FSMP is on:

(i) Attracting investment, both private and joint venture, in the form of public-private partnership (PPP),

(ii) Infrastructure development,

(iii) Value addition,

(iv) Creation of an enabling environment and empowerment,

(v) Improved technology,

(vi) Promotion of underutilized resources,

(vii) Industrial development, and

(viii) Marketing, research, and information sharing.

Content-wise, the FSMP is very broad as it is not restricted only to fisheries sector issues, but also focuses on cross-cutting issues and issues related to the sector such as:

(i) food security,

(ii) poverty alleviation,

(iii) governance,

(iv) climate change,

(v) post-harvest loss,

(vi) environmental degradation,

(vii) unsustainable management of fisheries resources,

(viii) illegal, unreported and unregulated (IUU) fishing,

(ix) cross-border trade,

(x) high dependence on the fisheries resources, and

(xi) the contribution of the fisheries sector to the blue economy so that services and goods can be delivered for the purpose of attaining human well-being and ecological well-being.

The fisheries sector is dependent on other sectors. It is for this reason that the development, management and conservation of fisheries cannot be considered in isolation or separately from other sectoral influences.

1.3 Target Audience of the FSMP

The FSMP is intended to inform all interested parties about various issues related to the fisheries sector, which comprises both capture fisheries and aquaculture. The audience of this master plan includes all the stakeholders of the fisheries sector that were identified during the stakeholders' analysis exercise that was conducted concurrently with the collection of baseline information. The involvement of the stakeholders from the beginning of developing of the FSMP increases their sense of ownership and commitment to participate in its implementation voluntarily. Tanzania has realized the importance of people's participation in managing fisheries and, therefore, the National Fisheries Policy of 2015 recognizes and duly supports stakeholders' participation in the sector to achieve the sustainable sector management goals. The policy states that "successful implementation of the policy and the performance of the fisheries sector will depend on both vertical and horizontal coordination of activities" (URT, 2015).

The stakeholders include the Ministry of Livestock and Fisheries (MLF), other sector ministries, institutions, the private sector, local and international NGOs, local communities, the regional and the international community, development partners, agencies and other key stakeholders, researchers/scientists, conservationists, investors and traders (Appendix 1).

CHAPTER 2

2.0 METHODOLOGY AND APPROACH

2.1 The Fisheries Sector Master Plan Development Approach

The development of the FSMP was done in a participatory manner using an Ecosystem Approach to Fisheries (EAF). As an approach and a tool, the EAF refers to a management philosophy that strives to balance diverse societal objectives by taking account of the knowledge and uncertainties about the biotic, abiotic and human components of ecosystems and their interactions, and applying an integrated approach to fisheries within ecologically meaningful boundaries (FAO, 2003). This simply means that sustainable development relies on effective governance as a key mechanism for achieving both human and ecological well-being (Figure 2).

In a nutshell, the EAF is a practical way to implement sustainable development principles; it is an integrated approach that allows for trade-offs during the balancing of human well-being (social and economic) and ecological well-being (fish and environment) through good governance (legal and institutional framework). It includes a broad set of objectives and a participatory, precautionary and adaptive process. It is against this background that the EAF has been used to develop the FSMP with a comprehensive fishery management system that seeks to ensure sustainable and equitable use of the whole system (ecological and human) to best meet community needs and values.

Using the EAF, the development of the FSMP was done in the following steps;

(i) Collection of baseline information;

(ii) Organising stakeholders' workshops for validating and adopting the baseline information, and identifying any issues; and

(iii) Using a problem tree to separate issues from causes, effects and drivers in order to identify core problems as concrete issues that should be addressed by this master plan.

Other activities used to inform the process were:

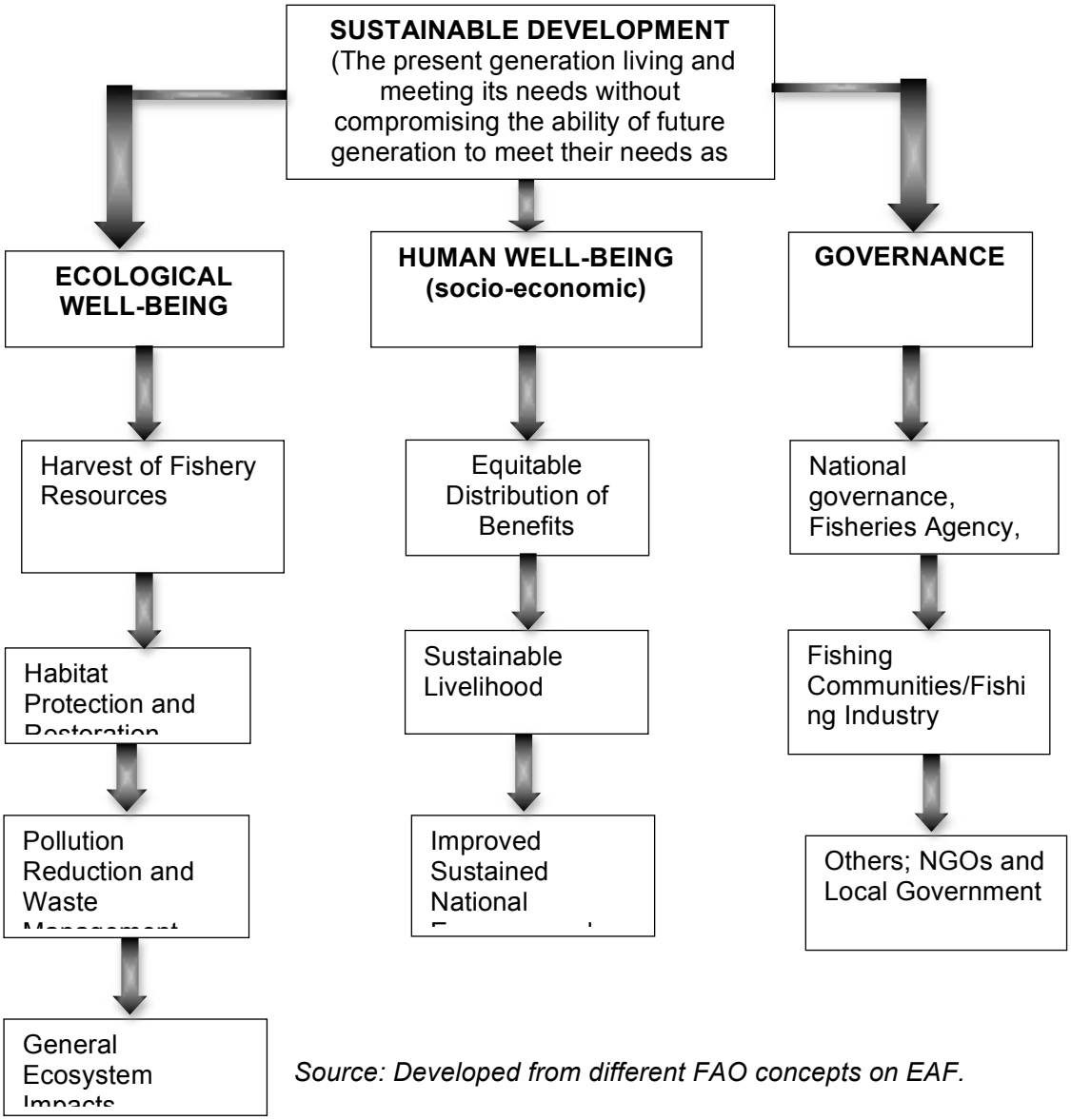
(i) a checklist,

(ii) a questionnaire survey,

(iii) an extensive review of related documents, and

(iv) an analysis of the strengths, weaknesses, opportunities and challenges (SWOC).

Figure 2: A conceptual framework showing how sustainable development relies on governance for achieving the human well-being and the ecological well-being.



Source: Developed from different FAO concepts on EAF.

2.2 Methodology for Developing the FSMP

2.2.1 Baseline information on the fisheries sector

The development of the FSMP started with a collection of baseline information on the fisheries sector in Tanzania; this was done during the initiation and scoping phases. The report on baseline information provided a comprehensive status of the sector, particularly on small-scale capture fisheries in all potential

water bodies and aquaculture to inform the development of the FSMP. The report also showed the status of the fishery resource, provided a description of trends of the marine and inland capture fisheries as well as of aquaculture, the economic importance of the fisheries sector, the management of fisheries, training in fisheries, research and extension services, the fisheries and aquaculture infrastructure, fish and fishery products, quality assurance and standards, a markets analysis, monitoring, control and surveillance (MCS), and the opportunities and challenges in the fisheries sector in the country.

2.2.2 Fisheries stakeholders' workshops

Fisheries stakeholders' workshops were held in Mwanza, Mbeya and Tanga. The workshops attracted stakeholders' representatives who benefit from the following water bodies; Lake Victoria, Lake Tanganyika, Lake Nyasa and the small water bodies in the South-West highland regions of Tanzania, and the Indian Ocean and river systems. The workshops were aimed at validating and adopting the baseline report, brainstorming on issues hindering the development of the sector and its contribution to improved livelihoods and to the national economy. The workshops were also used as avenues for kicking off the development of the FSMP by creating a shared understanding and ownership of priority issues, operational objectives and strategic interventions to address the issues identified. Since the overall objective of the National Fisheries Sector Policy is *"to develop a robust, competitive and efficient fisheries sector that contributes to food security and nutrition, growth of the national economy and improvement of the wellbeing of the fisheries stakeholders while conserving the environment",* this became the overarching focus of the FSMP.

2.2.3 Problem tree

During the stakeholders' workshops, the problem tree was used as a tool to separate threats and issues from causes, effects and drivers in order to identify core problems as concrete issues. The issues formed the basis for developing operational objectives, while the causes of the problems were used to develop strategic interventions. Since the importance of many issues varies and since not all issues require explicit management and often there are not enough resources for addressing everything, the issues identified were condensed and prioritized prior to the development of operational objectives.

The prioritization of issues was done based on a risk assessment, especially likelihood and impacts, considering the fact that risk is the effect of uncertainty to meet objectives. Other prioritization criteria included; (i) tasks assigned to the fisheries sector under international and national policies, laws and other directives; (ii) the sector's capability to make the contribution it is expected to make to the national economy; (iii) its capability to satisfy needs for the development and management of fisheries; and (iv) political, scientific, technological and economic factors.

2.2.4 Key informant interviews

A checklist for key informants was designed to collect information on the implementation status of the previous master plan (2002–2015) in order to

review it. The information that was collected using the checklist complemented the information that was obtained from the master plan implementation reports. The key informants included clientele and informed outsiders who were accessible and willing to talk, and who had enough knowledge of the fisheries sector. Thus, the key informants included officials from the Ministry, Local Government Authorities and staff members who had information on the implementation of the previous master plan.

2.2.5 Questionnaire

A questionnaire was used to collect information from different groups of stakeholders' representatives. The questionnaires were administered concurrently with the exercise of collecting baseline information. Specifically, the questionnaire was designed and developed by the Ministry for the purpose of collecting socio-economic data and other relevant information for developing the FSMP from stakeholders who were not invited in the stakeholders' workshops (Appendix 3). The questionnaire comprised many open-ended questions. Such questions were used because they made it possible for the informants to give their own answers.

2.2.6 Extensive review of documents

Secondary data was collected from relevant documents throughout the FSMP development process. The documents reviewed included the Fisheries Policy (2015), Tanzania Vision 2025, the Third Five-Year National Development Plan (2021/22–2025/26), the Fisheries Sector Development Programme (FSDP) (2010), the National Plan of Action for Small Scale Fisheries (2021) and the Fisheries Act (2003) and Regulations (2009). Other related documents were regulations, articles, priority fisheries management plans, strategic plans and the baseline report, which shows the current status of the fisheries sector in mainland Tanzania. Additional information was collected from different government ministries, departments and non-governmental organizations involved in fisheries activities.

2.2.7 SWOC analysis

SWOC analysis as a strategic planning tool was done during collection of baseline information by different stakeholders to identify the external and internal factors inhibiting the success and growth of the fisheries sector. The tool provided a comprehensive internal picture (strengths and weaknesses) and an external picture (opportunities and challenges). The analysis of internal factors provided information on how the sector should capitalize on its strengths and address the weaknesses, while the analysis of the external environment helped to identify opportunities and take appropriate measures to exploit the existing opportunities and to overcome/address the challenges facing the sector. As far as the FSMP is concerned, the tool was used to determine the status of the fisheries sector and its sustainability.

CHAPTER 3

3.0 GENERAL STATUS OF THE FISHERIES SECTOR

3.1 Overview

Tanzania is endowed with a rich diversity of tropical marine and freshwater ecosystems, and associated organisms. These provide the country with economic opportunities that require development for the benefit of the people residing within or adjacent to such areas and the entire country.

Inland water ecosystems occupy 20% of the total land area. Fishing activities in inland waters are mainly carried out in the three major lakes, also known as the Great Lakes or internationally shared lakes, namely Lake Victoria, Lake Tanganyika and Lake Nyasa. There are also small water bodies, including satellite lakes, rivers, wetlands and dams. The small lakes in which significant fisheries take place include Babati, Manyara and Rukwa, and various smaller lakes with insignificant fish biomass. The major rivers are Pangani, Wami, Ruvu, Rufiji and Ruvuma. Other rivers are Malagarasi, Ruaha, Kagera, Mara, Mbwemkuru and Lukuledi. The major wetlands include Kilombero, Malagarasi-Muyovosi, Rufiji-Mafia (include, freshwater, brackish and marine), Lake Natron and Ihefu. Fishing in inland waters is dominated by artisanal/small-scale fishery. Fish landings from inland waters are estimated to be 384,356 metric tonnes which is equivalent to 78.63% of the total weight of fish captured in Tanzania (Table 1).

Coastal and marine ecosystems occupy an area of about 241,500 km^2, equivalent to about 20% of total land area of the country. Marine fisheries are divided into artisanal and industrial fisheries. Artisanal fisheries take place in the territorial waters (a 12 -nautical miles stretch). The catch mostly consists of finfish and, to a small extent, shrimps. Artisanal fisheries are dominated by traditional small craft (3-11 m long) and traditional fishing methods. Semi-industrial/industrial fisheries are done in both territorial waters and the exclusive economic zone (EEZ), targeting shellfish (prawns/shrimps - white prawns (*Fenneropenaeus indicus*), giant black prawns (*Penaeus monodon*), tiger prawns (*P. semisulcatus*) and brown shrimp (*Metapenaeus monoceros*), lobsters, cephalopods and crabs) and finfish species belonging to the families of Lutjanidae, Lethrinidae, Pomacentridae, Scombridae, Flatfishes, etc. in the territorial waters; and tuna as well as tuna-like species, including marlin, swordfish, yellowfin tuna, skipjack tuna, bigeye tuna and sharks in the EEZ. Marine capture fish production was 86,467 metric tonnes equivalent to 17.69% of total fisheries (inland and marine) production (Table 1).

Table 1: Inland waters and marine areas fishery and aquaculture production in 2019.

Inland waters	**Tonnes**	%
Aquaculture production (freshwater)	16204	3.31
Capture production	384356	78.63
Sub Total	**400560**	81.94
Marine areas		
Aquaculture production (brackish-water)	360	0.07
Aquaculture production (marine)	1449	0.30
Capture production	86467	17.69
Sub Total	**88276**	18.06
Grand Total	**488836**	100

Source: FAO. 2021. Fishery and Aquaculture Statistics. Global production by production source 1950-2019 (FishstatJ). In: FAO Fisheries Division [online]. Rome. Updated 2021. www.fao.org/fishery/statistics/software/fishstatj/en

3.2 Importance of the Fisheries Sector

The fisheries sector has high potential to develop and contribute to the national economy. The contribution of the fisheries sector to the GDP is approximately 1.7% per annum and has been growing at an average rate of 1.5% (URT, 2020). The per capita fish consumption in Tanzania is 8.5 kg person^{-1} year^{-1} (URT, 2019), which is lower than FAO's estimates for the global per capita fish consumption of 20.5 kg person^{-1} year^{-1} (FAO, 2020). The per capita fish consumption of people residing along water bodies is higher, though figures from each water body are not established yet. Fisheries contribute to economic growth and human welfare in many developing countries, including Tanzania.

Fish is an important source of nutrients including; protein, fatty acids and minerals, particularly in areas where the consumption of fish is high. The sector plays a significant role in socio-economic development, foreign exchange and employment. Fisheries provided direct employment to fishers, with the number increasing over time, from 133,197 in 2005 to 195,435 in 2020 (Ministry of Livestock and Fisheries, 2020). This is attributed to the fact that in most coastal areas, there are no alternative income generating activities apart from fishing. About 200,000 people (0.35%) are full-time small-scale fishers and approximately 4.5 million Tanzanians (6.89%) are indirectly employed in the fisheries industry in the mainland Tanzania. The latter work in boat building

(there are about 5 boat building companies (Dar es Salaam, Mwanza, Mikindani, Kigoma and Mbamba Bay)), fish mongering, fishing net manufacturing (4 companies), net mending, fish trading and small scale fish processors at the beach. Others work for fisheries institutions, fish processing factories, fish shops (butcheries) and NGOs (Ministry of Livestock and Fisheries, 2018).

Luomba *et al.* (2013) and Igulu *et al.* (2014) revealed that fishers engage in other income generation activities to meet their daily needs and to subsidize their income. The main activities that the fishers are involved in to supplement their income are farming of both cash and food crops (if the environment is conducive), livestock keeping (cows, sheep, goats), petty business such as food kiosks, making of local brews and selling of clothes. It was estimated that about 58% of the fishers have more than one source of income (Luomba *et al.*, 2013). The fishers' income is mostly spent on various activities but, a large proportion use their income on the basic needs such as, food, clothes, shelter, medical service and education. Interestingly, the crews spend much of their money on entertainment such as alcohol, sex, attending video shows and night disco at the landing sites. However, from an economic point of view, fishing and related activities have been a major employer and contributor to the economy. The parameters that have been considered to compare the economic status of the countries are: annual fish production, balance of trade for fisheries sector and contribution of fisheries sector to the gross domestic product (GDP) of the particular nation.

The fisheries sector is among the priority sectors in the National Strategy for Growth and Reduction of Poverty II (NSGRP). The NSGRP is a medium-term mechanism to achieve the aspirations articulated in Tanzania Development Vision 2025 (TDV 2025), which is geared at transforming Tanzania into a middle-income country, characterized by: (i) high quality livelihoods; (ii) peace, stability and unity; (iii) good governance; (iv) a well-educated and learning society; and (v) a strong and competitive economy. It is worth noting that, Tanzania reached an important milestone in July 2020, when it formally moved from a low-income country to a lower middle-income country (World Bank, 2020), five years ahead of time. The NSGRP II translates the aspirations in Vision 2025 into measurable, broad outcomes organized under three clusters, namely Growth of Income for the Reduction of Poverty; Improvement of the Quality of Life and Social Well-being; and Governance and Accountability.

3.3 Fisheries Production in Tanzania

Over the last decade, the fish catch from inland and marine waters ranged from 375,533 tonnes in 2005 to 473,592 tonnes in 2020 (MLF, 2020). About 85% of the production was from inland capture fisheries, 14% from marine capture fisheries and 1% from aquaculture. Major commercial species include the Nile perch (*Lates niloticus*), the Nile tilapia (*Oreochromis niloticus*) and the Lake Victoria sardines (also known as Silver cyprinid - *Rastrineobola argentea*) while commercial marine fish, including both territorial and EEZ species are as

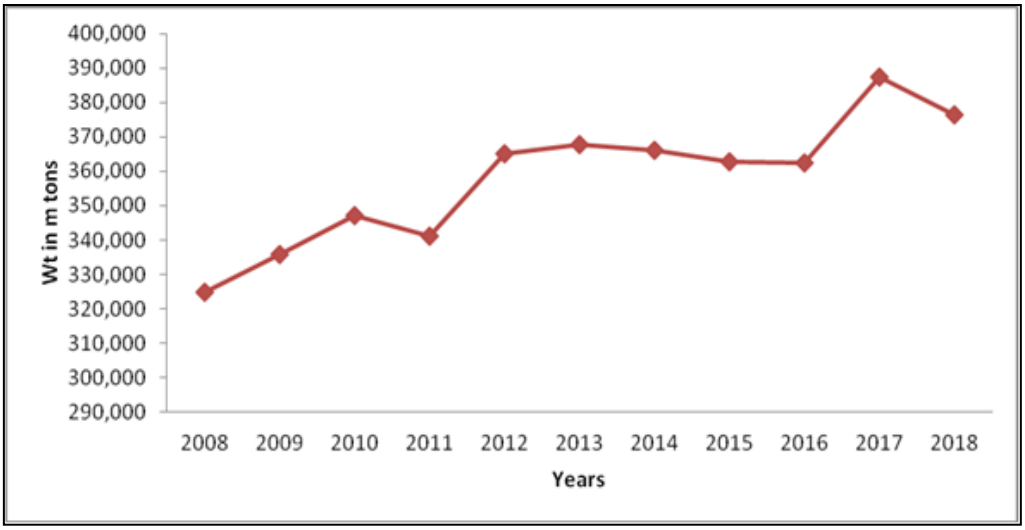
mentioned in sub-section 3.1. The production of fish in both inland and marine waters in the past fifteen years (2005–2020) is shown in Table 2.

The annual fish production of a country is used as an indicator of the performance of the fisheries sector. According to the available annual fisheries statistical reports (2008–2018), the fisheries production in Tanzania fluctuates, with an increasing trend overtime. The trend of estimated fish catches from inland and marine fisheries in ten years from 2008 to 2018 combined, ranged from 324,821 tonnes in 2008 to 363,153 tonnes in 2018, with annual average of 356,035 tonnes (Figure 3). In the past ten years (2008–2018), the contribution of the sector to the GDP has ranged between 2.4% (2009) and 1.71% (2018) (National Bureau of Statistics, 2019).

Table 2: Fish production in inland and marine waters (2005–2020.

Year	Inland Annual Catch (in Metric Tonnes)	Marine Annual Catch (in Metric Tonnes)
2005	320,566	54,967
2006	292,519	48,591
2007	284,347	43,499
2008	281,691	43,130
2009	288,059	47,615
2010	294,474	52,683
2011	290,474	50,592
2012	314,944	50,079
2013	315,008	52,846
2014	314,061	51,912
2015	309,922	52,723
2016	308,771	53,823
2017	332,373	55,169
2018	309,922	53,231
2019	409,333	60,977
2020	409,828	63,764

Figure 3: Catch trends (inland and marine combined) from 2008 to 2018.



Source: Division of Fisheries

In 2020, a total of 473,592 tonnes of fish worth TZS 2.37 trillion (USD 1.03 billion) were harvested compared to 362,645 tonnes worth 1.48 trillion shillings which were harvested in 2015. Out of the 2020 harvest, 409,828.31 tonnes were harvested from inland waters and 63,763.93 tonnes from marine waters compared to 470,309.5 tonnes harvested in 2019, of which 409,333 tonnes were harvested from inland waters and 60,976.51 tonnes from marine waters. The increase in the harvest was due to the decline of illegal fishing activities (URT, 2020). Such an increase may also be attributed to unregistered fishes, which currently are being recorded.

3.4 Export and Import of Fish and Fisheries Products

With respect to the fish trade and marketing, Tanzania is both an importer and exporter of fish and fishery products. The export of these products is done to earn foreign exchange for undertaking various government development activities. However, some of the revenues obtained are ploughed back into the Fisheries Division so that it can carry out its various activities such as management, training, monitoring and development of the sector.

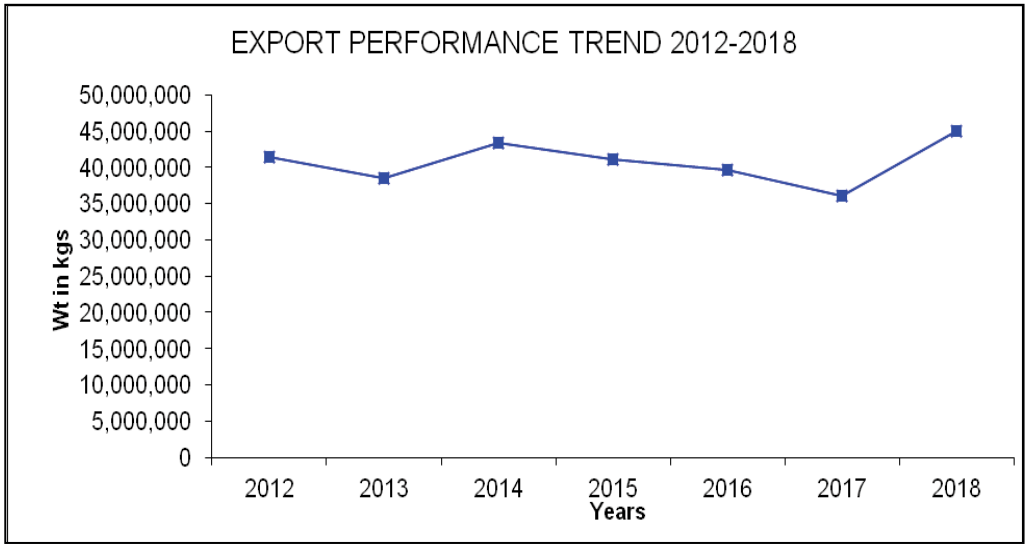
The demand for fish is very high in Tanzania. The fish available are not sufficient; this is due to the high population growth resulting in needs that surpass fish supply. Currently, the government and other stakeholders are promoting aquaculture to supplement the capture fisheries and to increase food security and livelihoods (see Part II).

3.4.1 Export of fish

It is mainly Nile perch fillets that are exported to international markets (mainly to the European Union, Japan and the United States); dried Lake Victoria sardines

are exported to regional markets (mainly to Democratic Republic of the Congo, Zambia, Malawi, Burundi). Other fishery products that are exported include crabs, prawns, fish maws, octopus, seashells, live lobsters, squid, seaweed and ornamental fish. In the past seven years, the country has exported 285,076,209 kg of fish (Figure 4). Increased exports of fishery products from an average of 379 billion shillings, equivalent to USD 164,782,608.7 per annum in 2008/2009 to 691 billion shillings, equivalent to USD 300,434,782.6 in 2018/2019, registered an increase of 82.3%, which depicts a significant increase that enabled the country to earn more foreign exchange (URT, 2020).

Figure 4: Fish export trends between 2012 and 2018.



Source: Fisheries Division

3.4.2 Fish import and fisheries production

Formerly the country was importing fish such as Frozen Bogue (Spain), Frozen Indian Mackerel (Yemen), Frozen Little Tunny (Yemen), Frozen Pacific Mackerel (China, South Korea, Japan and Yemen), Frozen Tilapia (China) and Frozen Yellow Tail Scad (Yemen). In the past seven years (2012 to 2018), Tanzania has imported a total of 94,750,018 kg (Figure 5; Table 2). The importation of fish declined by 99.7%, from 22,962 tonnes worth 56.12 billion shillings, equivalent to USD 24,400,000 in 2016/2017 to 8.21 tonnes worth 0.16 billion shillings, equivalent to USD 69,565.2 in 2020 (URT, 2020).

Figure 5: Fish import trends between 2012 and 2019.

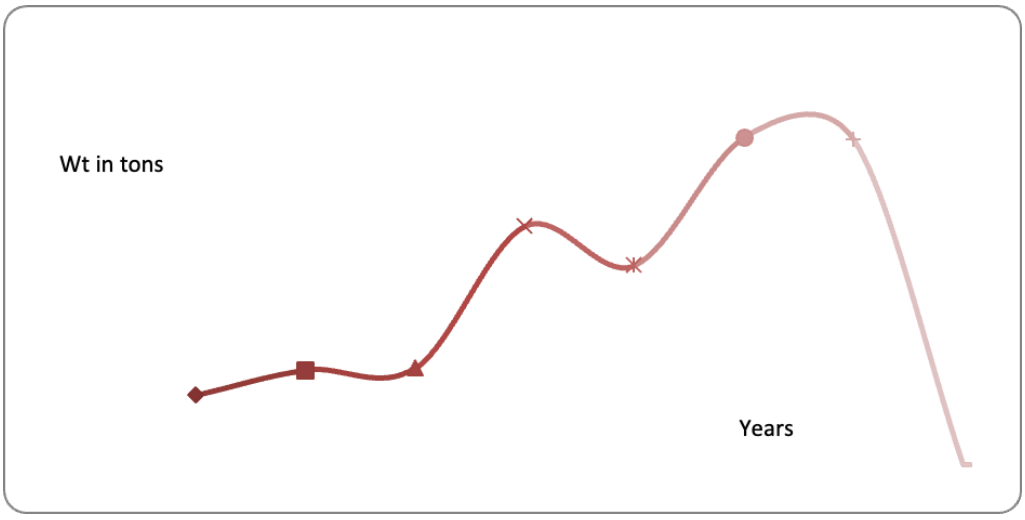


Table 2: Fish import trends from 2012 to 2019.

Year	Tonnes	Value		Royalty		
		USD	TZS	TZS	USD/kg	TZS/kg
2012	4,886	3,512,976	5,507,054,266	1,681,166,953	0.72	1127.11
2013	6,642	5,718,246	9,027,183,853	2,649,611,644	0.86	1359.11
2014	6,792	6,009,655	9,889,823,440	2,818,169,086	0.88	1456.10
2015	16,744	15,338,685	32,211,238,339	7,247,564,250	0.92	1923.75
2016	13,972	12,749,583	26,774,123,925	8,519,807,734	0.91	1916.27
2017	22,962	25,065,356	56,121,332,048	12,869,006,181	1.09	2444.10
2018	22,752	19,571,180	44,896,287,035	12,929,314,631	0.86	1973.29
2019	6	50,693	116,594,174	37,010,742	8.45	19432.36

Source: Fisheries Division

3.5 Fish Stocks, Production Trends, Value and Fishing Effort

3.5.1 Fish stocks/biomass

Based on the fish stock assessment surveys conducted in different water bodies and in different years (1970s, 1994, 1998 and 2019), the abundance of fish in terms of biomass shows that Lake Victoria is leading (1,109,932 tonnes). It is followed by Lake Tanganyika (295,000 tonnes), Lake Nyasa (168,000 tonnes) and marine territorial waters (100,000 tonnes) (TAFIRI, 2019). Other contributions come from the small water bodies. However, this data does not show the current fish biomass of these water bodies, except for Lake Victoria, because the data was collected many years ago (Table 3).

Table 3: Fish biomass of different water bodies (on Tanzanian side).

No.	Water Body	Total Area (km^2)	Tanzania's Share (km^2)	Coverage in Percentage Terms	Estimated Biomass** in Tonnes on Tanzanian side	Year of Survey
1	Lake Victoria	68,800	35,088	51	1,109,932	2019
2	Lake Tanganyika	32,900	13,489	41	295,000	1998
3	Lake Nyasa	30,800			168,000	1994
4	Marine (Territorial sea)	64,000	64,000	100	100,000	1970's
5	Other inland water bodies	5,000	5,000	100	30,000	1970

Source: TAFIRI (2019)

***Biomass – weight of an individual or a group of individuals contemporaneous of a stock (FAO, 2003). This is the same as the total weight of a stock or biological unit of fish or a fraction of it. It is a standing biomass of which part can be harvested based on maximum sustainable yield (MSY) calculated by researchers, while leaving enough in the water to ensure sustainability. The biomass figures presented in Table 1 merely provide an indication of the fish production capacity of the systems and not how much can be fished. Further stock assessment work is required to establish the MSY for the different fisheries.*

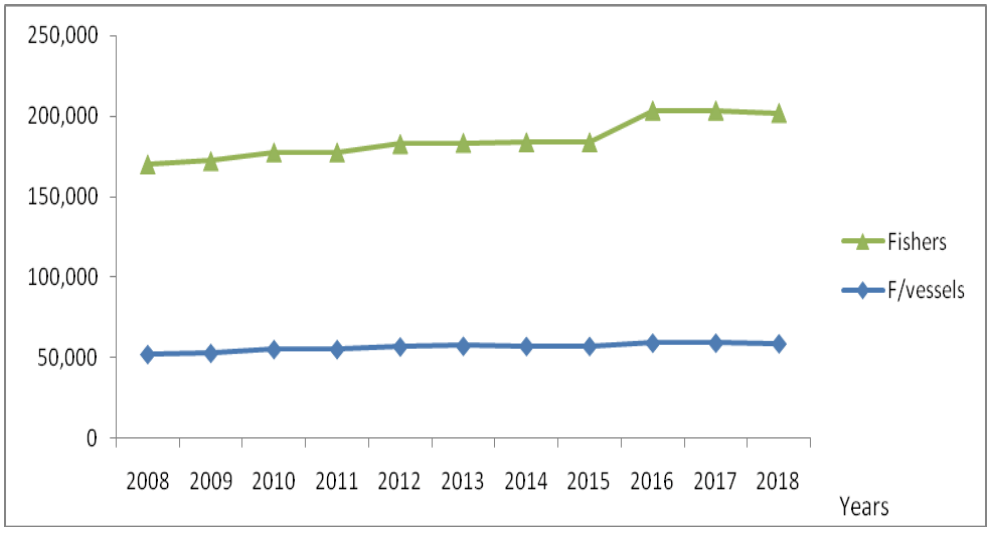
3.5.2 Trends in the fishing effort, total catch and value

The number of fishers in mainland Tanzania, fishing in both inland and marine waters is estimated to be 202,000 people, who possess 58,930 fishing craft. Out of these fishers, 54,511 are small-scale fishers, who fish in territorial waters, with 9,650 fishing craft (MLF, 2018). Most of the fishes caught by small-scale fishers in marine waters (88%) are consumed locally, while 12% is exported to regional and international markets. Fishing effort has been increasing over the years (Figure 6) due to new entrants in the fishing industry because of the open access nature of the fisheries sector and an increased

demand for fish as a source of livelihood for fishers and the surrounding communities. The trends given in Table 4 show an increase in the number of fishers and of fishing vessels with the associated catch. Table2 shows an increase of the effort over the years for inland fisheries, but the catches are fluctuating with an overall increased trend, with a notable small increase in the recent years.

The effort in marine fisheries is constant with a slight increase in catches over the years. Table 4 presents an increase of value for inland fisheries. However, since 2014, the value has been fluctuating with a decreasing trend. Such trends in the fishing effort and catch perhaps imply overfishing and overcapacity in the fisheries sector in some of the water bodies. In other water bodies like marine waters there is room to step up the effort. This situation calls for management interventions to control the fishing capacity in order to achieve sustainable exploitation and safeguarding of the optimal socio-economic benefits.

Figure 6: Fishing effort trends (number of fishing vessels and fishers).



Source: Fisheries Division

As far as the value of fish is concerned, the annual income per fisher in the inland fisheries (Table 4) had been increasing until 2014. The fishers working in Lake Victoria were 54% of all the fishers, with 62% of the total catch and value. In terms of catch and the number of fishers, the small-scale marine fisheries ranked second, but in terms of value they ranked third, while those working in Lake Tanganyika ranked second. The average annual income per fisher clearly depicts the effects of overcapacity in the Lake Victoria fisheries, where the total value of the catch ranked first, but the income per fisher was minimal compared to the other water bodies: Lake Victoria, TZS 10,103,812 (USD 4,366), Lake Tanganyika, TZS 10,317,185 (USD 4,458) and Lake Nyasa, TZS 13,681,200 (USD 5,912) (Table 5).

Table 4: Trends in the fishing effort and the estimated annual fish catch for inland and marine fisheries from 2008 to 2018.

	Inland Fisheries			Marine Fisheries		
Year	Fisher	Fishing Vessel	Annual Catch (in Tonnes)	Fisher	Fishing Vessel	Annual Catch (in Tonnes)
2008	133,791	44,832	281,690.9	36,247	7,342	43,130
2009	135,769	45,234	288,058.5	36,321	7,664	47,615
2010	141,206	47,635	294,474.0	36,321	7,664	52,683
2011	141,206	47,635	290,473.6	36,321	7,664	50,592
2012	146,420	49,321	314,944.0	36,321	7,664	50,079
2013	147,020	49,721	315,008.0	36,321	7,664	52,846
2014	147,479	49,627	314,061.5	36,321	7,664	51,912
2015	147,479	49,627	309,922.0	36,321	7,664	52,723
2016	149,018	49,688	308,771.6	54,511	9,650	53,823
2017	149,018	49,688	332,373.0	54,511	9,650	55,169
2018	149,018	49,688	309,922.1	53,035	7,664	53,231

Source: Fisheries Division

Table 5: Distribution of fishers, fishing crafts, catches and value by water bodies – 2018.

	Fishers	Fishing crafts	Catches (tonnes)	Values in '000' TZS	Yearly income per fisher (TZS)	Yearly income per fisher (USD)
Lake Victoria	109,397	31,773	235,171	1,105,326,730	10,103,812	4,366
Lake Tanganyika	26,612	11,506	58,417	274,560,934	10,317,185	4,459
Lake Nyasa	5,550	2,632	16,155	75,930,662	13,681,200	5,912
Lake Rukwa	3,428	1,786	4,172	19,607,037	5,719,672	2,472
Mtera Dam	2,369	1,238	5,175	24,323,487	10,267,407	4,437
Nyumba ya Mungu Dam	783	432	3,204	15,058,095	19,231,284	8,311
Minor water bodies	879	321	821	3,860,674	4,392,121	1,898
Marine - small scale	53,035	9,242	53,232	250,190,118	4,717,453	2,039
Total	**202,053**	**58,930**	**376,353**	**1,768,857,737**	**8,754,425**	**3,783**

Source: Fisheries Division

3.6 Status of Fish Stocks/Biomass and Fish Production by Small-Scale Fishers in Major Lakes

3.6.1 Status of fish stocks and biomass in Lake Victoria

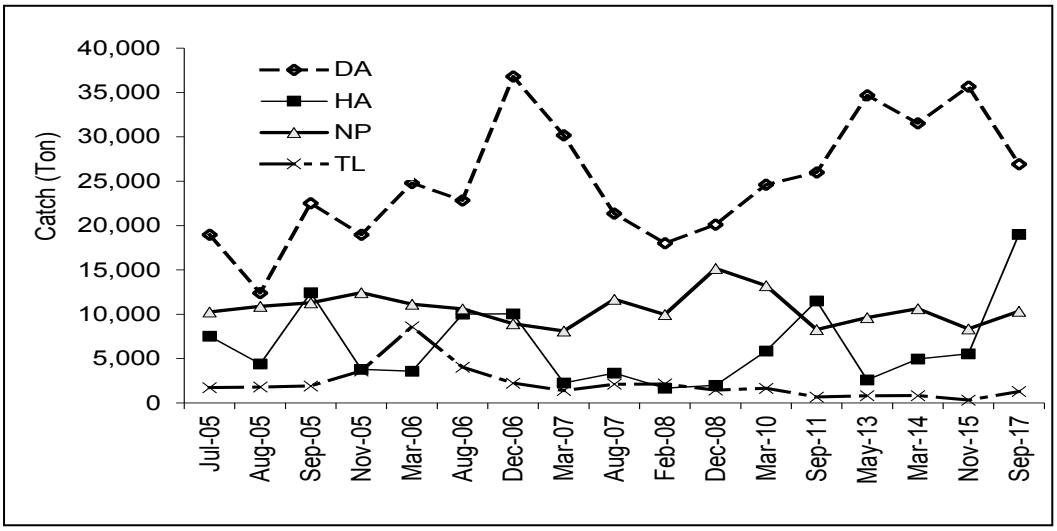
Lake Victoria supports Africa's largest inland fisheries, with most of the catch being the Nile perch (*Lates niloticus*), which was introduced in the lake in the 1950s (Mgaya and Mahongo, 2017). The latest acoustic survey conducted in September 2019 reported an estimated biomass (standing stock) for the Nile perch at 422,076 tonnes and *Dagaa* (*Rastrineobola argentea*) at 512,840 tonnes, while other fish species, including haplochromines, constituted 175,016 tonnes. These made the estimated biomass (standing stock) of Lake Victoria to be 1,109,932 tonnes for the Tanzanian part of the lake (Table 3; LVFO, 2019). The current status of the three main commercial fish stocks, namely the Nile perch (*Lates niloticus*), the Nile tilapia (*Oreochromis niloticus*) and the Lake Victoria sardines or *Dagaa* (*Rastrineobola argentea*) was reviewed by examining trends in the biomass (standing stock), landings, catch per unit effort (CPUE) and biological indicators (LVFO, 2016). Using coefficients of the linear regression of CPUE and effort, a Schaefer model was applied to estimate the maximum sustainable yield (MSY) for Nile perch in the lake. The model showed that the MSY for the Nile perch could be as high as 315,844 tonnes per year. However, to achieve the estimated MSY, the Nile Perch Fisheries Management Plan (2015-2019) recommended reduction of the fishing effort by 39%. Over the years, the biomass (standing stock) had considerably declined with catches being higher than the predicted MSY.

3.6.2 Fish production and the fishing effort in Lake Victoria

Lake Victoria fisheries contribute 62.5% of the country's total fish catches (Ministry of Livestock and Fisheries, 2018). It supports 109,397 small-scale fishers with 31,773 fishing vessels (Table 4). The most common gear used in Lake Victoria includes gillnets, seine nets, beach seines, long lines, hand lines and scoop nets. The Catch Assessment Survey (CAS) conducted by TAFIRI–Mwanza and the Fisheries Department in 2017 recorded the Nile perch, *Dagaa*, Haplochromines and Tilapiines as the major commercial fish species from Lake Victoria. *Bagrus docmac, Protopterus aethiopicus, Clarias gariepinus, Momyrus* spp.*, Brycinus* spp.*,* and *Labeo* spp. were also recorded. *Dagaa* contributed more to the total catch by weight (41.9%), though its contribution in monetary value was low (21.5%) when compared to that of the Nile perch (28.4%). Tilapiines were among the species that had low catches and a very low contribution to the total catch (2.0%), but highly preferred by the people in the lake region and its market price was second to that of the Nile perch. The increase in the Nile perch catches from the 8,348 tonnes estimated in November 2015 to the 10,321 tonnes estimated in September 2017 is explained by a slight increase in fishing craft used to target the species from the 15,407 recorded in the 2014 frame survey to the 15,825 crafts recorded in the 2016 frame survey. However, it could also be explained by the various management measures taken by the Fisheries Division, including removal of illegal fishing gear.

Although the general trend of *Dagaa* indicates an increasing rate, the last three surveys (2015–2017) indicated a decline (Figure 7). The craft used to target *Dagaa* increased in number from the 8,428 recorded in the 2014 frame survey to the 10,159 crafts recorded in 2016, but the catches of *Dagaa* dropped from the 35,659 tonnes recorded in the November 2015 survey to the 26,877 tonnes recorded in the September 2017 survey. This could be the result of an increase in the catch of haplochromines, a competitor, by almost three times. Haplochromines, which are caught mostly as by-catch in *Dagaa* fishery, have been on the increase from the 5,531 tonnes recorded in the November 2015 survey to the 18,965 tonnes recorded in the September 2017 survey. However, the number of craft used to target the species also increased from the 1,378 recorded in the 2014 frame survey to the 1,473 recorded in the 2016 frame survey. Tilapia catches increased from the 320 tonnes recorded in the November 2015 survey to the 1,285 tonnes recorded in 2017 survey. The increase in production of *Dagaa* and Tilapia could also be the result of the improved management measures taken, which involved constant surveillance during that period.

Figure 7: Estimated total catches of main commercial species from July 2015 to September 2017.
(NP = Nile perch; DA = *Dagaa*; TL = Tilapiines; HA = Haplochromines)



Source: TAFIRI, October 2019: Report on the Lake Victoria Catch Assessment Survey for September 2017

3.6.3 Status of fish stocks and biomass in Lake Tanganyika

The fish biomass (in the Tanzanian part) was estimated at 295,000 tonnes in 1998 (Table 3). The lake has more than 250 cichlid fish species and 150 non-cichlid fish species, most of which live along the shoreline, down to a depth of

approximately 180 m (Salzburger *et al.*, 2014). It has been observed that the largest biomass of fish is in the pelagic zone within the open waters dominated by six species: two Clupeid species (*Stolothrissa tanganicae* and *Limnothrissa miodon*) and four *Lates* species (*Lates stappersii, L. angustifrons, L. mariae* and *L. microlepis*). These are the important commercial fish species in Lake Tanganyika targeted by most fishers. Since no acoustic surveys have been undertaken for over twenty years, most of the information on the status of the resources is based on catch statistics, frame surveys and information from fishing communities. The fish landings and populations of the commercial species are reported to decline to levels that can no longer sustain the long-term commercial fishery (AU-IBAR, 2016).

3.6.4 Fish production and the fishing effort

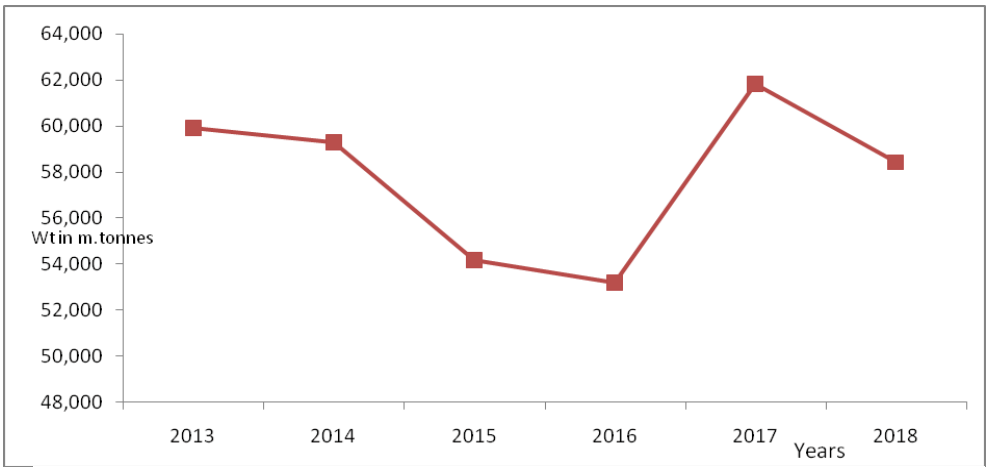
There are two distinct but overlapping fisheries in Lake Tanganyika, the near-shore (the littoral zone) fisheries and the offshore (pelagic zone) fisheries. The annual catch in 2018 was estimated to be 58,417 tonnes; this quantity contributed about 15% of the country's total catch (Table 3).

The fisheries depend on the six dominant pelagic species mentioned above (section 3.6.3). However, the communities reported a decline in fish landings and the fisheries biodiversity of Lake Tanganyika, particularly these important commercial fish species (AU-IBAR, 2016). The fisheries support 26,612 small-scale fishers with 11,506 fishing vessels, while more than 700,000 people depend on fishing-related activities. The latter include a wide range of operational groups (Ministry of Livestock and Fisheries, 2018). The catch trend is presented in Figure 6. The most common gear used in Lake Tanganyika includes gillnets, seine nets, beach seines, long lines, hand lines and scoop nets. The resources in the Lake Tanganyika fisheries play a vital role in the national and regional economy, as well as people's well-being and nutrition in the four riparian countries, namely Burundi, the Democratic Republic of the Congo, Tanzania and Zambia. Overall collapses in other food production sectors caused by civil unrest, social conflicts (DRC) and environmental degradation in the region have clearly increased pressure on the utilization of the fish resources in the lake.

3.6.5 Status of fish stocks and biomass in Lake Nyasa

Lake Nyasa is the third deepest freshwater lake in the world and is one of the lakes found in the Rift Valley. The lake is shared between Tanzania, Mozambique and Malawi, and is home to 800–1000 fish species, making it the most fish species-rich lake in the world. The last stock assessment conducted for Lake Nyasa in 1994 estimated the fish biomass at 168,000 tonnes (in the Tanzanian part of the lake) (Table 3); (UK/SADC, 1995). Many of the species in the lake are endemic, being isolated from the Zambezi fauna.

Figure 8: Catch trend for Lake Tanganyika (2013–2018).



Source: Fisheries Division

3.6.6 Fish production and the fishing effort

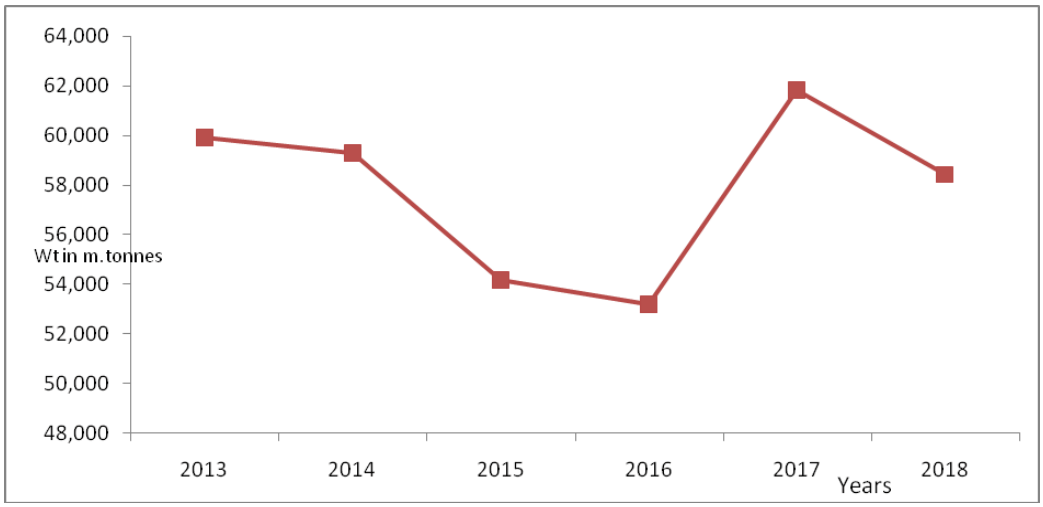
For the whole lake, there are about 56,000 fishers who harvest more than 100,000 tonnes of fish per year. On the Tanzanian side, there are 5,550 fishers and 2,632 fishing vessels harvesting about 16,155 tonnes of fish (Ministry of Livestock and Fisheries, 2018). Annual fish production on the Tanzanian side decreased slightly from 9,913 tonnes in 2013 to 9,386 tonnes in 2014. It increased again to 16,155 tonnes in 2018 (Figure 9).

The low fish production on the Tanzanian side is due mainly to the productivity of the area and the depth profile of the northern part of the lake. Productivity is higher in the shallow southern side; this enhances the deployment of small-scale and commercial trawlers by Malawian fishers (UK/SADC, 1995). Other factors may be environmental degradation and the inability to integrate environmental protection with development, insufficient empowerment of the local communities and the low level of technology among fishers. Strong winds and small fishing craft restrict Tanzanian fishers to near-shore fishing grounds.

Estimated fish catch by species is difficult to get in Tanzania, because of the large number of small-scale fishers and the government's limited capacity to collect sufficient catch data at the landing sites (few data enumerators) and limited funds to conduct research. For that matter, it is difficult to know the exact status of the Shire tilapia (*Oreochromis shiranus*) and Usipa or the Lake Nyasa sardines (*Engraulicypris sardella*). However, the catch data for all the fish species obtained from 2013 to 2018 showed an increasing trend from 2016 to 2018 (Figure 5). The IUCN Red List Assessment of Lake Malawi, which was

funded by JRS Biodiversity, found that 9% of 458 fish species are at the risk of extinction; this situation threatens local food security (Sayer et al., 2019).

Figure 9: Catch Trend for Lake Tanganyika (2013–2018).



Source: Fisheries Division

3.7 Status of Fish Production in Marine Waters

3.7.1 Small-scale fishers

Most of the fisheries in the inshore waters have been harvested by small-scale fishers, with the exception of prawn trawlers, which are semi-industrial. The fishing of prawns (semi-industrial) was closed for ten years, from 2007 to 2017, because of a decline in the stock. Despite the ten-year moratorium, the stock is still low. In a research conducted by TAFIRI it was concluded that small-scale fishers were responsible for the non-recovery of the stock (Chande et al., 2019). It was, therefore, recommended that the relevant authority pay attention to the small-scale fishers, for their activities were hindering the recovery of the prawn stock owing to the reduction of brood stocks which, in turn, affected inshore recruitment.

The moratorium for commercial prawn trawlers was lifted in 2017 by allowing up to 12 fishing vessels. However, only two trawlers were licenced to fish. The rest did not qualify according to the national regulations (Fisheries Regulations, 2009). Results of the assessment carried out on the status of the prawn stock in the artisanal fisheries by TAFIRI from 2018 to 2019 revealed that two species of shallow water prawns, the Indian prawn (*Fenneropenaeus indicus*) and the speckled shrimp (*Metapenaeus monoceros*), continued to dominate the catch. Other four species of prawns were identified, namely *Penaeus monodon, P. semisulcatus, P. japonicus,* and *Macrobrachium rude*.

The main fish species caught by small-scale fishers include (i) small pelagic species (herrings, mackerel and anchovy), (ii) large pelagic species (Spanish mackerel, bonito, yellowfin tuna, barracuda, jack and wolf herring), (iii) demersal fishes (Siganids, shark, ray, skate, sole, catfish, and prawn/shrimp), (iv) coral reef fishes (emperors, snappers, parrotfish, surgeon fish, rabbit fish, groupers and goat fish), and (v) the lagoon and intertidal species (high value species such as octopus, squid, crabs, lobsters and a variety of bivalves and gastropods). In 2018, small-scale marine fisheries contributed 14% (53,232 tonnes) of the total fish catch in the country, while 86% (309,922 tonnes) came from inland small-scale fisheries (Table 4).

3.7.2 Status of off-shore fisheries (marine waters)

The EEZ fisheries are currently exploited by licenced Distant Water Fishing Nations (DWFN) using purse seiners and long liners under the management of the Deep-Sea Fishing Authority (DSFA) and, therefore, not accessible to local fishers due to possession of poor fishing vessels and gears. The commercial fisheries are mainly concentrated in the EEZ and target tuna and tuna-like species such as yellowfin and bigeye tunas, skipjack, shark, swordfish and marlin.

The lack of fishing harbours in the country, which would have enabled EEZ fishing vessels to land and declare their catches, forces fishing vessels (which have been fishing in the Tanzanian EEZ) to land their catches in neighbouring fishing harbours. The volume of fish catches from the EEZ (Table 6) cannot be known because the data are in patches owing to the lack of a fishing port, which would have enabled EEZ fishing vessels to land and declare their catches before they are trans-shipped. There are ongoing efforts to address this problem and others related to landing sites for fish, especially those from the EEZ and the high seas.

Table 6: Fish catches from EEZ since the establishment of DSFA

Year	ALB	BET	YFT	SKJ	BMARL	SMARL	SWO	SAILF	Shark	Others	Total
2010	-	145	870	1,481	-	-	-	-	-	-	2,496
2011	-	22	138	384	-	-	-	-	-	-	544
2012	-	789	2,337	3,432	-	-	-	-	-	3	6,561
2013	-	2,069	4,124	7,073	-	-	-	-	-	390	13,656
2014	4	2,245	4,486	4,858	-	-	145	-	-	538	12,275
2015	5	2,575	3,155	5,173	289	11	132	6	82	58	11,485
2016	450	1,615	7,263	7,736	46	25	137	10	22	120	17,425
2017	-	1,007	844	0	70	-	190	6	46	83	2,245
2018	-	345	557	-	35	-	127	6	18	87	1,175

(ALB = Albacore, BET = Bigeye tuna, YFT= Yellowfin tuna, SKJ = Skipjack; BMARL = Black marlin; SWO = Swordfish; SAILF = Sailfish).

Source: Deep Sea Fishing Authority (2019)

CHAPTER 4

4.0 INVESTMENT AND INFRASTRUCTURE DEVELOPMENT

4.1 Investment in Fisheries Sector

The fisheries sector is one of the fast-growing sectors that have caught the attention of several investors. There are numerous and attractive investment opportunities in the fisheries sector in the country; these include fish processing, manufacturing of fishing vessels and gear, aquatic tourism (marine parks and reserves), ornamental fish aquarium, fish marketing and aquaculture.

The government has pledged its support to potential investors in the inland and marine fishing industry.

4.1.1 Investment opportunities in the inland fisheries

Despite the fisheries in Tanzania being dominated by inland fisheries with a contribution of about 85% to the national fish production, investment development is still poor/under-developed. The investment opportunities in the inland fisheries are numerous, and they include fishing craft and gear manufacturing, fish processing, fish supporting services, and fishing activities.

4.1.1.1 Fishing craft

Tanzania's fishery is dominated by wooden fishing boats, which are made from hard wood. Investment could potentially focus on the manufacture of fibre glass boats or any other alternative cheap material. The market for artisanal fishing boats exists; this is due to the fact that inland fishery is dominated by artisanal fishers who use dug-out canoes, dhows and small boats ranging between 7 and 11 metres long mainly motorized by outboard engines. Only few fishers have inboard engines.

4.1.1.2 Fishing gear manufacturing

There is a big domestic demand for fishing nets and other fishing gears like lines, hooks, mending twines and ropes of different sizes. The main type of gear used is gill nets with the mesh size determined according to the size of the target fish species.

4.1.1.3 Fish processing facilities

The available opportunities in the fish processing industry include the following:

(i) **Fish value-added products**

Exportation of fish and other fishery products in Tanzania is mainly done in a fresh/chilled or frozen state. Some sun dried and smoked fish are also

exported to neighbouring countries. Hence, there is an opportunity for investment in value-added fish products such as fish balls, salt-spiced marinated fish, fish sausages, fish fingers and ready to eat fish.

(ii) **Fish canning industry, frozen and hot smoking**

At present, sun drying is the main technology used for processing of the Silver cyprinid, locally known as *Dagaa*. There is a possibility of improving the methods of processing for this species for other consumers/markets, which do not prefer the sun-dried fish. Fish canning, cold and hot smoking increases the shelf-life of fish and their associated products for transport over long distances within the country and for export.

4.1.1.4 Fishing support services

Currently, there are only a few investors providing services in the fishing industry. The services required include; supply of boats and engine spares, safety equipment and containers for fish handling. Such services are encouraged to promote sustainable fishing along freshwater bodies.

4.1.1.5 Fishing activities

Investment opportunities also exist in the exploitation of freshwater pelagic stocks. The marketable inland fish include Nile perch *(Lates niloticus)* and Silver cyprinid from Lake Victoria (*Rastrineobola argentea*) and Sardines (*Stolothrissa tanganicae* and *Limnothrissa miodon*) from Lake Tanganyika.

4.1.1.6 Aquarium fish business

Lake Tanganyika and Lake Nyasa are very important in aquarium fish business. At the present only few investors are engaged in the aquarium fish business. The government is encouraging this business due to available international markets for tropical aquarium fish.

4.1.2 Investment opportunities in marine fisheries

The government of Tanzania and its stakeholders are in the process of reviving TAFICO and constructing a fishing harbour. The investments are at different development stages.

4.1.2.1 Tanzania Fisheries Corporation – TAFICO (2018)

In 1974, the government established a parastatal organization, a government-owned fisheries facility known as Tanzania Fisheries Corporation (TAFICO) with a view to developing a fishing industry entity, which was mandated to buy, sell, prepare for markets, import and export fish, fishery products and products of aquatic flora. The corporation operated for 24 years, from 1974 to 1998, before it was specified for privatization in 1996. The privatization move was intended to enhance the efficiency and effectiveness of selected parastatal organizations in the country, including TAFICO. In 2005, the Parastatal Sector Reform Commission (PSRC)de-specified TAFICO. It was returned to the Ministry of

Natural Resources and Tourism (MNRT) to finalize its privatization process. The MNRT, acting within its mandate, opted to sell TAFICO, but the Cabinet did not approve the decision to sell it. Instead, it instructed that TAFICO remain a government entity for promoting fisheries activities. Later, the Cabinet instructed the Ministry of Livestock Development and Fisheries to revive TAFICO.

The revival process is ongoing and TAFICO has been reinstated under the name, "Tanzania Fisheries Corporation - TAFICO (2018)", which is a public Corporation fully owned by the government through the Ministry of Livestock and Fisheries. Among other things, the Corporation is mandated to promote the fisheries sector by implementing large-scale commercial fisheries projects in the territorial waters, the EEZ and the high seas. It will also implement projects in aquaculture and fish processing. From its projects, the Corporation will provide fish and fishery products to domestic and international markets.

A business plan, which provides the business roadmap for the next ten years (2019–2029), is in place. Specifically, the plan mentions ten projects that the Corporation will implement. Each of the ten projects is independent and the projects are presented separately in this master plan. They are purse-seiner, long-liner, territorial waters fishing projects, cage fish farming projects and pond fish farming projects. Other projects are hatchery, ice making, cold storage facility services, fish feeds production, and a fish processing factory. The fish processing factory, fishing in the territorial waters and pond farming are likely to face slightly higher competition than the other projects.

4.1.2.2 Fishing port/harbour

Tanzania does not have a marine fishing harbour, which is the interface between the harvesting of fish and its consumption. In this regard, the Ministry of Livestock and Fisheries, which is responsible for ensuring sustainable development of the fisheries resources, plans to build a fully-fledged fishing harbour along the coast. The harbour is expected to aggressively promote the fisheries sector in order to attract traffic from competing ports in coastal and offshore fisheries, and thus make a significant contribution to the economic growth of the fisheries sector. Kilwa Masoko in Kilwa District has been earmarked as a suitable area for constructing a fishing port/harbour. Currently, a consultant is conducting a pre-feasibility study in the area.

Besides handling fish from the EEZ and high seas, the fishing port/harbour will facilitate the following services:

(i) unloading of target and non-target fish;

(ii) ship anchorage;

(iii) repairing ships;

(iv) loading water, food, fuel and bait; and

(v) embarking and disembarking of sailors.

4.1.2.3. Exploitation of marine fishery

There are several investment opportunities within the Tanzania Exclusive Economic Zone (EEZ) and the high seas, with possibilities for the exploitation of pelagic species like tuna, tuna-like species and others.

4.1.2.4. Other investment opportunities

Other investment opportunities in marine fishery, which are similar to inland fishery investment include:

(i) fish craft;

(ii) fishing gear manufacturing;

(iii) fish processing facilities;

(iv) aquarium fish from coastal/marine reef;

(v) fishing support services; and

(vi) the deepsea fishing investments aiming at improving fishing services.

4.1.3 Fisheries infrastructure development

Fisheries infrastructure is very important for proper handling of fish and fishery products so that quality standards are maintained in the interest of consumers at domestic and international markets. The availability of fisheries infrastructure reduces post-harvest losses, which are estimated to be 5–20% in the case of physical losses and as high as 70% in terms of quality losses. It also reduces illegal fishing and illegal fish trade, increases revenue and improves the collection of data. The fisheries infrastructure available in the country includes landing sites, laboratories, storage facilities, fish markets, aquaculture development centres and hatcheries. However, stakeholders who attended validation workshops opined that more infrastructure is needed to make the fisheries sector vibrant.

4.1.3.1. Fish landing sites

Fish landing sites are the most important form of infrastructure when it comes to unloading of catches from fishing vessels. The country has a total of 1,375 fish landing sites – 293 along the coastal beaches and 1,082 on the shores of inland waters. Out of these landing sites, 33 are improved (equipped with necessary facilities for fish landing) and 1,342 are non-improved landing sites (Table 7) (MLF 2018). Fish landing sites are put into two categories: (i) those which handle fish for domestic consumption and (ii) the upgraded ones, designated to handle fish for processing factories

(export). In collaboration with the World Bank, the Ministry of Livestock and Fisheries funded a project – Marine and Coastal Environment Management Project (MACEMP), which upgraded three landing sites in marine waters, namely Kilindoni – Mafia, Masoko Pwani – Kilwa and Nyamisati – Kibiti, so that they could meet export standards. Another four landing sites, namely Ikola – Mpanda, Kirando – Nkasi, Kibirizi – Kigoma Ujiji and Muyobozi – Uvinza, along Lake Tanganyika, were improved so they could meet the European Union (EU) standards. Support from the African Development Bank (AfDB) was used to upgrade them.

Although efforts were made by the Central Government to construct and improve landing sites, the management of all the landing sites was left to the LGAs. Management of the landing sites by the LGAs seems to be very poor as some of the landing sites are being mismanaged and left unattended. Therefore, there is a need to make close supervision to ensure proper management and regular maintenance and rehabilitation of the landing sites to maintain the standards and to achieve the objectives of the sector.

Table 7: Improved and non-improved landing sites in different water bodies.

Water Body	Landing Sites		
	Improved	Non-Improved	Total
Lake Victoria	26	616	642
Lake Tanganyika	4	235	239
Marine waters	3	290	293
Lake Nyasa	0	114	114
Lake Rukwa	0	20	20
Mtera Dam	0	28	28
Nyumba ya Mungu Dam	0	21	21
Small Water Bodies	0	18	18
Total	**33**	**1,342**	**1375**

Source: Fisheries Development Division, 2019

4.1.3.2. Fisheries laboratories

A quality assurance laboratory is an important facility for providing assurance and confidence to consumers on the safety of products. The National Fish Quality Control Laboratory (NFQCLAB) is an accredited laboratory, based in Nyegezi, Mwanza. The laboratory has made the Fisheries Division a competent authority in all matters pertaining to fish and fishery products. The laboratory has two wings: a microbiology wing and a chemical testing wing. The main services it offers are laboratory services, inspection, training, consultancy, research and other basic services. Laboratory services involve microbial and chemical tests, while inspection

deals with routine, ad hoc and audit inspections. Most of the fish and fishery products exported are tested in this laboratory.

There is another laboratory, similar to the National Fish Quality Control Laboratory, located in Dar es Salaam. It serves the factories located in the coastal regions within the same parameters. This laboratory is also specifically used for Harmful Algal Blooms (HABs). Plans are underway to enable the laboratory to test the quality of other food items such as meat, milk and animal feeds. It is highly recommended by stakeholders to construct such laboratories in different zones to minimize the costs incurred by fishers in the process of accessing the services.

The laboratories are intended to achieve and maintain accreditation in compliance with ISO/IEC 17025:2005 standards, fulfil the requirements of accreditation bodies and provide quality services to achieve customers' satisfaction.

4.1.3.3. Storage facilities

Fish and fishery products from Tanzania are sold on domestic, regional and/or international markets. The exports are made by both small- and large-scale fish exporters. In both cases, the products should be preserved in high quality standards so that they fetch good prices. The main preservation methods can either be cold storage or dry storage (smoked, salted and sun dried). There are 90 storage facilities countrywide. There are 39 structures for dried fish products, 27 cold storage facilities and 24 facilities for keeping live fish.

There are limited cold chain facilities in the country; the facilities are owned by the government and private companies/firms. Most of cold chain facilities, including ice producing plants and cold rooms, are owned by fish processing plants. Each plant has both ice plants and several cold rooms, depending on its production capacity. Most of the privately-owned cold chain facilities are used by the owners and, therefore, deny the public access to them or the services are provided at high charges. Some of the LGAs own the cold facilities attached to the landing sites of Kirando (Nkasi), Kilindoni (Mafia), Kilwa Masoko (Kilwa), Nyamisati (Kibiti) and the Kasanga fish market (Kalambo). Some of these facilities are not operating at full capacity for certain reasons, including the need for minor repairs. Others are inundated with water.

4.1.3.4. Fish markets

There are two (2) modern and international fish markets in the country, namely the Ferry/Magogoni fish market in Dar es Salaam (Figure 10) and the Kirumba fish market in Mwanza. There are three markets which are being upgraded, namely the Kasenda fish market in Chato, the Nyakaliro fish market in Sengerema and the Kasanga fish market in Kalambo.

Figure 10: Ferry/Magogoni International Fish Market in Dar es Salaam

4.1.4. Fish processing factories

There are 17 fish factories in the country. Most of them are located along Lake Victoria (11), in the coastal area (5) and along Lake Tanganyika (1). The factories were set up under the Tanzania Industrial Fishing and Processors' Association (TIFPA). The establishment of the industrial fish processing factories along the Lake Victoria shores had been escalated by the export of the Nile perch to the European Union (EU), the Middle East, the United States and Australia. The factories increased foreign exchange earnings for the lake's riparian states of Tanzania, Uganda and Kenya.

CHAPTER 5

5.0 INSTITUTIONAL AND LEGAL FRAMEWORKS

5.1 Institutional Framework

5.1.1 The national context

The fisheries sector in Tanzania has undergone several transformations during different eras, especially from the pre-independence period through the post-independence period. Fishing along the coast of Tanzania had been a mainly subsistence activity for supplementing agricultural production for centuries. People, especially the communities residing adjacent to water bodies, had been using traditional fishing methods to catch fish.

During the pre-independence period life in the fishing communities was drastically disrupted, after Germany decided in 1885 to impose colonial rule on Tanganyika (present-day mainland Tanzania). The imposition of colonial rule, taxation and plantation labour and the establishment of Christian mission stations did not have any positive effects on the fisheries sector. During the British colonial era, there was little interest in fisheries owing to the absence of suitable technology for exporting fish products to Europe. The fishing communities were less affected by British colonialism than the communities residing in areas where plantations and large settler farms had been established. The British established a small fisheries department and set up the East African Marine Fisheries Research Organization (EAMFRO) in Zanzibar. However, they were less concerned with the development of the already existing fisheries and only dealt with marine fisheries.

After independence, the government structure of the civil service closely followed that of the colonial government, and the fisheries department was built through the provision of extension services and improvement in the statistical record collections from the regional, district and village levels. Very few officials, especially those at the headquarters, came from the coastal or inland fishing communities or had any experience in the traditional coastal and inland fisheries. Some of them had been trained in industrial-type modern fisheries.

Following the Arusha Declaration of 1967, and the establishment of *Ujamaa* villages in the country, some successes and failures were noted. For example, in some villages, fisheries activities based on self-reliance and cooperation progressed well, but there were also failures, in that donated motorized boats, gear and fish-processing equipment quickly fell into disrepair. The management of fisheries continued to be centralized. However, the management of fisheries using the Central Government System was not effective at all. Illegal fishing methods became common, and fish and fishery products declined tremendously. The potential for service improvement (and more democratic governance) lies in the

decentralization of powers and resources to the ward, village and service outlet levels (URT, 1996). The changes also made the Fisheries Division move from one Ministry to another.

Administratively, the marine fisheries (in territorial waters within 12 Nm) are administered separately by mainland Tanzania and Zanzibar. The Ministry of Livestock and Fisheries has overall responsibility for managing fisheries in mainland Tanzania, which has its own National Fisheries Policy of 2015 and Fisheries Act No. 22 of 2003. In Zanzibar, the Ministry of Blue Economy and Fisheries is administering fisheries. Zanzibar has its own Fisheries Policy of 2000 and associated Act No. 7 of 2010. The Deep-Sea Fishing Authority (DSFA) Act of 1998 and its amendments of 2007 put the Exclusive Economic Zone (EEZ) fisheries under the authority of the DSFA, which was established in 2010. A chronology of the stages that the fisheries department went through from the colonial time to the present is given in Table 8 below and the organogram of the Fisheries Division is given in Appendix 4.

Table 8: Chronological changes of the fisheries sector.

Period	Ministry	Comment/Explanation
Up to 1964	Ministry of Agriculture	Inherited from the colonial Government to simplify government monitoring
1970–1971	Ministry of Land, Forestry and Animals	
1971–1984	Ministry of Natural Resources and Tourism	
1984–1985	Ministry of Land and Natural Resources	
1985–1995	Ministry of Land, Natural Resources and Environment	
1995–2008	Ministry of Natural Resources and Tourism	
2008–2017	Ministry of Livestock and Fisheries Development	For the first time, the word fisheries appeared in the name of the Ministry
2017 to date	Ministry of Livestock and Fisheries	

Source: Fisheries Division

5.1.2 Fisheries sector institutions

The Ministry of Livestock and Fisheries (MLF) is responsible for preparing, implementing, monitoring and reviewing national fisheries policies and regulatory frameworks. The Fisheries Division found in the MLF is responsible for managing and developing inland and marine fisheries within

the territorial waters of the mainland, through its institutions. The following are the institutions in the fisheries sector:

5.1.2.1. Tanzania Fisheries Research Institute (TAFIRI)
Tanzania Fisheries Research Institute (TAFIRI) is responsible for carrying out research on fisheries resources in the freshwater and marine waters, aquaculture (freshwater and marine), fish processing and quality as well as socio-economics. The institute also plays a role in disseminating research findings to the government and stakeholders. Other collaborative institutes are the Institute of Marine Sciences and the School of Aquatic Sciences and Fisheries Technology of the University of Dar es Salaam.

TAFIRI has centres located near water bodies in various areas, namely Dar es Salaam (the Indian Ocean), Mwanza and Sota (Lake Victoria), Kigoma (Lake Tanganyika) and Kyela (Lake Nyasa). However, more centres and adequate facilities, funding and staff are needed for the effective and efficient operation of the institute.

5.1.2.2. Fisheries Education and Training Agency (FETA)
The Fisheries Education and Training Agency (FETA) is a public institution, which was established in 2011 as an Executive Agency. The Agency came into being after merging the former Mbegani Fisheries Development Centre (MFDC) in Bagamoyo and Nyegezi Freshwater Fisheries Institute (NFFI) in Mwanza in accordance with the fisheries master plan. The two institutions are under the Ministry of Livestock and Fisheries and are fully accredited by the National Council for Technical Education (NACTE). As a result of the merging, FETA might be regarded as a young institution, but, in reality, it has inherited four decades of experience in providing fisheries education and training.

There are also three centres, namely Mikindani in Mtwara, Gabimori in Rorya, Kibirizi in Kigoma and Mwanza South, which are still under development. Other institutions that offer training in fisheries are the University of Dar es Salaam (UDSM), Sokoine University of Agriculture (SUA), University of Dodoma (UDOM) and the Vocational Education Training Authority (VETA). The effectiveness and efficiency of the fisheries training institutions requires adequate infrastructure, working facilities and well-trained staff. This can be achieved through institutional capacity building, awareness creation, training, exposure and exchange programmes. The challenges facing FETA include inadequate funds and a shortage of training infrastructure and facilities, and of personnel with hands-on skills.

5.1.2.3 Marine Parks and Reserves Unit (MPRU)
The MPRU is responsible for establishing and managing marine protected areas (MPAs) in mainland Tanzania. MPAs are divided into two categories, namely Marine Parks (multiple use areas) and Marine Reserves (no-take

areas, extractive use is strictly prohibited). At present, there are three marine parks, namely Mafia Island Marine Park, Mnazi Bay–Ruvuma Estuary Marine Park and Tanga Coelacanth Marine Park. There are 15 marine reserves, including Mbudya, Bongoyo, Sinda, Pangavini, Fungu Yasini, Mwakatumbe and Kendwa (Dar es Salaam); Maziwe, Kwale, Kirui, Mwewe and Ulenge (Tanga); and Mbarakuni, Nyororo and Shungimbili (Mafia). Efforts are still needed to put at least 30% of critical habitats under protection by 2030 to meet the international obligations, which Tanzania has ratified, including the SDGs.

5.2 Legal Framework

5.2.1 The national context

Management of fisheries in mainland Tanzanian waters is under the administrative jurisdiction of mainland Tanzania. Therefore, the laws and regulations related to the management of fisheries in mainland Tanzania are provided under the National Fisheries Policy of 2015, and Fisheries Act No. 22 of 2003 and its principal regulations of 2009. The key policies and legal provisions that guide the fisheries sector in 12 nautical miles of territorial waters of the marine area and all inland water bodies are under the Fisheries Policy and other related policies. A summary of the fisheries and related policies, laws and their relevance to the fisheries sector is given in Table 9.

Table 9: Fisheries resource management policies and laws.

Policy/Law	Function in Fisheries Development and Management	Relevance to the Fisheries Sector
National Fisheries Policy (2015)	Development of a robust, competitive and efficient fisheries sector that contributes to food security and nutrition, growth of the national economy and improvement of the well-being of fisheries stakeholders, while conserving the environment.	Focuses on: (i) resource management and control; (ii) knowledge of the fisheries resource base; (iii) efficient resources utilization; (iv) processing and marketing; (v) application of strategic research; (vi) extension services; training and information services; (vii) aquaculture development; and (viii) cross-sectoral collaboration, regional and international cooperation.

Fisheries Act No. 22 (2003)	The law restricts destructive fishing practices and advocates for the protection of fish breeding, nesting and nursery grounds. The law and its Regulations are being reviewed so that they meet micro- and macro-economic changes and other challenges facing the sector.	Prohibits illegal use of fishing gear like: (i) under-sized mesh gillnets, beach seine, spear guns and blast fishing. Regulates the licencing of: (ii) local and foreign fishers; (iii) fishing vessels; (iv) fisheries scientific research; (v) landings, trade and imports; and (vi) exports of fish and fishery products.
Tanzania Fisheries Research Institute (TAFIRI) Act No. 11 (2016)	Authorizes TAFIRI to carry out fisheries scientific research in all water bodies.	Aims to offer scientific information and research findings to inform and guide management of fisheries resources, and the livelihoods of fishing communities. The research includes aquaculture research for the development of quality seeds and feeds for enhanced fish production.
Marine Parks and Reserves (MPRU) Act No. 29 (1994)	The law is aimed at integrating the conservation, management and sustainable use of the fisheries resources.	It highlights directives for protection, productivity and biological diversity of aquatic ecosystems by: (i) preventing habitat destruction; (ii) protecting fragile ecosystems; and (iii) addressing pollution and overexploitation.
National Environmental Policy (1997)	Promotes environmental sustainability, security and equitable use of resources for sustaining the livelihoods of the present and future generations.	The policy outlines the following key environmental concerns: (i) land degradation, deforestation and environmental pollution; (ii) loss of wildlife habitat and biodiversity, deterioration of aquatic ecosystems; (iii) lack of accessible good quality water; and (iv) need for continuous research in these and other relevant

		sectors for more focused management interventions.
Environmental Management Act (EMA) No. 20 (2004)	The law contains key provisions for environmental management and planning, for doing environmental impact assessments and strategic environmental assessments, for pollution prevention and control, for waste management, and for compliance with relevant laws and their enforcement.	Part V 65 (1) of the law states that "all fisheries resources shall be managed in accordance with the provisions of Fisheries Act No. 22 of 2003 and the Marine Parks and Reserves Act of 1994. In case of conflicts in the course of application of these laws, EMA section 65 (4) shall prevail.
The National Water Policy (2002)	It addresses issues related to the management of water resources, and rural and urban water supply and sewerage.	It addresses key issues, including accessibility to clean water for both urban and rural inhabitants, and the management of aquatic systems and biodiversity.
National Integrated Coastal Environment Management Strategy (2003)	Describes principles and attributes of the ICM, the rationale for a national ICM strategy, and statement of the vision, mission, goal and strategies.	It defines strategies and implementing mechanisms, particularly with respect to planning and integrated management, conservation, research and monitoring, stakeholder participation and capacity building.
National Plan of Action for Small Scale Fisheries (NPoA-SSF) Guidelines (2021)	This plan is linked with sectoral policies and regulatory framework to attain food security, poverty reduction, increase local and foreign exchange, and contribution of fisheries to GDP.	Enable the country to achieve responsible SSF and sustainable development of the sector, enabling fishers to secure more significant socio-economic benefits as a result of well managed fisheries resources.
Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT)	The Voluntary Guidelines provide guidance to improve the governance of tenure of land, fisheries and forests with the overarching goal of achieving food security for all and support the progressive realization of the right to adequate food in the context of national food security.	Implementation of the guidelines helps the country to eradicate hunger and poverty; enable the sustainable use of the environment and management of natural resources. The guidelines also help to avoid conflicts among resource users including fishers, and environmental degradation.

5.2.2 The regional context

5.2.2.1. African Union (AU)

The African Union (AU) is a continental union consisting of 55 member states located on the continent of Africa. The Union was founded on 26th May 2001 in Addis Ababa, Ethiopia, and was launched on 9th July 2002. In fisheries, the AU established the "Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa" that created a conducive and enabling environment for the fisheries sector to create equitable, social and economic development in Africa. The document also provides guidelines on how countries should better exploit the wealth of fisheries, reduce poverty, increase food and nutritional security and ensure equitable distribution of the benefits, particularly for the poorest, marginalized and most vulnerable in society, such as women.

5.2.2.2. East African Community

The East African Community (EAC) is a regional inter-governmental organization of six Partner States (Burundi, Kenya, Rwanda, South Sudan, Tanzania and Uganda). The Community has a number of semi-autonomous institutions that help it to implement its mandate, including (i) Lake Victoria Fisheries Organization (LVFO) - its main functions and mandates are to coordinate the management and development of fisheries and aquaculture resources in the EAC region; and (ii) the Lake Tanganyika Authority (LTA). This coordinates the implementation of sustainable management of fisheries, supervising activities pertaining to the protection of Lake Tanganyika natural resources, supporting and improving the livelihoods of the communities living along the lake shores and its basin for the four sharing countries, namely Tanzania, Burundi, DRC and Zambia.

5.2.2.3. Southern African Development Community

The Southern African Development Community (SADC) is an inter-governmental organization with a goal of bringing about socio-economic cooperation and integration as well as political and security cooperation among its 16 southern African member states. One of its instruments is the SADC Protocols. The SADC Protocol on Fisheries, 2011, provides codes of procedure and practice on various issues, as agreed by the Member States, so as to improve food security and reduce poverty through intra-regional fish trade in the SADC region.

5.2.2.4. Indian Ocean Tuna Commission

The Indian Ocean Tuna Commission (IOTC) is an intergovernmental organization responsible for managing tuna and tuna-like species in the Indian Ocean. It works to achieve this by promoting cooperation among its Contracting Parties (members) and incorporating Non-Contracting Parties in order to ensure conservation and appropriate utilization of fish stocks and encourage sustainable development of tuna and tuna-like species fisheries.

5.2.3 The international context

Tanzania is a signatory to several international conventions and programmes relevant to the management and development of the fisheries sector. The implementation of the FSMP should take cognizance of these conventions, agreements, protocols and programmes as shown in Table 10.

Table 10: International conventions relevant to the fisheries sector in Tanzania.

International Convention and Programme	Relevance to Fisheries Sector Management and Development	Linkage with the Fisheries Sector
The United Nations Convention on the Law of the Sea (UNCLOS) was adopted and signed in 1982.	It is concerned with the territorial sea, the continental shelf, the high seas, fishing and conservation of living resources.	Aimed at overseeing all matters pertaining to deep sea fishing in the country. This is the basis for establishing the DSFA for the management of tuna and tuna-like species in the country.
The Ramsar Convention on Wetlands (1971)	It embodies the commitment of its member countries to maintain the ecological character of their wetlands of international importance.	Promotes wise use/sustainable use of all of the wetlands in the territories of the ratifying countries.
The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	It ensures that international trade in the specimen of wild animals and plants does not threaten the survival of the species in the wild.	It accords varying degrees of protection to the species of animals and plants, including fish.
Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (the Nairobi Convention) and Related Protocols (1985)	It ensures sound environmental management of the marine and coastal areas of the Eastern African region.	It provides a framework for the protection and development of marine and coastal resources. The protocols developed under the convention focus on the conservation of flora and fauna, and on

		combating pollution. The fisheries sector undertakings support the government's commitment to achieve the objectives of the convention.
Convention on Biological Diversity (1992)	It is a framework agreement for the conservation and sustainable use of biological resources. It includes general provisions in support of the conservation of aquatic resources.	Achievement of the fisheries sector objectives, including improving the management of aquatic resources (coastal and marine). Through this convention, Tanzania developed a National Biodiversity Strategy and Action Plan (2000).
Convention on the Conservation of Migratory Species of Wild Animals (1979)	It addresses species that migrate across one or more national jurisdictional boundaries. States have to take appropriate, necessary steps to conserve such species and their habitats.	Tanzanians are benefiting from migratory marine species with respect to consumption and tourism.
Convention on UN Fish Stocks Agreement (2001)	It is aimed at conserving and managing straddling fish stocks and highly migratory fish stocks.	It spells out the duties of the flag states, including Tanzania, especially those related to the registration and records of vessels, authorizations, MCS and compliance and enforcement.
The Convention on Climate Change (1992)	It sets an overall framework for inter-governmental efforts to tackle the challenge posed by climate change.	It recognizes that the climate system can be affected by industrial emissions of carbon dioxide and other greenhouse gases from various sources.

Food and Agriculture Organization (FAO) and Associated Fisheries and Aquaculture Instruments		
FAO Code of Conduct for Responsible Fisheries (1995)	It sets out principles and international standards of behaviour for responsible practices with a view to ensuring effective conservation, management and development of living aquatic resources.	As one of the states involved in fisheries, Tanzania uses the code and gives effect to it.
FAO Agreement on Port State Measures (2009)	It is the first binding international agreement targeting illegal, unreported and unregulated (IUU) fishing.	It prevents the vessels engaged in IUU fishing from using ports of countries to land their catches.
FAO Compliance Agreement (1993)	It is intended to enhance the role of the flag states and to ensure that a state strengthens its control over its vessels to ensure compliance with international conservation and management measures.	It promotes compliance with international conservation and management measures by fishing vessels in the high seas.
Food and Agriculture Organization (FAO) and Associated Fisheries and Aquaculture Instruments, i.e., SSF Guidelines, VGGT Guidelines	It is intended to achieve food security for all and to make sure that people have regular access to enough high-quality food so that they can lead active and healthy lives.	These are efforts to defeat hunger countrywide. This would be achieved by promoting the Human Rights-Based Approach (HRBA); through empowering both men and women to participate in decision making processes and assume responsibilities for sustainable use of fishery resources.

CHAPTER 6

6.0 REVIEW OF THE PREVIOUS FISHERIES MASTER PLAN (2002–2015)

6.1 The Review Process

The previous master plan identified important areas for the development of the sector and provided a roadmap for sustainable development of the fisheries sector that would generate both ecological and socio-economic benefits for the people of Tanzania, and address some key challenges. The previous master plan was phased out in 2015, thus creating room for its review and for the development of a new FSMP. The previous master plan was reviewed to, among others:

(i) assess the progress towards implementation of the priority programmes identified in the master plan;
(ii) identify the challenges encountered during the implementation of the master plan; and
(iii) document the experience gained and the lessons learnt from the implementation of the master plan.

The information obtained from the review in question was useful for developing a comprehensive FSMP, which is essentially a roadmap that provides direction for sustainable development of the fisheries sector in the next 15 years, i.e. 2021/22–2036/37.

6.2 Implementation Status of the Programmes

During the review process, it was learnt that some of the fisheries sector staff and key stakeholders at different capacities, mainly from the Local Government Authorities and villages, had participated in the implementation of the previous master plan. A total of 15 programmes were identified and prioritised for implementation. However, the identified priority programmes, besides mentioning the location and type of the programme, lacked explicit information on their magnitude and timeframe. Thus, the findings of this review process were based on the respondents' knowledge and ideas.

As far as the implementation of the programmes is concerned, the majority of respondents revealed that seven programmes, out of the 15 programmes, had been implemented. This is equivalent to 46.6% of the priority programmes; the percentage given suggests that all the programmes had equal status. The programmes which had been implemented include (i) Dar es Salaam – fisheries infrastructure improvement programme, (ii) Kigoma – Lake Tanganyika major landing beach improvement programme; (iii) national level – fisheries co-management programme, (iv) national level – fish export promotion programme, (v) Musoma, Mwanza and Bukoba – major landing beach improvement programme, (vi) Nyegezi and Mbegani – training institute improvement programme, and (vii) Southern part of Coast Region – fisheries communities development programme.

The interviewees pointed out that, out of the remaining eight programmes, seven (equivalent to 46.6%) had been partially implemented and one programme (equivalent to 6.6%) had not been implemented at all. The main reason for some of the programmes not being implemented was shortage of funds. The implementation status and the source of funding for each programme are given in Table 11.

6.3 Master Plan Funding Sources

Through the Ministry, the government was responsible for funding the implementation of the previous master plan. Apart from allocating funds through the Ministry's annual development budgets, the government solicited funds from different sources to supplement its efforts to implement the master plan. Apart from supporting the development of the previous master plan, JICA supported the implementation of some of the programmes. Other sources of funds for implementing the previous master plan were development agencies, financial institutions and donors, including the World Bank, which funded the Marine and Coastal Environmental Management Project (MACEMP), the European Union (EU), African Development Bank (AfDB) and a World Bank funded Project Lake Victoria Environmental Management Project (LVEMP). Below is brief information on MACEMP, a project which contributed significantly to the implementation of the previous master plan for the programmes implemented along the coastal area.

A World Bank loan to Tanzania was used to fund Marine and Coastal Environment Management Project (MACEMP). The project was aimed at improving the regulatory and institutional framework for managing marine resources, particularly establishing links between the marine environment and the fisheries resources. It was also aimed at filling gaps in the fisheries data on the Tanzanian marine waters and the coastal and offshore environment, upon which the fisheries depends. The main objective was to increase the contribution of the resources to economic growth and reduction of poverty, and to obtain a scientific understanding of the status of the resources and the major threats to them. Core project activities were designed to assist the government in implementing the National Integrated Coastal Environment Management Strategy (2003), the National Fisheries Master Plan (2002–2015) and the Fisheries Act. It should be noted that MACEMP covered marine fisheries only.

Table 11: Implementation status of priority programmes in the previous master plan.

No.	Programme	Implementation Status - (implemented, partially implemented or not implemented)	Source of Funding/Reason for such Implementation
1.	Programme 1: (Dar es Salaam, Bagamoyo and Mafia Island) – Marine Fisheries Sub-Sector Capacity Building Programme	Partially implemented – Only a few capacity development programmes were implemented, most of them concentrated in Dar es Salaam and Bagamoyo.	Government and MACEMP
2.	Programme 2: (Dar es Salaam) – Fisheries Infrastructure Improvement Programme	Implemented – The Ferry/Magogoni Fish Market was improved/re-constructed.	JICA
3.	Programme 3: (Lake Victoria, Mwanza) – Lake Victoria Fisheries Sub-Sector Capacity Building Programme	Partially implemented – Capacity building programmes were implemented in some parts of Mwanza.	LVEMP & IFMP, though the funds were inadequate.
4.	Programme 4: (Mwanza, Musoma, Kirumba) – Lake Victoria Fish Marketing Improvement Programme	Partially implemented – Only Kirumba International Fish Market in Mwanza was constructed.	JICA
5.	Programme 5: (Kigoma) -– Lake Tanganyika Major Landing Beach Improvement Programme	Implemented - Four landing sites, namely Ikola – Mpanda, Kirando – Nkasi, Kibirizi – Kigoma Ujiji and Muyobozi – Uvinza, located along Lake Tanganyika were improved.	African Development Bank (AfDB) and the European Union
6.	Programme 6: (Mbeya, Ruvuma and Iringa Regions) – Lake Nyasa Planked Canoes Extension Programme	Partially implemented - The workshop for planked canoes was rehabilitated, although machines and equipment have not been procured yet.	Government

No.	Programme	Implementation Status - (implemented, partially implemented or not implemented)	Source of Funding/Reason for such Implementation
7.	Programme 7: (Morogoro Region) – Aquaculture Extension Programme	Partially implemented – Kingolwira Aquaculture Centre in Morogoro was renovated and equipped with some modern facilities.	Government; partially implemented owing to insufficient funds.
8.	Programme 8: (Kigoma and Mafia Island) – Fisheries Financial Support Programme	Implemented - Three landing sites, namely Kilindoni – Mafia, Masoko Pwani - Kilwa and Nyamisati – Kibiti, located in the Indian Ocean were improved.	MACEMP
9.	Programme 9: (National Level) – Fisheries Co-Management Programme	Partially implemented – Involves Lake Victoria and the coastal areas.	Implemented in Lake Victoria with support from LVEMP. While implementation along the coastal areas was supported by MACEMP.
10.	Programme 10: (National Level – National Fish Export Promotion Programme	Implemented Nyegezi and Dar es Salaam Laboratories were constructed.	This programme was funded by the European Union in collaboration with the Government of Tanzania.
11.	Programme 11: (Musoma, Mwanza and Bukoba) – Major Landing Beach Improvement Programme	Implemented – 26 landing sites were built/improved along Lake Victoria.	The European Union – Improved so that they could meet EU standards.
12.	Programme 12: (Southern Part of Coast Region) – Fisheries Communities Development Programme	Implemented – Three landing sites, namely Kilindoni – Mafia, Masoko Pwani – Kilwa and Nyamisati – Kibiti, located in the Indian Ocean, were improved. These were improved with support from the World Bank so that they could meet the relevant export	MACEMP

No.	Programme	Implementation Status - (implemented, partially implemented or not implemented)	Source of Funding/Reason for such Implementation
		standards.	
13.	Programme 13: (Dar es Salaam) – Information System Improvement Programme	Partially implemented – A fisheries database developed.	MACEMP; Inadequate technology and funding.
14.	Programme 14: (Nyegezi and Mbegani) – Training Institute Improvement Programme	Implemented – The Fisheries Education and Training Agency (FETA) was established. The Agency came into being after a merger between Mbegani Fisheries Development Centre (MFDC) in Bagamoyo and Nyegezi Freshwater Fisheries Institute (NFFI), located in Mwanza. This is in line with the master plan.	MACEMP
15.	Programme 15: (National Level) – Fisheries Master Plan Implementation Training Programme	Not implemented.	It was expected that the master plan would be implemented like other activities in the fisheries sector (learning by doing).

6.4 Challenges Encountered during the Implementation of the Master Plan

Various challenges were encountered during the implementation of the previous master plan. Some of the challenges encountered are presented below.

6.4.1 Weaknesses in the master plan itself

The stakeholders involved in the review process pointed out that, the master plan had certain weaknesses, including being silent on the magnitude of the identified priority programmes, the absence of an implementation plan which would provide guidance on how the master plan should have been implemented and the time frame for concluding each programme. The absence of these details made it difficult to know exactly if the programmes had been fully or partially implemented.

6.4.2 Inadequate funds for implementing the master plan

It was revealed that inadequate funding was one of the major bottlenecks which, to a great extent, hindered the implementation of the master plan. The only reliable funding was from external sources, including donor funding, grants and loans from the World Bank and other International Financial Institutions. Treasury set aside a small amount of funds in the fisheries sector annual budgets for implementing development projects, including the master plan. The small internal budget might be the reason for slow implementation and for some of the programmes not being accomplished. It should be noted that the master plan is a future plan document which uses present and past data to make future projections. So, it might be outdated once it is not implemented within the proposed timeframe. It is worth noting that inadequate implementation of the master plan may have contributed to poor implementation of the policies and other sectoral arrangements, as the master plan was linked to policy achievements.

6.4.3 Inadequate coordination among key agencies

There was a weak intra- and inter-sectoral coordination among the key agencies responsible for implementing the previous master plan. The absence of a coordinated team to ensure successful implementation of the master plan, among other factors, significantly hindered its implementation.

6.4.4 Limited capacity

The Fisheries Master Plan Implementation Training Programme was one of the identified priority areas which was intended to equip staff with the skills they needed to implement the master plan, considering that it was the first plan in the fisheries sector. Hence, such training was very important. Unfortunately, staff training was the only programme which was not implemented at all. Limited capacity (technical know-how) of the staff on execution of the master plan might be the reason for the observed slow and

incomplete implementation, though many respondents mentioned inadequate funding as the major reason.

6.5 Experience Gained and Lessons Learnt

The experience gained and the lessons learnt from the implementation of the phased-out master plan will guide fisheries staff and other key stakeholders in identifying the best way to implement the current plan so that they do not repeat the same mistakes made in the past. The experience gained and the lessons learnt during the implementation of the previous master plan are presented below.

6.5.1 Local communities and other stakeholders' involvement

The involvement of local communities and other stakeholders in the development and implementation of a master plan is very important, given the fact that the successful implementation of such a plan and similar undertakings relies on the goodwill, commitment and collaboration of communities. Hence the involvement of communities and other key stakeholders in both processes should have been given high priority to achieve the set objectives. In addition, there was a need to allocate sufficient time for building the capacity of key stakeholders so that they could be confident before implementation and attaining expected results. Building the capacity of stakeholders leads to a more successful implementation of the master plan.

Good master plans are flexible and involve the community and other stakeholders from the outset. This gives such plans a legitimate base and a better chance to be successful. Master plans are most successful when they represent a vision that brings together the concerns of different interest groups. This was not the case with the phased-out fisheries master plan (2002–2015). There were only a few staff members, especially senior ones, who were aware of the existence of the master plan and its implementation process. Therefore, the inauguration of the current FSMP is very important for creating awareness and a sense of ownership.

During the review process, it was learnt that insufficient involvement of the Local Government Authorities (LGAs) in the development and implementation of the priority programmes of the previous master plan slowed their implementation, to a great extent. Even some of the projects which were successfully accomplished and which were handed over to the LGAs are still regarded as Central Government property. For example, the fish landing sites equipped with ice production facilities constructed at Kilindoni in Mafia, Masoko Pwani in Kilwa and Nyamisati in Kibiti have been abandoned as if they were useless. It was also noted that there is little attention paid to other fisheries projects originating from the Central Government and operated by the LGAs, even though they generate revenues for the LGAs. There is limited or no budget provided for their rehabilitation.

6.5.2 Financial sustainability of the fisheries sector

Financial sustainability seemed to be an issue in the implementation of the previous master plan. The fisheries sector depended, and still does, on one or a few sources of revenues. This hindered implementation of its activities. The fisheries sector should explore other potential sources of revenue (diversifying the revenue base) for successful implementation of the FSMP and other activities related to the management and development of the sector. However, it should be noted that developing the financial sustainability of any institution is a long, slow and delicate process, which needs extra efforts.

6.5.3 Awareness raising and education programmes

Awareness raising and education programmes were among the key components of the fisheries sector development. It was realized that awareness raising was one of the activities important to the sustainability of the fisheries resources. Awareness creation should be a continuous process because things keep changing and there is always a new generation, which needs to be aware of various issues, including how to manage and develop their resources and the environment from one level to another. This applies to the FSMP as well.

CHAPTER 7

7.0 CAPTURE FISHERIES ISSUES IDENTIFIED BY STAKEHOLDERS AND A SWOC ANALYSIS

7.1 Issues Identified during Stakeholders' Workshops

A total of 18 capture fisheries issues were identified during the stakeholders' workshops held in Mwanza, Mbeya and Tanga. Out of such issues, three were ecological, seven socio-economic and eight on governance (Table 12).

Table 12: Issues identified during stakeholders' workshops.

No.	Issue
	Ecological
1.	Destruction of aquatic ecosystems/critical habitats as a result of illegal fishing, overfishing and poor land use activities, leading to the extinction of some species, low productivity, drying up of small water bodies and slow growth of some species.
2.	Human activities contributing to the degradation of water bodies/aquatic systems and the environment. The activities include deforestation, agriculture/farming in restricted areas, mining, invasion of water sources, waste disposal and pollution.
3.	Climate change and variability effects such as drought, floods, water level rising, coral bleaching, erosion, and water level and temperature fluctuations which affect aquatic resources, including fish.
	Socio-economic
1.	Increased fishing owing to high demand and dependence on fish and fishery products, which, in turn, causes the decline of fish stocks and associated fishery products.
2.	Inadequacy and inconsistency of fisheries data and information owing to shortages of human and financial resources.
3.	High post-harvest loss of fish and fishery products before they reach the market.
4.	Inadequate markets (physical), market information and access to fish and fishery products for artisanal fishers, fish workers and others along the value chain.
5.	Inadequate capital and access to finance and financial services for investors, artisanal fishers and fish workers.

6.	Irresponsiveness of fishery stakeholders to behavioural change on communicable diseases such as STDs, HIV-AIDS and cholera.
7.	Limited involvement of stakeholders in the management of fisheries resources.
Governance	
1.	Lack/absence of management plans for some important fish species and fisheries.
2.	Weak fisheries associations or cooperatives to guarantee access to finance and to regulate the price of fish and fishery products.
3.	Inadequate trans-boundary cooperation, implementation agreements and protection mechanisms for fishers in shared water bodies.
4.	Inadequate capacity to develop practitioners/experts on new technologies for fisheries, research, training and co-management institutions.
5.	Limited access among fishers and fish workers to social protection, safety at sea, a decent working conditions scheme (life and fishing gear/vessels insurance).
6.	Weak cooperation in managing fisheries resources among key actors.
7.	Low contribution of EEZ and high seas fisheries resources to the GDP, the fisheries sector and the national economy.
8.	Inadequate capacity and infrastructure in conservation, training and research institutions.

7.2 SWOC Analysis of the Fisheries Sector

The strengths, weaknesses, opportunities and challenges of the fisheries sector identified through the SWOC analysis are shown in Table 13.

Table 13: SWOC analysis of the fisheries sector.

Strengths	**Weaknesses**
(i) Presence of a diverse fisheries and aquaculture resource base; (ii) Presence of clear policies, vision, mission and goals; (iii) Presence of appropriate working facilities; (iv) Established organization structure which is functioning; (v) Political will, stability and peace; (vi) Good governance (accountability and governance); (vii) Availability of fish feed ingredients; (viii) Availability of brood-stock in the wild aquatic environment for aquaculture seed production; and (ix) Presence of skilled labour.	(i) Inadequate personnel in terms of numbers and distribution; (ii) Inadequate extension services; (iii) An inadequate record keeping and data management system; (iv) Inadequate remuneration in the formal sector; (v) Inadequate technology on fishery and aquaculture production and value addition; (vi) Inadequate infrastructure such as fish landing sites, ice making, hatchery, feed mill, fishing vessels and cold stores; (vii) Inadequate supply of quality seeds and feeds; and (viii) Limited awareness on safety at sea.
Opportunities	**Challenges**
(i) Availability of fisheries resources and aquaculture essential ingredients; (ii) Ratification of international treaties, protocols, conventions and MOUs; (iii) Readiness of development partners to support the fisheries sector; (iv) Availability of markets for fish and fishery products; (v) Availability of people who can invest in fisheries and	(i) Illegal fishing, trade and unsustainable utilization of fisheries resources and products; (ii) Decline of some species of commercial importance; (iii) Resource-user conflicts; (iv) Inadequate and ineffective community participation in the management of fisheries resources; (v) Pollution of the natural resources base; (vi) Presence of invasive species in some water bodies;

aquaculture; (vi) Presence of ongoing research focusing on fisheries and aquaculture; (vii) Presence of a clear national investment policy; and (viii) Readiness of the private sector to invest in the sector. (ix) Provision of investment guidelines in the fisheries sector.	(vii) Prevalence of diseases such as HIV/AIDS and COVID-19; (viii) Inadequate funding for investing in aquaculture; (ix) Poor infrastructure in some parts of the country, especially roads and water; (x) High production costs; (xi). Great post-harvest loss; and (xii). Communities' great dependence on capture fisheries for their livelihoods.

CHAPTER 8

8.0 THE FISHERIES SECTOR MASTER PLAN OF THE MAINLAND TANZANIA: CAPTURE FISHERIES

8.1 Vision, Mission, Goal and Objectives

The vision, mission, goal and objectives of this master plan are in line with the Fisheries Policy (2015) and with other ongoing government, regional and global initiatives related to the management and development of the fisheries sector. The Fisheries Policy (2015) aims at having a progressive fisheries sector which is economically, socially and environmentally sustainable. The vision statement was developed based on what the fisheries sector aspires to achieve in the next 15 years. It provides a concrete way for the sector employees and principal stakeholders to understand the meaning and purpose of the sector towards achieving the desired long-term results. While, the mission, goal and objectives are focused on the purpose of what is to be done by the industry.

Vision: Attaining sustainable fisheries resources management which supports fisheries sector development, blue economy growth, improved livelihood, nutrition and food security.

Mission: Ensuring effective protection and sustainable use of fisheries resources by creating a conducive environment to attract investment, and to use high technology and applied research for fishery industry development.

Goal: Developing a sustainable, competitive and more efficient fishery industry that contributes to improved services, high production and national economy.

Objectives

(i) To build a robust public-private partnership (PPP) in the fisheries sector.

(ii) To increase job creation, food security and production capacity, and to build a competitive fisheries sector that contributes to the blue economy.

(iii) To promote adaptive management so as to have sustainable fisheries resources in accordance with ecosystem-based fisheries management, laws and regulations.

(iv) To ensure that research-oriented extension services and other relevant technical support are provided to the fisheries sector.

8.2 Key Guiding Principles

As far as the FSMP is concerned, guiding principles are a set of core values or moral standards established to lead the fisheries sector and its principal stakeholders in any situation they are in during the implementation of this plan. They are important in the decision-making process, since no decision on the implementation of this master plan should contradict any of these principles. In implementing this master plan to achieve management and development outcomes, the fisheries sector and its key stakeholders will be guided by the following principles:

(i) Consistency in decision-making: The FSMP gives decision makers a point of reference for making decisions.

(ii) Wise use of resources: The FSMP includes information from different sources. Such information can be used in prioritizing projects. It can also be used to allocate the meagre resources available in the effort to achieve the expected outcomes.

(iii) Positive economic development: The involvement of a local community and other stakeholders in planning helps predict the future development of an area. It also encourages them to undertake new development initiatives because they know what is expected. In addition, the planning process allows a community to raise the sector's issues, propose interventions and the infrastructure needed, among other things. Through this approach, appropriate economic development strategies can be developed.

(iv) **Results-oriented performance:** Performance of this master plan will be appraised and rewarded on the basis of the outputs and outcomes achieved, and not on the basis of the inputs and activities implemented (activity-oriented).

(v) **Client-focus:** The goals and operations of the sector will focus on meeting the needs of the beneficiaries of the sector's services or clients. Thus, the fisheries sector employees will avoid self-interest and unnecessary bureaucracy.

(vi) **Strategic orientation:** Strategic planning, budgeting and management techniques will be standard practice in the implementation of this master plan.

(vii) **Innovativeness:** The fisheries sector and its stakeholders will continuously search for quality-enhancing and cost-saving techniques and technologies in its operations and in the implementation of this master plan.

(viii) **Participatory orientation:** The fisheries sector will continue to promote the participation of communities and clients, and continuously seek to empower the communities so that they make progress. It has also been realized that top-down control leads to alienation, results in low compliance of laws and increases conflicts among resource users.

(ix) **Monitoring and evaluation:** The fisheries sector will institute systems and mechanisms to continually monitor and evaluate its performance, and make adjustments, where necessary.

8.3 Structure of the FSMP – Capture Fisheries

The FSMP design has taken into account the identified key issues and threats by stakeholders as guided by the EAF. The FSMP aligns with the Fisheries Policy (2015), Five-Year National Development Plan (2021/22–2025/26), Africa Blue Economy Strategy, NPoA-SSF Guidelines and VGTT Guidelines. Most of the issues identified in the new fisheries policy, FYDP and various strategies related to fisheries sector have been addressed through this master plan. Furthermore, this master plan also developed various operational objectives and intervention strategies for implementing NPoA-SSF Guidelines including; (i) enhancement of social services for sustainable development of fisheries, (ii) enhancement of social protection, safety at sea, and decent working conditions scheme for fishers, fish workers and other resource users, (iii) support development and implementation of approved strategies by involving youths, women and marginalized groups, and reducing post-harvest loss of fisheries products along the value chain.

The FSMP for capture fisheries consists of eight (8) thematic areas. The thematic areas referred to in this master plan, are the topics of concern which translate the relevant socio-economic and ecological values, high level objectives, policy statements and legislation into a form that has a direct and practical relationship with the management and development of the fisheries sector.

Each of the eight thematic areas contains an introduction, providing an overview of the topic and how it is covered in the FSMP, and specific sub-topics. Each sub-topic contains operational objectives, issues, strategic interventions and proposed actions which are clearly stated in the narrative section. The rest of items including expected delivery of each objective (outputs and outcomes), key performance indicators (KPI), baseline, timeframe, indicative budget and responsible body are shown in the FSMP Matrix (Table 14). One sub-topic can be addressed by a number of objectives, interventions and associated outcomes/outputs, regardless of their placement/category, i.e. ecological, socio-economic, governance or cross-cutting.

8.4 Thematic Area One: Maintenance of the Environment, Ecological Systems and Biodiversity

The main focus of this theme is on addressing the impact of anthropogenic activities on the diversity of fish and associated ecosystems, especially aquatic ecosystems. It is worth noting that the number of anthropogenic effects have been increasing, thus affecting the productivity of aquatic ecosystems, which, in turn, affects the management and development of the fisheries sector in different water bodies in the country.

At present, most areas along the aquatic environment in the country, even the most remote ones, are affected by human activities. Most of the loss and change to the biodiversity and the ecosystems are caused by the growth of the human population along the aquatic areas, coupled with growing economic activities. Resource dependence seems to be the underlying cause of many anthropogenic drivers such as migration from inland to aquatic areas. There is an influx of people in aquatic environments resulting in increased fishing pressure. The negative effect of the increased fishing pressure is exacerbated by use of destructive fishing gears, habitat destruction, and the capture of high proportions of juvenile fish. These factors contribute to reduced yields and unsustainability of the fishery. Under such conditions, deliberate measures to balance conservation and use of resources are inevitable for long-term resource protection and attainment of sustainability.

8.4.1 Management of aquatic ecosystems and biodiversity

Various efforts and measures intending to strengthen management of aquatic ecosystems and associated biodiversity are in place. These include fisheries and related laws, regulations, guidelines and rules. Some fishery (prawns, octopus, small and medium pelagic fish, and Nile perch) management plans have been developed, although they may need reviewing. The development of management plans for critical habitats and other important fish species, i.e. coral reef mixed species is underway.

There are also a number of mitigation measures on anthropogenic effects of aquatic resources, although not all are adequately enforced due to inadequate human and financial resources. Inadequate awareness about anthropogenic effects, especially at grassroots level, where most of local communities are highly dependent on aquatic resources for their livelihood is another bottleneck. Thus, the management of aquatic ecosystems and biodiversity is needed to strengthen management interventions.

Operational objective 1: To strengthen the management of aquatic ecological systems and their processes to reduce the decline in the quantity of fish and fish species.

Issues:

(i) Destruction of aquatic ecosystems/critical habitats (aquatic environment) due to pollution, contamination, eutrophication, and introduction of invasive alien species.

(ii) Habitat conversion, loss, degradation and fragmentation in freshwater and marine environments.

Strategic interventions:

(i) Promoting conservation programmes and sustainable management of aquatic ecosystems to reduce the loss of critical habitats and associated biodiversity.

(ii) Promoting biodiversity conservation and the protection of endangered species

(iii) Promoting Ecosystem Approach to Fisheries Management, Co-management and Spatial Planning among fishers and other stakeholders. Creating awareness of fishers and other key stakeholders on the importance of aquatic ecosystems to fisheries activities.

(iv) Promoting establishment of reserved aquatic ecosystems, ecosystem restoration programmes, temporary and permanent closed systems. Protecting and restoring destroyed habitats and ecosystem processes.

(v) Developing appropriate fisheries management plans (MPs) and multi-sectoral collaborative mechanisms to facilitate implementation of MPs.

Proposed actions:

(i) Study the linkages between ecosystems; identify critical habitats.

(ii) Designate different resources user zones.

(iii) Restore degraded habitats.

(iv) Review and strengthen outdated laws, regulations, management plans, guidelines and their enforcement procedures.

(v) Conduct awareness raising campaigns; identify all important fisheries and develop their management plans.

Operational Objective 2: To reduce anthropogenic impacts on the resources located within and adjacent to water bodies so as to increase their productivity.

Issues:

(i) Illegal fishing of fishery resources in different water bodies.

(ii) Sedimentation and pollution from different environmentally unfriendly activities undertaken closer to water bodies and up-stream of rivers discharging their waters in the lakes and ocean. Those activities include unplanned settlement, shifting cultivation, overgrazing, deforestation and agricultural expansion.

(iii) Over-exploitation/over-fishing of particular species of aquatic biodiversity.

Strategic interventions:

(i) Improving the governance of resources in the marine and inland waters.
(ii) Introducing and strengthening community environment management programmes.
(iii) Developing mitigation measures to reduce the effects of anthropogenic activities on water bodies.
(iv) Fostering collaboration with relevant institutions to enforce the laws and regulations governing aquatic-ecosystem management.
(v) Establishing mechanisms for controlling aquatic pollution and contamination from domestic, industries, rivers up-stream activities and establishment of development projects closer to water bodies

Proposed actions:

(i) Strengthen management measures.
(ii) Develop and implement management programmes.
(iii) Formulate, review and strengthen mitigation measures.
(iv) Develop collaboration MoUs/agreements for stakeholders.
(v) Raise awareness about anthropogenic impacts among different stakeholders.
(vi) Harmonize relevant laws and other management protocols.

8.4.2 Beach/intertidal areas use and waste disposal

The use of beach and intertidal areas is being changed or modified and sometimes those changes are contributing to degradation of aquatic ecosystems. In most cases those changes are done without evaluation that takes into consideration the economics of the proposed development in relation to the ecological and the social consequences of the area. This could affect the environment and people using the areas including fishers. It reduces the fishers access rights to their traditional working areas due to the presence of new developments.

Similar effects are experienced in waste disposal practices which lead to the pollution of some aquatic environments. Despite the presence of the beach use and waste management laws and plans, they could be enforced without consultation with traditional users of the area. Another weakness on waste disposal is inadequate treatment of liquid wastes and poor recycling of solid wastes.

Operational objective 3: To implement environmentally friendly beach use and waste management programmes around the landing sites.

Issues:

(i) Unplanned and environmentally unfriendly beach/intertidal area use practices i.e., waste disposal and invasion of water sources, beaches and other aquatic areas.

(ii) Reduced/banned access rights of fishers to traditional fish landing sites, camps, processing facilities due to new development projects.

Strategic interventions:

(i) Promoting sustainable waste disposal and land/beach use practices within and adjacent to water bodies.

(ii) Promoting beach use best practices within and adjacent to water bodies.

(iii) Developing youth and women litter management programmes at landing sites, fish markets and beaches.

(iv) Developing a multi-stakeholder platform to strengthen partnerships and cooperation among the stakeholders in the fisheries sector and used to mainstreaming the application of both the VGGT and the SSF guidelines.

Proposed actions:

(i) Develop, strengthen and implement land-use/beach plans to avoid unnecessary conflicts among users.

(ii) Develop solid and liquid waste management plans covering coastal and inland shores; promote and support ongoing waste recycling initiatives.

(iii) Develop and enforce relevant laws, regulations and rules prohibiting the disposal and discharge of waste prior to its treatment.

(iv) Develop a strategy with fishing communities and other resource users to ensure all solid waste (litter) is disposed of in an environmentally friendly way.

8.4.3 Availability of adequate data and information on fisheries

Data and information are needed for policy development, sound decision making and responsible fisheries management. Despite considerable efforts being made by the government to ensure availability of accurate data, there is a dearth of fisheries data in some of the water bodies. In some water bodies fish stocks are estimated using subjective data that relies on fishers' observations and sometimes expert judgment. There are presently only a few stock assessment reports for some water bodies that are available, for example, Lake Victoria and in the territorial waters (prawn fishery) of Indian Ocean. The stock assessment reports for the rest of Great Lakes (Lake Tanganyika and Nyasa) and marine waters are non-existent/outdated and no stock assessment has been conducted in the small water bodies.

Operational objective 4: To maintain the ecological balance to stocks so that they continue generating Maximum Sustainable Yields (MSYs).

Issue:
Inadequate data and information for making sound decisions in management of fisheries resources.

Strategic interventions:
(i) Supporting assessment of the status of fish (fish stocks) in different water bodies.
(ii) Supporting acquisition of fisheries on a regular basis and using standard data collection protocols.

Proposed actions:
(i) Conduct stock assessments of fish stocks and species in various water bodies (both marine and fresh waters).
(ii) Recruit staff with the required skills at different management levels.
(iii) Solicit additional funds for enabling the carrying out of stock assessments.
(iv) Facilitate Tanzania Fisheries Research Institute (TAFIRI) in terms of human and financial resources.

8.5 Thematic Area Two: Improved Research, Monitoring and Reporting System

This is intended to change the current status of all three aspects (research, monitoring and reporting) to a state considered to be better so as to make sound management and development decisions relating to the fisheries sector. This could be supported by data collected from research and/or monitoring processes, reported and disseminated in an appropriate manner. Usually improvement of these aspects is done through some actions intended to bring about a better state.

8.5.1 Fisheries Information and Data Management System

The current Fisheries Information System (FIS) database in mainland Tanzania has some limitations that impede the availability of all relevant information needed for decision making, proper management and development of fisheries sector. This is due to irregular maintenance and updating of the FIS.

The fisheries are dominated by a large and dispersed small-scale fleet, thus data are collected through sample-based surveys**.** The routine data collection that enables estimation of the monthly catches, categorized by species groups of the different fishing units, comprises; (i) a frame survey,

the sampling frame, based on a full census, and (ii) a catch assessment survey (CAS) based on stratified sampling. The estimates of annual catches therefore depend heavily on samples of catches and fishing effort from fish landing sites.

Data collection for artisanal fisheries are routinely collected by beach recorders in the areas where beach management units (BMUs) are active. The data is then compiled by District Fisheries Officers (DFOs) and sent to the Statistics section at the Fisheries Division Headquarters for processing/analysis. Such data lacks some important information e.g., ecological parameters and is fraught with error as it is processed manually.

Sustainable fisheries management requires sufficient knowledge and information on the status of resources base. Currently fisheries management is being constrained by inadequate human resource capacity to enable the collection of sufficient data and information and adequate documentation.

Operational objective 1: To strengthen fisheries data collection and information management systems.

Issues:

(i) Poor management of fisheries information and data management system.
(ii) Inadequate human capacity in data collection at various landing sites.
(iii) Poor documentation and un-harmonized fisheries data collection protocols.

Strategic interventions:

(i) Improving fisheries data collection and information management/storage systems.
(ii) Developing strategies to gather and collect fisheries data and information from minor waters (small lakes, wetlands, rivers and dams) and marine.
(iii) Building the capacity of fisheries data collectors including fisheries staff and BMU members.
(iv) Developing strategies for the collection of fish marketing, post-harvest and fisheries social-economic data.

Proposed actions:

(i) Monitor fisheries resources on a regular basis.
(ii) Maintain a fisheries database.
(iii) Recruit staff with skills necessary for managing fisheries.
(iv) Train fisheries data collectors.
(v) Allocate adequate funds for monitoring/data collection.

(vi) Collect data using agreed protocols and make it available to relevant authorities.
(vii) Share scientific information with different stakeholders.

8.5.2 Research, monitoring, training and extension services

Increased attention is being given to the research as a means of achieving sustainable fish stocks, while at the same time providing information to decision makers, investors and to those dependent on the fishery. In fisheries management, the scientific advices are being provided to make sound management and development decisions. The Tanzania Fisheries Research Institute (TAFIRI) is responsible for carrying out research on fisheries resources in both fresh and marine waters.

Training is very important for sustainable development of the fisheries sector; this requires well trained staff and the practitioners along the value chain. This would be attained through training and awareness raising campaigns. Fisheries and Education Training Agency (FETA) is responsible for providing competence-based training aimed at imparting fisheries knowledge and hands-on skills to fisheries staff and stakeholders.

Extension service is needed for sharing of information from research and training, lessons learnt and experiences gained in implementation of a particular activity. Further, it aims to enhance knowledge and skills of fishers and other stakeholders with a view to improving production and productivity of fisheries resources. Fisheries extension services are constrained by fewer extension workers, inadequate extension capacity and weak cooperation between extension service providers and stakeholders.

Operational objective 2: To strengthen fisheries research, monitoring and extension services for informed decisions.

Issues:

(i) Inadequate reliable data and information limits the understanding on the status and trends of fisheries resources/biodiversity.
(ii) Inadequate feedback mechanisms to fishers and other resource users due to shortage of extension service workers at the ministry and LGAs.
(iii) Inadequate cooperation between extension staff and stakeholders.

Strategic interventions:

(i) Improving fisheries research, monitoring programmes and information dissemination systems.
(ii) Building capacity of the Tanzania Fisheries Research Institute
(iii) Developing strategies to solicit funds for supporting fisheries research and monitoring programmes on a regular basis.
(iv) Strengthening and supporting fisheries extension service delivery.

(v) Facilitating fisheries information and technology dissemination.

Proposed actions:

(i) Carry out research and monitoring of fisheries resources on a regular basis.
(ii) Disseminate information to improve production and productivity of fisheries resources.
(iii) Mobilise funds for research and monitoring activities.
(iv) Develop different extension methods and outreach materials so as to facilitate extension services.
(v) Disseminate appropriate innovation and technology information.

Operational objective 3: To develop and improve appropriate technologies for fisheries industries so as to increase production and productivity.

Issues:

(i) Inadequate skilled and competent personnel in fisheries technology.
(ii) Inadequate appropriate technologies and technical know-how in the fisheries sector.
(iii) Poor fisheries production and productivity.

Strategic interventions:

(i) Strengthening research collaboration and linkages both within and outside Tanzania.
(ii) Promoting investment and capacity building in appropriate technology and innovations.
(iii) Promoting fisheries research agenda, demand driven fisheries researches and indigenous knowledge.
(iv) Supporting innovation and technologies in fisheries sector.
(v) Promoting technologies to reduce fisheries' post-harvest losses and add value.

Proposed actions:

(i) Design relevant technology and innovation systems and processes.
(ii) Identify communication needs and efficiently turn research data into information.
(iii) Develop employees and stakeholders through training and learning.
(iv) Use good change management processes.

8.6 Thematic Area Three: Empowerment of Fishers and Fish Workers

The empowerment of fishers and fish workers is intended to address the socio-economic conditions of small-scale fishers, fish workers and the communities concerned. Empowerment should be regarded as an incentive

to fishing communities for easing pressure on resources and to continue participating in the management of resources. Lack of empowerment increases frustration among resource users, especially fishers. The issues in focus include accessing finance and financial services, reliable markets, public infrastructure and other social or public services. The empowerment process also calls for increased attention and action being placed on issues related to small scale fishers and fish workers so as to support their visibility and recognition.

8.6.1 Access to finance and financial services

At present the terms and conditions for fishers to access loans from banks and other credit facilities are not friendly. Investment in the fisheries sector by both foreign and local fishers, particularly small-scale fishers is very low. Most of the small-scale fishers are day-workers employed by vessel owners. The product is largely for their own consumption with a small amount being traded at the domestic and regional markets. However, the earning by the majority is hand to mouth, with no savings at all.

Operational objective 1: To support the creation of an enabling environment for fishers and fish workers, investors and other actors along the fisheries value chain to access finance and financial services.

Issue:

Inadequate capital and access to finance and financial services for local investors, artisanal fishers and fish workers.

Strategic interventions:

(i) Creating a conducive environment (on the part of government) to enable fishers to access loans from financial institutions.

(ii) Encouraging more financial institutions and credit facilities to provide soft loans and other financial services to fishers.

(iii) Imparting hands-on/entrepreneurial skills to fishers/fish workers.

Proposed actions:

(i) Create an environment for working with investment and commercial banks so that they provide credit for investment in the fisheries sector.

(ii) Encourage potential donors to provide funding assistance for the establishment of a credit facility for investment in the fisheries sector.

(iii) Encourage relevant ministries to establish concessional fees to attract more investors; and the government to act as a guarantor and encourage commercial banks to support fishers/fish workers by giving them credit.

(iv) Promote Public-Private Partnerships and improve the business environment.

8.6.2 Improvement on fish processing and negotiation skills for fishers and fish workers

The skills needed to properly handle and process fish are inadequate for many of the small-scale fishers and fish workers. Since, the export of fish and fishery products is low, and the contribution of fisheries to the GDP and foreign exchange is also low, there is a need to impart skills to fishers and fish workers on handling, processing and negotiation to enable them to access reliable markets for selling their products.

Operational objective 2: To support the fishers and other actors along the value chain to access reliable markets.

Issues:

(i) Weak fisheries associations or cooperatives to guarantee access to finance and to regulate the price of fish and fishery products.
(ii) Inadequate negotiation skills for artisanal fishers and fish workers compared to other actors along the value chain.

Strategic interventions:

(i) Promoting the production of high quality products.
(ii) Increasing the possibility of fishers accessing finance, financial services and international markets.
(iii) Promoting the formation of fisheries associations or cooperatives.
(iv) Developing strategies to empower small scale fishers, commercial and industrial fishers.
(v) Promoting the establishment of fish and fishery products market centres and linkages.

Proposed actions:

(i) Conduct training on fish handling, processing and production of quality goods for domestic markets and export.
(ii) Encourage the establishment of fisheries cooperatives; provide modern technology to increase production and quality.
(iii) Enable fishers to access finance and financial services to purchase modern fishing vessels, gear and handling facilities.
(iv) Establish cold facilities at the airports located near water bodies and international airports; establish new foreign markets.
(v) Identify local and foreign fish markets; and establish a communication network for fish markets.

8.6.3 Enhancement of alternative livelihoods

The Fisheries Division has been supporting alternative income generating activities (AIGAs) as a way of empowering local community members and

easing or reducing the pressure on fisheries resources without creating hardships to the communities that have become dependent on them. Some of AIGAs have failed, and most of those implemented under the established projects cease once they are phased out. To address this challenge, it is highly recommended that all AIGAs must be evaluated thoroughly before they are applied, and this process should involve local communities from the beginning, instead of introducing or imposing some activities from other areas which may not be relevant.

Operational objective 3: To reduce high/extreme dependence on fisheries resources by local communities by introducing alternative sources of livelihoods.

Issue:
Increased fishing owing to high demand and dependence on fish and fishery products, due to inadequate diversified livelihood and AIGAs.

Strategic interventions:
(i) Building capacity and empowering local fishers.
(ii) Supporting diversification sources of livelihoods for fishing communities identified and implemented.
(iii) Promoting AIGAs and improved coastal livelihood opportunities.

Proposed actions:
(i) Introduce alternative activities for earning a living.
(ii) Involve local communities at different levels of fisheries management; provide entrepreneurship skills to fishers and local community members,
(iii) Conduct awareness raising campaigns.
(iv) Provide training in the use of underutilized natural resources.

8.7 Thematic Area Four: Institutional Capacity Building and Infrastructure Development

This is aimed at enhancing the capacity of the employees of the institutions in the fisheries sector, including key stakeholders (non-governmental groups) and communities, so that they can plan and manage the fishery and associated ecosystems efficiently and effectively. It is also aimed at improving the institutional arrangements and working facilities for managing the sector. Concepts such as technical know-how, leadership and awareness are part and parcel of the fisheries institutional capacity building programme. Based on the current funding situation, the capacity of the fisheries institutions to meet their objectives may be limited. Thus, there is a need to ensure that these institutions are well equipped with the required capacities.

8.7.1 Capacity building to staff of fisheries institutions

The capacity of institutions that are implementing various activities to meet obligations of fisheries sector, including its management and development may be limited. Their coordination capacity may also be limited. Thus, there is a need to ensure that many institutions are well equipped with management and development capacities to meet long term results. It is worth noting that the capacity building of staff and stakeholders contributes towards achieving both expected management and development objectives and goals. Given appropriate knowledge, staff and other key stakeholders including fishing communities are ready and willing to implement fisheries sector activities.

Operational objectives 1: To strengthen the fisheries management, research, training and co-management institutions so that the sector is developed.

Issues:

(i) Inadequate capacity to develop practitioners/experts on new technologies for fisheries, research, training and co-management institutions.

(ii) Inadequate/worn out working facilities and infrastructure.

Strategic interventions:

Strengthening human resource development and capacity to respond to both extant and emerging fisheries challenges.

(i) Strengthening fisheries and co-management institutional capacity.

(ii) Improved working environment through effective training and service delivery.

Proposed actions:

(i) Develop the necessary infrastructure.

(ii) Purchase the equipment and facilities needed by the sector and its institutions.

(iii) Conduct a training needs assessment to identify gaps and develop training programmes for the fisheries sector.

(iv) Recruit adequate staff.

8.7.2 Improved hands-on skills and purchase of training materials

Various on-the-job and long term training courses are offered to government staff, key stakeholders and a few private-sector employees. Though, there is a reasonable number of staff members with enough knowledge and hands-on skills, working facilities at different fisheries institutions under central and local government are not adequate. Institutions under the auspices of the Fisheries Division include; TAFIRI, MPRU, FETA and different departments at the Fisheries Division Headquarters and LGAs all over the country. Some

of the working facilities need major repairs, and new high technology equipment in order for these institutions to fulfil their obligations.

Operational objective 2: To ensure Fisheries officers and private staff have the knowledge and hands-on skills necessary for performing their duties.

Issues:

(i) Inadequate capacity and hands-on skills of staff in management, conservation, training and research institutions.
(ii) Inadequate training materials/equipment (outdated technology).

Strategic interventions:

(i) Strengthening of institutions and human resources in fisheries management and development towards achieving blue economy goals.
(ii) Strengthen fisheries training institutions and establish special training programmes for fisheries stakeholders along the value chain
(iii) Managing environment and ecosystem for fishery including land use, water access and related rights, and soil monitoring.

Proposed actions:

(i) Conduct training programmes aimed at equipping fisheries officers with basic hands-on/tailor-made skills.
(ii) Design and offer training courses based on the needs and emerging issues in the fisheries industry and related sectors (e.g., land, forestry and water).
(iii) Conduct long term training (PhD and master degrees) to staff in fisheries, aquaculture, blue economy and other related disciplines in local higher learning Institutions and abroad.
(iv) Create awareness programmes to the private sector on fisheries and aquaculture.
(v) Facilitate short courses (both local and abroad) in specialized skills for MLF staff (fisheries management, data management, aquaculture development, project management, procurement, financial management, accounting software, quality control, MCS skills, master fisherman, marine engineering, fish processing, marine, deep sea fishing, gear technology, observers).

8.7.3 Infrastructure development for fisheries institutions

There are well-developed institutions under the Fisheries Division, complementing each other to fulfil a number of tasks assigned to the sector including research, training and education, conservation and sustainable utilization of resources, compliance and enforcement and those institutions operating under LGAs. Despite their development, most of these institutions are experiencing a serious shortage of infrastructure (offices, laboratories,

classrooms, jetty, and staff houses) that hinders them from fulfilling their duties efficiently. Since, the sustainable management and development of the fisheries sector is anchored in these institutions, there is a need to rehabilitate and develop new infrastructure as required.

Operational objective 3: To support infrastructure development for fisheries management, research, training and conservation institutions.

Issue:
Inadequate capacity of fisheries institutions to fulfil their obligations and responsibilities due to inadequate infrastructure.

Strategic interventions:
(i) Creating an enabling environment for institutions to fulfil their statutory functions.
(ii) Support fisheries infrastructure development for fisheries management, research, training and conservation institutions.

Proposed action:
Build/rehabilitate all necessary infrastructure to enable all institutions under the fisheries sector to carry out their functions.

8.8 Thematic Area Five: Compliance and Enforcement of Management Measures

Compliance and enforcement measures are the key elements of resources management necessary for ensuring sustainable use of fisheries resources. Both are common undertakings in managing the fisheries sector. Compliance seeks to encourage the right behaviour, and in most cases it is a bottom-up approach, whereby community members and other stakeholders residing adjacent to resources adhere to laws, regulations and rules. While, enforcement could be interpreted as a top-down approach, where government machinery enforces laws as a disciplinary function.

Besides a top-down management approach, the Fisheries Division also uses co-management philosophy in managing its resources. This philosophy provides room for local community members to participate in the enforcement of fisheries and other related laws. Community participation in enforcement activities is a positive indicator demonstrating that the consensus and acceptance of such important obligations has been reached among fisheries local communities and other key stakeholders, aiming to combat illegal harvesting of the fisheries resources within their respective areas. In most cases, community members are reporting illegalities to

relevant authorities and this seems to be a common mechanism of law enforcement, because it is an easy task which any community member could do while engaged in other routine activities. This is done confidentially, as the illegal undertakings could also be reported anonymously. Local community groups participating in the enforcement of fisheries resources include Beach Management Units (BMUs), Collaborative Fisheries Management Areas (CFMAs) and Village Liaison Committees (VLCs).

8.8.1 Strengthening MCS Units and NMATT

There are several ongoing initiatives aiming to control illegal undertakings related to natural resources including fisheries, wildlife, forests and minerals to mention a few. Such initiatives involve the use of special task teams such as the Monitoring, Control and Surveillance (MCS) Unit and the National Multi-Agency Task Team (NMATT).

The objectives of fisheries management and MCS in the country are generally to take advantage of the economic opportunities of the aquatic resources; they also include the conservation of marine and inland resources, and collection of appropriate data on activities to ensure sound, and rational fisheries management. Fisheries Act (2003) stipulates various conditions that support proper management of fisheries through surveillance and control of illegal undertakings as well as monitoring. The Act also provides support restrictions against the use of particular gear and other characteristics of the endangered species particularly, target ones. Part V of the Fisheries Act provides for the management and control of the fishing industry.

In addition, a Special National Multi-Agency Task Team (NMATT) has been established to strengthen environmental enforcement and to control associated crimes including; blast fishing and IUU. The task team include members from Tanzania Police Force (TPF), Ministry of Natural Resources and Tourism (MNRT), Ministry of Livestock and Fisheries (MLF), Tanzania Intelligence and Security Service (TISS), and Ministry of Minerals. At present NMATT is hosted at TPF Headquarters.

Operational objective 1: Ensure that Monitoring, Control and Surveillance (MCS) unit, NMATT, BMUs and CFMAs enforce fisheries legislation effectively.

Issues:

(i) Degradation of aquatic ecosystems and decline of fish stocks due to illegal harvesting of resources and other human activities.
(ii) Limited enforcement is putting more pressure on biodiversity.

Strategic interventions:

(i) Strengthen compliance and enforcement agents (MCS, NMATT, BMUs and CFMAs).
(ii) Promote the establishment and strengthening of fisheries patrols and quality control stations across the country.
(iii) Promote the establishment and strengthening of BMUs and CFMAs for efficient fisheries resources management across the country.

Proposed actions:

(i) Establishment of CFMAs in 5 districts; purchase working facilities (boats, engines and safety equipment).
(ii) Construction/Renovation of MCS offices.
(iii) Strengthen existing BMUs; and MCS units established in all major water bodies.

8.8.2 Management of Trans-boundary/cross-border ecosystems

One of the areas that are in urgent need of compliance and enforcement is trans-boundary (cross-border) ecosystems in different countries sharing water bodies. The management of trans-boundary resources that are shared by Tanzania and her sister countries located in the East African Community (EAC) and Southern African Development Community (SADC) is in line with the objectives of EAC and SADC.

Among other things, the EAC objectives promote synergy in the regional initiatives for economic, social and conservation benefits among member states. Articles 2, 5, and 9 of the Environmental and Natural Resources Management Protocol of EAC obliges the member states to develop mechanisms that will ensure sustainable utilization of trans-boundary ecosystems.

At present, management, international cooperation and interventions in fisheries resources in the EAC and SADC countries are streamlined and legalized, although they are not adequately enforced by the respective countries, especially for the cross-border resources. Inadequate enforcement is due to different management approaches, legal and institutional frameworks between/among the countries sharing water bodies. Thus, deliberate efforts are needed to strengthen the management, interventions and cooperation between Tanzania and other countries sharing water bodies.

Thus, there is a need to develop effective management mechanisms, including the protection of the critical habitats and management plans of the remaining important species e.g., ornamental fish species which are valuable and common in Lake Tanganyika, Lake Nyasa and the marine environment (coral reef species).

Operational objective 2: To strengthen management interventions, international cooperation/collaboration and dialogue among countries sharing water bodies.

Issues:

(i) Inadequate trans-boundary cooperation, implementation agreements and protection mechanisms for fishers in shared water bodies.
(ii) Un-harmonized legal and institutional framework for managing cross-border resources.
(iii) Smuggling of fish and fisheries products between cross borders.

Strategic interventions:

(i) Strengthening the capacity to meet regional and international obligations and to pro-actively act on existing and emerging issues.
(ii) Establishing trans-boundary conservation areas (TBCAs) and associated management strategies.
(iii) Strengthening collaboration/cooperation of fisheries resources management regionally and internationally.

Proposed actions:

(i) Develop cooperation and management MoUs between/among states sharing water bodies.
(ii) Establish trans-boundary conservation areas (TBCAs); establish information sharing mechanism/strategy.
(iii) Identify legal and institutional frameworks; develop harmonized functions of legal and institutional frameworks.
(iv) Agree on management measures/protocol(s).

Operational objective 3: To support protection and development of management plans and their implementation for all important fisheries in Lake Nyasa, Lake Tanganyika, Lake Victoria and Indian Ocean.

Issue:

Lack of management plans/arrangements/guidelines for some important fish species and fisheries.

Strategic interventions:

(i) Developing, implementing and reviewing management plans for all important fisheries.
(ii) Designing appropriate mechanisms for the protection, research and monitoring of important fish stocks.

Proposed actions:

(i) Review phased out management plans and develop new ones.
(ii) Develop strict management measures and harvesting strategies.

(iii) Establish restricted and no-take areas.

8.8.3 Partnerships and cooperation among fisheries stakeholders

In fisheries, partnerships and cooperation refer to management system under which one group, for instance, community members take a leading role in managing fisheries resources with partnership, or with support of other groups. There are different models of partnership in resources management e.g., joint community management. Under this type of management approach, the government involves different stakeholders at different levels of management such as, implementation of various activities, decision making, benefit sharing and monitoring/evaluation of the resources. Whereas, in community based management, the community takes a leading role and other groups are involved as partners.

The essence of partnerships in the management of fisheries resources is to create a sense of ownership among partners, ensuring commitment and support from various stakeholders. It is one of the successful approaches which replaced the conventional approach. Through partnerships people regard the resources being managed as their property and not government property as it used to be in the past.

Operational objective 4: To strengthen partnerships and cooperation among the stakeholders in the fisheries sector.

Issues:

(i) Weak cooperation in managing fisheries resources among key actors.
(ii) Inadequate collaborative partnerships among multiple stakeholders constrain achievement of biodiversity goals.

Strategic interventions:

(i) Develop a multi-sector platform to strengthen partnerships and a cooperation platform for fisheries management actors, including the private sector.
(ii) Promoting an intra- and inter-cooperative and collaborative institutional framework.

Proposed actions:

(i) Review relevant documents.
(ii) Develop/formulate partners' platforms.
(iii) Develop a collaborative institutional framework.

8.8.4 Illegal, unreported and unregulated fishing

Tanzania is no exception, and like other developing countries it has to contend with the problem of IUU fishing. Fishers are still using illegal and

destructive fishing gear such as under mesh size, monofilament nets, beach seines and currently to a very small extent blast fishing as a way of killing fish. Destructive gears and practices have greatly contributed to resources and environmental destruction.

IUU fishing also cause damage to the communities that rely on fisheries for their livelihoods and food security, so it is important that their aquatic resources are managed sustainably to provide livelihoods, being amongst the most affected by IUU fishing. However, some small-scale fishers are also part and parcel of IUU.

Besides the high level of unlicensed craft and fishers, another major issue relating to IUU fishing is the use of illegal gear. The high number of unregistered vessels in the country may be attributed to increasing levels of IUU fishing. As a strategy to reduce if not to control IUU, fisheries staff, local communities and other stakeholders are collectively enforcing fisheries laws and regulations.

Operational objective 5: To prevent illegal, un-reported and un-regulated (IUU) fishing.

Issues:

(i) Fishers vulnerability due to lack of training, and little enforcement of safety and international labour standards.
(ii) IUU fishing practices impacting the sustainability of resources.
(iii) Misunderstanding/conflicts between fishing communities and law enforcers on IUU measures and practices.

Strategic interventions:

(i) Establishing awareness raising programmes on effective law enforcement procedures.
(ii) Strengthening mechanisms for sharing information and disseminating awareness raising materials among the key stakeholders.
(iii) Develop strategies to combat IUU fishing and illegal trade.

Proposed actions:

(i) Create awareness raising programmes on enforcement of laws for local community and other stakeholders.
(ii) Develop and provide training on environmental programmes.
(iii) Develop mechanism/platform for information sharing.
(iv) Create conflict resolution mechanisms for resource users.

8.9 Thematic Area Six: Fisheries Infrastructure Development

This theme focuses on the building of infrastructure facilities in the fisheries and aquaculture sector to help boost annual fish production in the country and develop the sector by reducing post-harvest loss. Tanzania does not currently have suitable facilities to service both artisanal and industrial fisheries, this is believed to be one of the serious constraints for the development of the fisheries sector. The lack of dry docking and a fishing harbour contribute to further loss in the fisheries revenues and thus, there is a need to establish a national fishing harbour that can provide services to deep sea fishing vessels. There are also inadequate landing sites for artisanal fishers, handling, storage (cold rooms and ice plants), processing plants, transportation, marketing facilities, fishing gear, a vessel manufacturing factory, and a vessel for deploying water, food and fish aggregating devices (FADs).

8.9.1 Infrastructure development for boosting production

The available infrastructure, equipment and facilities are not enough for the fisheries sector and its stakeholders to carry out all their functions. Consequently, there is a need to join efforts between the public and private sectors to address the existing constraints. Specific constraints facing fisheries infrastructure development include; high investment costs, inaccessibility to credit facilities, technical backstopping, inadequate technologies and support services, worn-out infrastructure, uncoordinated and low participation of the private sector.

Operational objective 1: To establish and rehabilitate the necessary infrastructure for development of the fisheries sector.

Issue:

Inadequate fish and fisheries infrastructure (physical) for artisanal fishers, fish workers and other actors along the value chain.

Strategic interventions:

(i) Developing and improving the fishing landing sites, fishery market infrastructure and facilities (cold chain and handling equipment for fish and fishery products).
(ii) Creation of conducive environment by the government to attract more investors in the fisheries sector.
(iii) Promote and support private sector participation in the investment and rehabilitation of fisheries infrastructure and facilities.

Proposed actions:

(i) Develop the infrastructure needed.
(ii) Purchase equipment and facilities.
(iii) Provide training to staff on the use of equipment and facilities.

(iv) Build new fisheries infrastructure and rehabilitate the old ones.

Operational objective 2: To encourage the private sector to develop infrastructure in the fisheries sector.

Issue:
Inadequate suitable facilities to service both artisanal and industrial fisheries.

Strategic intervention:
Develop a strategy for promoting the involvement of the private sector in the development and management of the fisheries sector.

Proposed actions:
(i) Encourage both local and foreign investors to build fisheries infrastructure.
(ii) Purchase of fishing vessels for fishing in the EEZ.
(iii) Build fisheries infrastructures (e.g., jetty/port, cold room, and processing industries).
(iv) Establish fishing support services.

8.9.2 Development of market information system

Currently there is no information system for fisheries markets that exists in the country. Inadequate information on the fish and fisheries products market hinders the development of the fisheries sector. Hence, the development of a market information system at this stage is inevitable.

Operational 0bjective 3: To strengthen the information system on the availability of markets.

Issues:
(i) The absence of a market information system for fish and fisheries products.
(ii) Limited access to local and international market information.

Strategic interventions:
(i) Developing a marketing information system and linkages in the marketing chain.
(ii) Establishing a market intelligence unit.
(iii) Promoting use of technology in accessing market information.

Proposed actions:
(i) Develop a marketing information system on markets.
(ii) Solicit funds for developing the market infrastructure and an information system.
(iii) Establish a market unit.

(iv) Use information technology to access markets.

8.10 Thematic Area Seven: Exclusive Economic Zone (EEZ) and High Seas Fishing Opportunities

Tanzania's capability to exploit its EEZ is limited by a lack of appropriate fishing vessels, and to-date there is no estimate of the fish potential in the Tanzanian EEZ. This is due to the absence of effective data reporting, as a result of inadequate research and lack of observers on-board of distant water fishing nations (DWFNs)' vessels. Fishery resources in the EEZ are currently exploited by DWFNs through a licensing system under a regime of a private access agreement. The Deep Sea Fishing Authority (DSFA) among other things, ensures the sustainable use of fisheries resources in the EEZ, and determines the fees, charges, resource rents or royalties from foreign vessels. Given the existing situation, the Five-Year National Development Plan is targeting to develop EEZ and high seas fishery. Thus, efforts are being made to develop a national fleet and to re-establish the Tanzania Fisheries Corporation (TAFICO) so that it can exploit the fishery resources in the EEZ and high seas.

8.10.1 EEZ and high seas fishing

There are no local fishers currently fishing in the EEZ and high seas, due to inadequate technology and capital. As far as EEZ fishing is concerned, the DSFA is issuing licences and permits to foreign fishing vessels so that they can harvest resources in the EEZ (both purse seiners and long liners). The available fishery resources in the EEZ and high seas, are migratory species and if they are not caught while in our waters, the country loses a substantial amount of revenue and employment.

Despite her reasonably rich fisheries resources, the country has not been able to adequately benefit from the sector, particularly fisheries in the EEZ due to several challenges including the absence of essential fisheries infrastructure including fishing harbour, the absence of a national fishing fleet and fishing support services in the EEZ and high seas by local fishers. For example, at present, there is no dry-docking facility in the country. Instead, there are a few vendors and small shops engaged in the supply of boat engines and spare parts for boats and cold chain machines.

Operational objective 1: To promote the utilization of untapped/underutilized EEZ and high seas fisheries resources for economic growth.

Issue:

Low contribution of EEZ and high seas fisheries resources to the GDP, the fisheries sector and the national economy.

Strategic interventions:

(i) Encouraging investment in the EEZ and high seas.
(ii) Designing research programmes to explore the investment potential of the EEZ and high seas.
(iii) Building the capacity of local investors to invest in fisheries in the EEZ and high seas.
(iv) Developing infrastructure to support the EEZ (fisheries harbour and processing factories).
(v) Ensuring investment strategies are in place and promoting investment through public-private partnerships (PPP).

Proposed actions:

(i) Promote investments targeting EEZ and high seas fishing.
(ii) Design and conduct research to explore the potential of the EEZ and high seas.
(iii) Develop and implement relevant capacity building programmes for local investors.
(iv) Encourage investors to build infrastructure and procure facilities for harvesting fish in the EEZ.
(v) Develop a strategy for the government to collaborate with the private sector in investing in the fisheries sector under PPP arrangements.
(vi) Development of dry-docking facilities that will serve both private and national fleets.
(vii) Encourage local people to invest in spare parts for boat engines and cold chain storage facilities.

8.11 Thematic Area Eight: Cross-Cutting Issues

These are issues that affect different aspects of the FSMP and other related disciplines that need special attention. They should also be integrated into all stages of the Master plan implementation and should, if possible, be addressed by the government through the Ministry of Livestock and Fisheries in collaboration with other relevant authorities/partners such as LGAs, development partners and the private sector. This approach would create a diversified means of accessing livelihood and reduce high dependence on fisheries resources.

The sub-topics placed under this theme include; (i) HIV/AIDS and other communicable disease prevention mechanisms, (ii) the disaster risks and climate change impacts, (iii) limited involvement of stakeholders, particularly women and youths in the fisheries management, (iv) low coverage and unaffordable social protection services to small-scale fishers and fish workers, (v) value chain and post-harvest loss, and (vi) inadequate social services in fishing communities.

8.11.1 HIV and other communicable disease prevention mechanisms

The fishing communities residing in remote areas and fishing camps located on isolated islands are particularly vulnerable to sexually transmitted diseases (STDs) including HIV/AIDS, and other communicable diseases including water borne diseases, malaria and the COVID-19 pandemic.

The Ministry of Health and LGAs have been making deliberate efforts to address HIV/AIDS in fishing communities and other disadvantaged groups through awareness campaigns, providing health services, protectives (condoms), ARVs and supporting them to access affordable social protection services, affordable basic needs and the implementation of alternative income generating activities. Despite all these efforts, the main challenge is to reduce the prevalence rates within fishing communities for sustainable management and development of fisheries resources.

Operational objective 1: To promote behavioural change and communicable disease prevention mechanisms/programmes for fishers and fish-workers.

Issues:

(i) Irresponsiveness of fishery stakeholders to behavioural change on communicable diseases such as STDs, HIV-AIDS and cholera.
(ii) Low awareness, socio-economic and cultural factors, amongst fishing communities contribute to high infections.

Strategic interventions:

(i) Creating programmes advocating behavioural change and communicable disease prevention among fishers/fish workers and their families.
(ii) Provision of adequate health services and facilities in the fishing communities.

Proposed actions:

(i) Develop and strengthen interventions aimed at changing behaviour in isolated fishing communities.
(ii) Develop a mechanism that would enable fishers and their families to access affordable health insurance.
(iii) Construct health centres/dispensaries in the permanent fishing villages.
(iv) Provide mobile health services to fishers in temporal fishing camps/villages.

8.11.2 The disaster risks and climate change impacts

Climate change impacts and disaster risks affect the fisheries sector in many different ways, for example, floods often lead to large numbers of

deaths, casualties and cause tangible losses such as damage to boats, gear, fish cages, households and production assets, the destruction of infrastructure (houses, roads, landing sites, fish processing facilities) and other properties.

A national climate change adaptation and mitigation strategy exists under the Vice-President's Office, Environment Division. There is also a National Disaster Committee under the Prime Minister's Office. Both of these initiatives are aimed to ensure that mitigation and adaptation measures are implemented accordingly, to rescue vulnerable groups of people, including fishers from risks associated with climate change and other natural disasters.

Operational objective 2: To ensure that mitigation and adaptation strategies for reducing the effects of climate change and variability are in place and implemented accordingly.

Issues:

(i) Effects of climate change on fisheries and aquatic environment.
(ii) Uncoordinated disaster preparedness and climate change adaptation and mitigation measures among fishers.

Strategic intervention:

Implementation of national mitigation and adaptation strategies for climate change.

Proposed actions:

(i) Develop/review and implement mitigation measures.
(ii) Develop disaster and climate monitoring programmes.
(iii) Sign MoUs with institutions dealing with disasters and climate change.
(iv) Integrate, harmonize and coordinate environmentally sustainable strategies on adaptation to and mitigation of climate change.
(v) Support research programmes to improve and develop new technologies.

8.11.3 Limited involvement of stakeholders in the fisheries management

The existing policies and guidelines related to the fisheries sector encourage stakeholders' involvement in the fisheries sector. However, they do not clearly show the role and responsibilities of different groups of stakeholders in managing and developing the fisheries sector. The involvement of different groups, such as women, youths and marginalized stakeholders in the implementation of appropriate strategies and

management of fisheries resources is an important aspect and increases the chances of success.

The involvement of youths and women in fisheries is constrained by limited access to productive resources, especially in the decision making and benefit sharing. There is a feeling that women and youths are not given special consideration due to social and cultural reasons. Thus, for the sustainable management and development of a vibrant fisheries sector, there is a need to increase the involvement of those groups.

Operational objective 3: To support the development and implementation of appropriate strategies for involving the youth, women and marginalized groups at different levels of management.

Issues:

(i) Limited involvement of stakeholders especially marginalized groups in the management of fisheries resources.
(ii) Limited entrepreneurial skills among the youth.
(iii) Limitations on equity in resource allocation and capital accessibility.

Strategic interventions:

Developing an appropriate collaborative framework to involve stakeholders at different management levels of fisheries resources.

(i) Creating a sense of ownership and commitment among fisheries stakeholders, including marginalized groups.
(ii) Develop strategy to involve youth, women and marginalized groups in fisheries management and development.

Proposed actions:

(i) Design, develop and implement appropriate strategies or frameworks for involving stakeholders in the fisheries sector.
(ii) Review the fisheries sector's guidance documents and remove barriers to stakeholders' involvement in the sector, if any.
(iii) Involve stakeholders at different levels of management.

8.11.4 Low coverage and unaffordable social protection services

The government has been taking various initiatives to address issues related to social security, decent work, safety services and basic rights for small-scale fishers. It recognizes the importance of decent work for her people. Decent work has a role in realizing sustainable fishing through the employment opportunities created or reduced underemployment that enables people to enhance higher labour returns. However, these issues are not well captured in the existing policies and laws.

There are inadequate social protection services in remote fishing villages/camps and geographically isolated islands. Such a situation, in one

way or another hinders small scale fishers to access some of the basic services and socio-economic benefits, which are their human rights. The National Plan of Action for Small-Scale Fisheries Guidelines developed recently will address all of these items. Addressing this objective would enable fishers and poor communities residing in these areas to improve their livelihood and enhance their contribution to an economically, socially and sustainable future.

Operational objective 4: To enhance social protection, safety at sea and decent working conditions scheme for fishers, fish workers and other resource users.

Issues:

(i) Absence of framework that would enable small scale fishers and disadvantaged groups to access their rights and basic needs.
(ii) Lack of rescue centres and safety equipment for small scale fishers.
(iii) Inadequate employment opportunities in the fisheries sector.
(iv) Low coverage and unaffordable social protection services to small scale fishers.

Strategic interventions:

(i) Enhancing safety at sea, and establishing decent working conditions and social protection schemes.
(ii) Develop mechanisms to engage fishers, fish workers and other fisheries resources users in social security services.

Proposed actions:

(i) Develop/review formal arrangements on fishers' rights and strengthen them.
(ii) Encourage the National Social Security Fund (NSSF) to extend its services to small scale fishers and other marginalized groups.
(iii) Encourage different institutions to support fishers' welfare and create a conducive/enabling environment for fishers to earn their livelihoods.
(iv) Implement NPoA-SSF Guidelines; establish SSF cooperatives and related organizations.
(v) Incorporate the legal mandates of fishers' cooperatives and organizations so that they can provide support in terms of goods and services to fishers in the Fisheries Act/Regulations.
(vi) Develop rescue centres along various water bodies; safety equipment accessed by fishers and sold at reasonable prices.
(vii) Develop/review of both formal and informal arrangements on fishers' rights and strengthen them.

(viii) Encourage different institutions to support fishers' welfare and create a conducive/enabling environment for fishers to earn their livelihoods.
(ix) Develop a mechanism of accessing information on the size of the fisheries sector and socio-economic status of small scale fishers.

8.11.5 Value chains and post-harvest loss management

Various initiatives are undertaken to reduce post-harvest loss for artisanal fishers, although the problem is not resolved yet. Capture fisheries face a big challenge of decreasing supply against a growing demand. Part of the supply decline has been attributed to post harvest losses. Normally, fishing, processing and trading are the major three fish value chain nodes which are profitable. Post-harvest losses occur at all nodes of the value chain but there are higher chances of occurrence at the processor's node. Traders lose more in terms of percentage weight and in monetary value. Somanje (2016) analysed the value chain and concluded that, storage time, interest rates and price of materials were the major factors influencing the profitability of operators. In this case, the interaction of price of capital and price of transport, price of labour and price of materials influences levels of profitability. Therefore, post-harvest losses occur at all nodes of the value chain with the trader node experiencing the highest levels of percentage physical loss and quality loss. Post-harvest losses can be reduced through improved processing and handling methods.

Operational objective 5: To ensure that fish and fishery products are properly handled, processed and stored/preserved to reduce post-harvest loss along the value chain.

Issue:

Poor income from fishing due to poor post-harvest practices.

Strategic interventions:

(i) Enhance introduction of improved and appropriate technology and techniques for fish and the fishery products value chain (fishing, handling, processing, storage/preservation and marketing).
(ii) Improving skills and knowledge of good product handling from processing practices to supply chain actors.
(iii) Develop strategies to reduce post-harvest loss along the fish value chain.
(iv) Reducing the post-harvest loss by opening up off-shore facilities.
(v) Support fisheries value chains affected by climate change e.g. coolers/insulated containers to improve the conservation of fish products.

Proposed actions:

(i) Use appropriate technology along the fisheries value chain.
(ii) Develop the infrastructure needed for fish handling, processing, storing and trading.
(iii) Conduct land use plans to reduce pressure on inshore fish stocks.
(iv) Demarcate specific areas/land to improve storage of fish products.

8.11.6 Inadequate social services in fishing communities

Many fishing communities lack essential social amenities including schools, health services facilities and clean water supply. Lack of these facilities hinders fisheries and aquaculture development in these areas.

Operational objective 6: Enhance social services for sustainable development of fisheries sector.

Issue:

Inadequate social services in both fishing communities and other rural areas.

Strategic intervention:

Promoting social services in fishing camps and villages**.**

Proposed actions:

(i) Construction of schools for fishing community families staying in remote areas.
(ii) Supply clean water services in the fishing communities.

8.12 The Master Plan Matrix for 2021–2036

This section presents the main actions in the master plan that will be carried out by the Fisheries Division to achieve outputs and outcomes in the next 15 years (2021–2036). The thematic areas matrix consists of operational objectives, outcomes, outputs and actions for managing and developing the fisheries sector in mainland Tanzania, and baseline information which shows the status of each item/component, timeframe for implementation of each objective, estimated budget and responsible body (Table 14). This matrix is the most important tool for guiding the implementation of the FSMP. It is also the basis for adaptive management. It provides a comprehensive summary of the scope and key components, as well as indicators of the progress made towards achieving the objectives/outcomes.

Table 14: Fifteen-year Master Plan Matrix of the Fisheries Sector Indicating the Major Target Outputs/Outcomes for each Operational Objective in the Thematic Areas

Thematic Area One: Maintenance of the Environment, Ecological Systems and Associated Biodiversity.							
Operational objective 1: To strengthen the management of aquatic ecological systems and their processes to reduce the decline in the quantity of fish and fish species.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Timeframe**	**Indicative Budget (USD)**	**Responsible Institutions**
1.1. Cross-ecological systems, processes and biodiversity restored and protected from anthropogenic risks.	Critical ecological systems understood, identified and put under protection.	Promoting conservation programmes and sustainable management of aquatic ecosystems to reduce the loss of critical habitats and associated biodiversity.	Ecological linkages understood/information available.	Fisheries and related laws, regulations and guidelines are in place. Some fishery management plans have been developed, although they may need reviewing. Very little information on cross-ecological systems is available	2021-2036 These activities are ongoing, though will be implemented in phases.	A total of USD 25,000 per year is required to implement the activities. **USD 450,000**	Ministry of Livestock and Fisheries (MLF), Ministry of Natural Resources and Tourism (MNRT), Vice President's Office – Division of Environment (VPO-DoE) and NGOs.
	Laws, regulations, guidelines and management plans are strengthened to control illegal undertakings and minimize natural hazards.	Promoting biodiversity conservation and protect endangered species.	Critical habitats in different water bodies identified and documented.				
	Enforcement improved (both human and financial resources made available).	Promoting Ecosystem Approach to Fisheries Management, Co-management and Spatial Planning among fishers and	User zones and their maps exist.				

		other stakeholders					
		Creating awareness of fishers and other key stakeholders on the importance of aquatic ecosystems to fisheries activities.	Number of degraded habitats restored. .				
		Promoting establishment of aquatic reserves, ecosystem restoration programmes, temporary and permanent closed systems.	Laws, regulations, management plans and guidelines reviewed and improved accordingly				
		Protecting and restoring destroyed habitats and ecosystem processes.	Awareness raising manuals and reports.				
		Developing appropriate fisheries management plans (MPs) and multi-sectoral collaborative mechanisms to facilitate implementation of MPs.	Important fishery and management plans developed.				

Operational objective 2: To reduce anthropogenic impacts on the resources located within and adjacent to water bodies to increase their productivity.							
2.1 Anthropogenic effects on aquatic resources reduced to a great extent.	Mitigation measures (regulations, guidelines, management plans and rules) against anthropogenic effects reviewed as needed and strengthened.	Improving the governance of resources in the marine and inland waters.	Reports and a number of management measures reviewed, improved and put in place.	Mitigation measures are in place, although not all are adequately enforced. There is little awareness about anthropogenic effects.	2022 – 2027	USD 10,000 per annum for 5 years. **USD 200,000**	MLF, LGAs, Fishing and Local Communities
			Reports on the status of anthropogenic effects.				
	Collaboration amongst key stakeholders in managing fisheries resources strengthened. Awareness on anthropogenic effects among stakeholders increased.	Introducing and strengthening community environment management programmes.	Collaborative enforcement reports.				
		Developing mitigation measures to reduce the effects of anthropogenic activities on water bodies. Fostering collaboration with relevant institutions to enforce the laws and	A number of developed (new) and reviewed mitigation measures.				
			Available				

		regulations governing aquatic-ecosystem management.	MoUs/agreements.				
			Awareness raising programme meetings.				
		Establishing mechanisms for controlling aquatic pollution and contamination from domestic, industries, rivers up-stream activities and establishment of development projects closer to water bodies	Management programmes development and implementation reports.				
			Harmonized laws and management protocols are in place.				
Operational objective 3: To implement environmentally friendly beach use and waste management programmes around the landing sites.							
3.1 Beach/intertidal areas use, solid and liquid waste issues are properly addressed using appropriate mechanisms.	Effective beach/intertidal areas use plans developed, implemented and reviewed accordingly.	Promoting sustainable waste disposal and land/beach use practices within and adjacent to water bodies.	Beach/intertidal areas use plans and their impact.	Land use and waste management laws and plans are in place. However, they are not properly enforced, some may need to be reviewed and strengthened. Recycling initiatives/activities are still on a small scale.	2024 – 2031	**USD 400,000**	MLF, LGAs, and Ministry of Lands and Urban Development, CSOs, CBOs and fishing community members
			Beach use zones and the level of compliance.				
	Effective solid and liquid waste management	Promoting beach use best practices within and adjacent	Waste management plan and implementation reports.				

	plans developed, implemented and reviewed accordingly.	to water bodies.					
	Some solid waste is being recycled.	Developing youth and women litter management programmes at landing sites, fish markets and beaches.	A number of recycling initiatives.				
			Enforcement reports and the level of compliance.				
	Laws and regulations on waste disposal and land use enforced.	Developing a multi-stakeholder platform to strengthen partnerships and cooperation among the stakeholders in the fisheries sector and used to mainstreaming the application of both the VGGT and the SSF guidelines.	Strategy documents and implementation reports.				
Operational objective 4: To maintain an ecological balance to stocks so that they continue producing Maximum Sustainable Yields (MSYs).							
4.1 Stock assessments are conducted routinely to maintain the	Stock assessments of the great lakes and the ocean conducted at least every three years.	Supporting assessment of the status of fish (fish stocks) in different water bodies.	Stock assessment and fish catch reports.	Only a few stock assessment reports for some water bodies).	2022, 2027 and 2032	**USD1,500, 000**	MLF (Fisheries Division and TAFIRI), LGAs
			Skilled staff present at different fisheries management levels	To date, no stock	Stock assessme		

ecological balance in different resource bases (water bodies).	At least three staff members who are experts in stock assessment present at TAFIRI and in the Central Government (Fisheries Division) and the Local Government Authorities.		(both in the central and local government.	assessment has been conducted in small water bodies.	nt carried after every 5 years.		
	Increased budgets and facilities for carrying out stock assessments in different water bodies.	Supporting acquisition of fisheries on a regular basis and using standard data collection protocols.	Stock assessments carried out using available facilities.				
	Strengthened Tanzania Fisheries Research Institute (TAFIRI) and its centres.		Increased the budgets and the number of staff members at TAFIRI.				
Thematic Area Two: Improved Research, Monitoring and Reporting System.							
Operational objective 1: To strengthen fisheries data collection and information management systems for informed decisions.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Timeframe**	**Indicative Budget**	**Responsible Institutions**
1.1. Scientific information/data is available	Data collection systems are in place for all fisheries (artisanal,	Improving fisheries data collection and information management/storage	Progress/monitoring reports. .	A fisheries database is available, although not	2022 – 2025	**USD 500,000**	MLF (Fisheries Division and TAFIRI).

for making sound management decisions on fisheries resources.	semi-industrial and industrial fisheries).	systems.	Presence of an operational and up-dated database.	regularly maintained and updated. Data collection for artisanal fisheries is done consistently in the areas where BMUs are active. Fish export and import data are available.			
	Staff members with skills to collect, analyze, interpret and write scientific reports are available.	Developing strategies to gather and collect fisheries data and information from minor waters (small lakes, wetlands, rivers and dams) and marine.	Presence of skilled staff discharging their duties				
	All data collected analyzed and fisheries reports produced and disseminated to stakeholders.	Building the capacity of fisheries data collectors including fisheries staff and BMU members.	Monitoring programmes and their implementation reports.				
			Data collection protocols and dissemination reports.				
	Database properly maintained and updated on regular basis.	Developing strategy to collect and gather fish marketing, post-harvest and fisheries social-economic data.	Application of scientific information in the fisheries sector.				
Operational objective 2: to strengthen fisheries research, monitoring and extension services for informed decisions							
2.1 Required information for making sound and informed decisions from basic and applied research are available and	Research, monitoring and extension services programmes are in place and implemented as planned.	Improving fisheries research, monitoring programmes and information dissemination systems.	Research and monitoring reports	as stated above (operational objective 1)	2022 – 2031	**USD 700,000**	MLF, LGAs, TAFIRI, NGOs and Development partners.
	Adequate funds for carrying out research, monitoring and extension made available from reliable	Building capacity of the Tanzania Fisheries Research Institute.	Application of technology and innovation skills				

disseminated accordingly.	sources.						
	Staff are equipped with required hands-on skills.	Developing strategies to Soliciting funds for supporting fisheries research and monitoring programmes on a regular basis.	Report on funds raised for research.				
	Innovations and technology disseminated.	Strengthening and supporting fisheries extension service delivery.	Extension services and information dissemination reports.				
		Facilitating fisheries information and technology dissemination.	Dissemination reports				
Operational objective 3: To develop and improve appropriate technologies for fisheries industries so as to increase production and productivity.							
3.1 High production and productivity of fisheries due to developed and improved appropriate technology.	Capacity building in appropriate technology and innovations programmes are in place.	Strengthening research collaboration and linkages within and outside the country.	Designed relevant technology and innovations system in place.	Production and productivity of fisheries is low due to inadequate appropriate technologies.	2022 – 2028	**USD 600,000**	MLF, LGAs, Ministry of Industry and Trade, NGOs and Private sector.
		Promoting investment and capacity building in appropriate technology and innovations	Reports on research data turned into information.				
	Mechanisms for disseminate research information to various stakeholders are in place.	Promoting fisheries research agenda, demand driven fisheries researches and indigenous knowledge.	Reports on training and learning of employees and stakeholders.				
	Required innovations and technologies being applied.	Supporting innovation and technologies in fisheries sector.	Available innovations and technologies in fisheries				
			Identified communication needs				

		Promoting technologies to reduce fisheries' post-harvest losses and add value	Reports on post-harvest and value addition technologies				
Thematic Area Three: Empowerment of Fishers and Fish Workers.							
Operational objective 1: To support the creation of an enabling environment for fishers and fish workers, investors and other actors along the fishery value chain to access finance and financial services.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Timeframe**	**Indicative Budget**	**Responsible Institutions**
1.1 More local and foreign investors access finance and invest in the fisheries sector (fish processing and infrastructure developmen).	Increased employment opportunities.	Creating conducive environment (on the part of government) to enable fishers to access loans from financial institutions.	More credit facilities established.	At present the terms and conditions for fishers to access loans from banks and other credit facilities are not friendly to them. Investment in the fisheries sector by both foreign and local fishers is very low.	2022 – 2026	**USD 50,000**	MLF, Ministry of Finance (MF), NGOs and Private Sector (PS)
	Increased local and foreign investment in the fisheries sector.	Encouraging more financial institutions and credit facilities to provide soft loans and other financial services to fishers	Concessional fees are offered to competitive investors by the relevant Ministry.				
		Imparting hands-on/entrepreneurial skills to fishers/fish workers.					
1.2 Development of the fisheries sector is supported by financial institutions.	Credit facilities to support investment in the fisheries sector are established.	Encouraging commercial banks to support fishers/fish workers by giving them credits.	A number of banks and credit facilities provide loans to fishers.		2022 – 2034	Government to inject USD 200,000 to financial institutions after every 3 years to enable them to provide loans to fishers. **USD 800,000**	

Operational objective 2: To support fishers and other actors to access reliable markets along the value chain.							
2.1 Fishers have skills for producing improved and high quality products for the domestic, regional and international markets.	Enhanced production capacity, fish handling and processing skills for both artisanal and commercial fishers.	Promoting the production of high quality products.	Fishers produce high quality products that fetch high prices.	At present the skills needed to properly handle and process fish are inadequate for small-scale fishers and fish workers.	2025 - 2030	**USD 1,000,000**	MLF, Private sector and Ministry of Agriculture and Cooperatives.
	Production of high quality fish and fishery products increased.	Increasing the possibility of fishers accessing finance, financial services and international markets.	A number of cooperatives formulated/established.	Most small-scale fishers' products are for their own consumption and some are for domestic and regional markets.			
		Promoting formation of fisheries associations or cooperatives.	Export of fish and associated products increased.				
		Developing strategies to empower small scale fishers, commercial and industrial fishers.	Modern vessels, gear and handling facilities are used in fishing activities.				
		Promoting establishment of fish and fishery products market centres and linkages.					

2.2 More domestic and export markets identified and established for fish and fishery products	Increased contribution of the fisheries sector to the Gross Domestic Product (GDP) and to foreign exchange.	Supporting production of fish and fish products for domestic and international markets.	Cold chain facilities established/improved at the airports.	The export of fish and fishery products is low. The contribution to the GDP and foreign exchange is low.	2022 – 2025 An on-going activity.	**USD 2,500,000**	
	The export of fish and fishery products increased.		Export markets increased.				
			The distribution chain for domestic markets improved.				
			Communication networks for fish markets are in place				
Operational objective 3: To reduce dependence on fisheries resources by local communities by introducing alternative activities for getting livelihoods.							
3.1 Alternative income generating activities (AIGAs) to diversify sources of livelihoods for fishing communities identified.	Research conducted to identify reliable and sustainable AIGAs for fishing communities.	Building capacity and empowering local fishers.	Reports on introduced alternative activities.	Many projects have an AIGA component, although most of them have failed. Most of the established projects cease once they are phased out	2023 – 2028 and 2029 – 2035 Done in two phases	**USD 1,200,000**	MLF, LGAs, NGOs and Donors
			Reports on implementation of a co-management approach				
		Supporting diversification sources of livelihoods for fishing communities identified and implemented.	Training reports promoting the use of underutilized				
			Awareness raising/training reports on natural resources				
		Promoting AIGAs and improved coastal livelihood opportunities.	Entrepreneurship programmes/training reports				

Thematic Area Four: Institutional Capacity Building.							
Operational objective 1: To strengthen fisheries management, research, training and co-management institutions to ensure effective development of the sector.							
Outcomes	**Outputs**	**Strategic interventions**	**Key Performance Indicators**	**Baseline Information**	**Timeframe**	**Indicative Budget**	**Responsible Institutions**
1.1 Fisheries and its institutions are well strengthened and given the capacity to fulfil their functions.	All fisheries institutions have a reasonable number of staff and the necessary infrastructure, and are equipped with all the necessary working facilities.	Strengthening human resource development and capacity to respond to existing and emerging fisheries challenges.	Infrastructure and facilities available.	There is a reasonable number of staff members, infrastructure and working facilities all over the country, although these are not enough. Some of the infrastructure and facilities need major rehabilitation.	2022 – 2036 Ongoing activity	**USD 5,500,000**	MLF, LGAs, BMUs, CFMAs, and Fishing communities.
			Equipment purchased.				
	Capacity building programmes are in place and developed based on a training needs assessment (TNA) carried out in each institution.	Strengthening fisheries and co-management institutional capacity.	A TNA report and capacity building/training programmes in place.				
		Improved working environment through effective training and service delivery	A number of staff members recruited				
Operational objective 2: Fisheries officers and private staff have the knowledge and hands-on skills necessary for performing their duties.							
2.1 Fisheries officers at different levels equipped with skills for discharging their duties and any other	All fisheries officers in the country have skills for discharging their duties and any other technical duties.	Strengthening of institutions and human resources in fisheries management and development towards achieving blue economy goals.	Training manuals and reports	Various on-the-job courses are offered to government staff, key stakeholders and a few private-sector employees	2023 – 2035	**USD 1,750,000**	MLF, LGAs and PS
	Fisheries officers working	Strengthen fisheries training	A number of fisheries officers trained				

duties, especially those relating to emerging issues.	for the government and the informal/private sector equipped with fish handling and processing techniques.	institutions and establish special training programmes for fisheries stakeholders along the value chain.	in various fisheries issues.				
		Managing environment and eco-system for fishery including land uses, water access and related rights, and soil monitoring.	A number of staff graduated in PhD and master programmes.				
			Report on awareness programmes carried out.				
			A number of staff attended short courses training in specialized skills.				
Operational objective 3: To support infrastructure development for fisheries management, research, training and conservation institutions.							
3.1 Public sector infrastructures in fisheries sector are well developed	All necessary infrastructure available and used by different institutions to carry out their functions.	Creating an enabling environment for institutions to fulfil their statutory functions.	Infrastructure built/rehabilitated.	Only few infrastructures available and some need major rehabilitation.	2024 – 2033	**USD 4,500,000**	MLF, and LGAs
		Support fisheries infrastructure development for fisheries management, research, training and conservation institutions.					

Thematic Area Five: Compliance and Enforcement of Management Measures.							
Operational objective 1: Ensure Monitoring, Control and Surveillance (MCS) unit, NMATT, BMUs and CFMAs enforce fisheries legislation effectively.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Timeframe**	**Indicative Budget**	**Responsible Institutions**
1.1 Fisheries enforcement/compliance machinery are well developed and coordinated.	Necessary working facilities are in place and being used to ensure compliance enforce laws at different management authorities.	Strengthen compliance and enforcement agents (MCS, NMATT, BMUs and CFMAs).	CFMAs established in 5 Districts.	Enforcement machinery available but not well equipped.	2022 – 2036	**USD 20,000,000**	MLF, LGAs and Local communities
		Promote establishment and strengthening fisheries patrols and quality control stations across the country.	Equipment purchased.				
		Promote establishment and strengthening of BMUs and CFMAs for efficient fisheries resources management across the country.	MCS offices constructed and renovated.				
			BMUs strengthened.				
			More MCS units established.				
Operational objective 2: To strengthen management interventions, international cooperation/collaboration and dialogue among countries sharing water bodies.							
2.1 A platform for discussing potential issues for developing collaborative relationships among partner states developed.	Communication and information sharing agreements developed to build trust on common goals among state partners.	Strengthening the capacity to meet regional and international obligations and to pro-actively act on existing and emerging issues.	Cooperation and management MoUs are in place	Management cooperation and interventions in fisheries resources are streamlined and legalized, although they are not adequately enforced.	2026 – 2029	**USD 300,000**	MLF and Ministry of foreign Affairs and International Cooperation, and conservation institutions.
			TBCAs in place.				
			Information sharing mechanism/strategy is in place and applicable.				

2.2 Trans-boundary/shared ecosystems are managed properly in partnerships.	Cooperation among states sharing water bodies established.	Establishing trans-boundary conservation areas (TBCAs) and associated management strategies.	Legal and institutional frameworks identified.				
	Presence of an avenue/mechanism for sharing information between/among neighbouring states.	Strengthening collaboration/cooperation of fisheries resources management regionally and internationally.	Harmonized functions of legal and institutional frameworks in place				
	Presence of harmonized functions of legal and institutional frameworks and agreed management measures.		Agreed management measures/protocols being operationalized.				
Operational objective 3: To support the development of management plans and their implementation for all important fisheries in Lake Nyasa, Lake Tanganyika, Lake Victoria and Indian Ocean.							
3.1 Management plans for all important fisheries and their ecosystems in different water bodies developed.	Fish groups and ecosystems which need special management arrangements identified.	Developing, implementing and reviewing management plans for all important fisheries.	New and reviewed management plans in place.	Management plans of some important fish species developed, although they are not fully implemented .	2023 – 2030	**USD 2,000,000**	MLF (Fisheries Division, MPRU and TAFIRI)
	Availability of funds for implementation of fisheries management plans.	Designing appropriate mechanisms for research and monitoring of important fish stocks.	Management measures and harvesting strategies in place.				
	Adopted management		Research and monitoring				

	approach and action plans are in place.		programmes and reports.				
			No-take or restricted zones established.				
Operational objective 4: To strengthen partnerships and cooperation among stakeholders in the fisheries sector.							
4.1 Cooperation and partnerships amongst stakeholders strengthened.	Stakeholder's partnership and cooperation policies reviewed.	Develop a multi-sector platform to strengthen partnerships and a cooperation platform for actors, including the private sector.	Review documents.	Fisheries policy and guiding rules do not show the role and responsibilities of stakeholders in managing and developing the fisheries sector.	2022 – 2033	**USD 600,000**	MLF, LGAs, NGOs, CSOs and Fishing/Local Communities.
	Expanded new opportunities for cooperation.	Promoting an intra- and inter-cooperative and collaborative institutional framework.	Partners' platforms.				
		Specification of the Public Private Partnership arrangements in fisheries sector/industry	Developed a collaborative institutional framework.				
Operational objective 5: To prevent illegal, un-reported and un-regulated (IUU) fishing.							
5.1 Illegal, un-reported and un-regulated fisheries at different levels adequately prevented.	Involvement of committed staff and local community members in the enforcement of laws and regulations against IUU fisheries	Establishing awareness raising programmes on effective law.	Reports on awareness materials produced and disseminated.	Key stakeholders are consulted in the process of reviewing laws and preparing regulations. Fisheries staff, local communities and	2021 - 2036	**USD 800,000**	MLF, LGAs, NGOs. CSO, BMUs, CBOs and Fishing Communities.

	Increased awareness of local communities and other potential stakeholders on the Fisheries Act and Regulations, including the do's and don'ts.	Strengthening mechanisms for sharing information and disseminating awareness-raising materials among the key stakeholder's enforcement procedures.	A number of IUU fisheries and compliance events reported.	other stakeholders are collectively enforcing laws and regulations.			
		Develop strategies to combat IUU fishing and illegal trade.					
Thematic Area Six: Fisheries Infrastructure Development.							
Operational objective 1: To establish and rehabilitate the necessary infrastructure for the development of fisheries sector.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Timefra me**	**Indicative Budget**	**Responsible Institutions**
1.1 Infrastructure needed by fisheries sector to fulfil their obligations developed.	Fisheries sector carry out their tasks and functions.	Developing and improving the fisheries landing sites, fishery market infrastructure and facilities (cold chain and handling equipment for fish and fishery products).	Infrastructure developed.	Some of the necessary infrastructure for development of fisheries sector are in place, though they need major rehabilitation.	2024 – 2029	**USD 2,000,000**	MLF, NGOs, fishing communities and Private Sector.
	Fisheries sector equipped with all the necessary infrastructure, equipment and facilities.	Creation of conducive environment by the government to attract more investors in the fisheries sector.	Equipment and facilities purchased.				
		Promote and support private sector participation in the investment and rehabilitation of fisheries infrastructure and facilities.	A staff training report.				
			Physical fisheries infrastructure and rehabilitated ones in place and reports.				

Operational objective 2: To encourage the private sector to invest in infrastructure development in the fisheries sector.							
2.1 Fisheries sector infrastructure built by the private sector or under PPP arrangements.	Expanded infrastructure developed by the private sector and under PPP arrangements.	Develop a strategy for promoting involvement of the private sector in the fisheries sector management and development.	Private-sector developed fisheries infrastructure in place.	There is little infrastructure developed by the private sector, by the government and under PPP arrangements.	2022 – 2027	**USD 250,000**	MLF, Ministry of Industry and Trade, NGOs and Private Sector.
2.2 Fisheries investments done by the private sector or under PPP arrangements.	The required fisheries infrastructure and investments developed under PPP are in place.	Encourage investors to develop fisheries infrastructures and facilities to increase production.	Purchased fishing vessels and other items are in place. Developed fisheries infrastructures and investment are in place and operationalized.	Fisheries infrastructure, facilities and investments are very few and inadequate.	2024 – 2030	**USD 6,000,000**	MLF, LGAs, PS, Donors and fishing communities
Operational objective 3: To strengthen the information system on the availability of markets.							
3.1 The fisheries information system on markets are in place and operationalized.	Fisheries infrastructure is in place.	Developing a marketing information system and linkages in the marketing chain.	An information system for fish and fishery products markets is in place.	The available infrastructure, equipment and facilities are not enough for institutions to carry out all their functions. No information system for fisheries markets	2021 – 2025	**USD 300,000**	MLF and LGAs.
	A marketing information system developed.	Establishing a market intelligence unit.	Funds made available for infrastructure development.				
		Promoting use of technology in accessing market	Market units in place.				

		information.	Information and Communication Technology (ICT) used to access fish and fisheries markets.				
Thematic Area Seven: Exclusive Economic Zone (EEZ) and High Seas Fishing Opportunities.							
Operational objective 1: To promote the utilization of untapped/underutilized EEZ and high seas fishery resources for economic growth.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Timeframe**	**Indicative Budget**	**Responsible Institutions**
1.1EEZ and high seas fisheries contribute significantly to the national GDP and foreign exchange.	More fish preservation/storage facilities, processing facilities and international fishing markets constructed.	Encouraging investment in the EEZ and high seas.		No local fishers fishing in the EEZ and high seas. The Fisheries Division is issuing licences and permits to foreign fishing vessels so that they can harvest resources in the EEZ (both purse seiners and long liners).	2023 – 2031	**USD 5,000,000**	MLF, LGAs, Private Sector, Ministry of Finance – (Financial Institutions), Ministry of Industry and Trade, Academic institutions.
	Fishing harbours/ports and associated facilities constructed.	Designing research programmes to explore the investment potential of the EEZ and high seas.					
1.2 National fisheries fleet developed / TAFICO revived and strengthened so that it can harvest untapped resources in the EEZ and high seas.	Industries specialized in making vessels and processing machines, and in making refrigeration repairs are in place.	Building the capacity of local investors to invest in fisheries in the EEZ and high seas. Developing infrastructure to support the EEZ (fisheries harbour and processing factories).	A number of investments targeting the EEZ. Report on research carried out in the EEZ and high seas.				

	Private-sector vessels fishing in the EEZ increased and the national fleets/vessels are in place	Ensuring investment strategies are in place and promoting investment through Public-Private Partnerships (PPPs).	A number of local investors trained. Harbours, jetties, storage facilities and processing factories in place. Investments made under PPP arrangements.				
1.3 A hub for EEZ and high seas fishing established to maximize employment opportunities.	The number of vendors/shops supplying consumables, boat engines and spare parts for boats and machines increased. Direct and indirect employment opportunities in the fisheries sector increased.	Encourage local people to invest in spare parts for boat engines and cold chain storage facilities.	Dry-docking facilities available. Number of vendors/shops selling spare parts of boat engines and cold chain storage facilities.	No dry-docking facilities in the country. There are few and small shops supplyin boat engines and spare parts for boats and cold chain machines	The activity will be done for four year to establish hub for EEZ and high seas fishing	**USD 450,000**	AS above

Thematic Area Eight: Cross-Cutting Issues.							
Operational objective 1: To promote the behaviour change and communicable disease prevention mechanisms/programmes for fishers and fish-workers.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Timeframe**	**Indicative Budget**	**Responsible Institutions**
1.1 Health centres/dispensaries are available in the high-risk fishing areas (isolated islands and remote fishing villages/camps).	Programmes that bring about behaviour that improves the health of fishing communities are in place.	Creating programmes advocating behavioural change and communicable disease prevention among fishers/fish workers and their families.	Documented interventions developed for fisher's behaviour change.	There are inadequate social services in remote fishing villages/camps and geographically isolated islands	2022 – 2035	**USD 950,000**	MLF, LGAs, Ministry of Health and NGOs, CSOs, Development partners and fishing communities.
	Fishers and their families enabled to access affordable health insurance	Provision of adequate health services and facilities in the fishing communities.	A number of fishers with access to health insurance.				
	Improved health services offered in high-risk fishing camps/villages.		A number of health centres/dispensaries constructed in permanent fishing camps/villages				
			Mobile health services provided.				
Operational objective 2: To ensure that mitigation and adaptation strategies for reducing the effects of climate change and variability are in place and implemented accordingly.							
2.1 Disaster risks, climate change adaptation and mitigation measures are implemented	The disaster risks and the effects of climate change on the fisheries sector and their mitigation/adaptation measures identified and documented.	Implementation of national mitigation and adaptation strategies for climate change.	Documented measures against disaster risks and the effects of climate change.	A national climate change adaptation and mitigation strategy exists under the Vice-President's Office, Environment Division. A National Disaster	2021 – 2035	**USD 1,000,000**	MLF, LGAs, Prime Minister's Office (PMO), VPO-DoE, Fishing community,

with government support.				Committee is under the Prime Minister's Office.			Academic institutions and NGOs.
	The government supports different initiatives aimed at addressing disaster risks and mitigating the effects of climate change.		Disaster and climate change monitoring programmes are in place.				
			MoUs are in place.				
			Environmentally sustainable strategies on climate change are in place.				
			A number of research projects aimed at improving and developing new technologies.				
Operational objective 3: To support the development and implementation of appropriate strategies for involving the youth, women and marginalized groups at different levels of management.							
3.1 All the barriers to equal involvement of different groups of stakeholders in the management of the fisheries sector are removed.	Strategies/frameworks for involving stakeholders in the management of the fisheries sector have no barriers.	Developing an appropriate collaborative framework to involve stakeholders at different management levels of fisheries resources.	Strategy document and an implementation report.	Policies and guidelines related to the fisheries sector do not prevent stakeholders' involvement in the fisheries sector. However, there is a feeling that women and other marginalized groups are not given special consideration.	2024 – 2036	**USD 850, 000**	MLF, NGOs, CSOs, fishing communities and CBOs.
		Creating a sense of ownership and commitment among fisheries stakeholders, including marginalized groups.	A review report.				
		Develop strategy to involve youth, women and marginalized groups in fisheries management and development.	Level of stakeholders' awareness and their involvement at different management levels				

Operational objective 4: To enhance social protection, safety at sea and a decent working conditions scheme for fishers, fish workers and other resource users.							
4.1 Fishers and fish workers protected and access social security services.	A social service scheme, guidance and related programmes addressing fishers' challenges complimenting the National Plan of Action (NPoA) are in place and operationalized.	Enhancing safety at sea, and establishing decent working conditions and social protection schemes.	Developed/reviewed and strengthened formal arrangements on fishers and fish workers' basic rights are in place and are being implemented.	Formal/legal fishers' social security, decent work, safety services and basic rights are not well addressed in the policies and laws. The National Plan of Action for Small-Scale Fishers Guidelines developed, although they are not implemented yet.	2023 – 2028	**USD 550,000**	MLF, NGOs, Ministry of Labour, CSOs and Development partners
.	NPoA for Small-Scale Fishers' Guidelines implemented.	Develop mechanisms to engage fishers, fish workers and other fisheries resources users in social security services.	Reports on initiatives being undertaken to support fisher's welfare and their livelihoods. NPoA-SSF Guidelines implementation report.				
4.2 Fishers' cooperatives provide assistance to small-scale fishers, fish workers and other needy fishers, including marginalized groups.	Well-established small-scale fishers' cooperatives and organizations.	Establish small scale fisher's cooperatives and related organizations.	A number of established small scale fisher's cooperatives and organizations. .	A few fisheries cooperatives and organizations exist, although they are still in their infancy.	2026	**USD 700,000**	

	Legal mandates delegated to fishers' cooperatives under the Fisheries Act so that they can provide goods and services	Incorporate the legal mandates of fishers' cooperatives and organizations so that they can provide support in terms of goods and services to fishers in the Fisheries Act/Regulations.	The legal mandates of fishers' cooperatives and organizations incorporated in the Fisheries Act/Regulations				
4.3 Rescue and safety mechanisms are in place and implemented accordingly.	Rescue centres allocated at strategic points of different water bodies.	Develop rescue centres along various water bodies.	A number of rescue centres in different water bodies.	Most of water bodies do not have rescues centres and safety mechanisms.	2022 – 2025	**USD 155,000**	
	Safety equipment available.	Safety equipment accessed by fishers and sold at reasonable prices.	A number of fishers accessing affordable safety equipment.				
4.4 Small scale fishers and marginalized groups access their basic rights including decent work.	Small fishers and fish workers have contracts with their employers are being paid reasonable salaries.	Develop/review both formal and informal arrangements on fishers' rights and strengthen them.	Formal and informal arrangements for fishers' rights exist and accessed.	Majority of small scale fishers are not getting their basic rights including decent work.	2023 – 2035	**USD 500,000**	Ministry of Labour, MLF, LGAs and Development partners
	Affordable social protection services are available in fishing communities.	Encourage different institutions to support fishers' welfare and create a conducive/enabling environment for fishers to earn their livelihoods.	Fishers earning their livelihoods and other basic services.				

		Develop a mechanism of accessing information on the size of the fisheries sector and socio-economic status of small scale fishers.	Important information for small scale fishers is available and accessed.				
Operational objective 5: To ensure that fish and fishery products are properly handled, processed and preserved to reduce post-harvest loss.							
5.1 Post-harvest loss reduced along the important nodes of the value chain such as handling, processing, storing and trading.	Reduced post-harvest loss in terms of quality and quantity through responsible fishing practices and infrastructure development.	Enhance introduction of improved and appropriate technology and techniques for fish and fishery products value chain (fishing, handling, processing, preservation and marketing).	Use of technology to reduce post-harvest loss.	Various initiatives are undertaken to reduce post-harvest loss for artisanal fishers, although the problem is not resolved yet.	2024 – 2033	**USD 550,000**	MLF, PS and Fishing communities
		Improving skills and knowledge of good product handling from processing practices to supply chain actors.	Presence of infrastructure/facilities.				
		Develop strategies to reduce post-harvest loss along the fisheries value chain.					
		Reducing the post-harvest loss by opening up off-shore facilities.					
		Support Fisheries value chains affected by climate change e.g. coolers/insulated containers to improve the conservation					

		of fish products.					
Operational objective 6: Enhance social services for sustainable development of fisheries sector.							
6.1 Basic social services, including clean water supply and schools are available in fishing communities staying in remote areas on isolated islands.	Fishing community family access clean water and their children attend schools.	Promoting social services in fishing camps and villages.	Schools constructed for fishing communities. Clean water facilities available in fishing communities.	There are no basic services such as school and clean water in fishing communities' camps/villages.	2022 – 2029	**USD 750,000**	MLF, LGAs, Ministry of Health, Education, Finance, CSOs, CFMAs and BMUs.
GRAND TOTAL						**USD 65,355,000**	

CHAPTER 9

9.0 IMPLEMENTATION, MONITORING, EVALUATION AND REVIEW OF THE FSMP

9.1 Implementation Arrangements

The Ministry of Livestock and Fisheries is responsible for implementing the Fisheries Sector Master Plan (FSMP), along with the principal stakeholders. Specifically, in order to speed up the implementation of this master plan, there shall be a committee responsible for it.

It should also be noted that the successful implementation of this master plan will depend on effective collaboration and coordination amongst the key stakeholders, including the government, donors, NGOs, development partners and all Tanzanians.

It is anticipated that the Fisheries Division, which is responsible for coordinating and implementing this master plan will mobilize resources and prepare a more detailed implementation action plan. The plan will, among other things, show in detail the activities/actions needed to realize the outputs and outcomes, and charge the committee with the task of steering its implementation. The activities related to this plan will be implemented through the annual implementation plan, developed projects and programmes.

9.2 Monitoring and Evaluation

Monitoring and evaluation systems will be built to provide feedback on how successful the implementation of the FSMP is. The systems may also help to identify emerging threats and needs of the sector. Thus, a proper monitoring system has been built to measure progress and demonstrate the impact of the FSMP on both management and development. Such a system gives feedback to the implementers, that is, if the efforts made have a positive or negative impact on the implementation of the FSMP. In most cases, such feedback helps to know effective strategies for further implementation as well as ineffective strategies that should be dropped or adjusted. Therefore, for better implementation of the FSMP a detailed monitoring and evaluation plan has been developed.

The FSMP matrix provides the basis for monitoring and evaluating the plan with respect to the baseline and outputs/outcomes. The monitoring and evaluation mechanism also provides a clear direction for the ongoing implementation of this master plan. Through monitoring and evaluation, the FSMP will be a living document as it focuses on the higher-level outcomes expected from the fisheries sector (the goals, objectives and results) for the fifteen-year period, i.e., from 2021 to 2036. Monitoring and evaluation will also provide indicators that could be used to measure progress. A

comprehensive evaluation and review process will be undertaken by external agents in 2036 or thereabouts. The Fisheries Division and the Department of Policy and Planning will develop an annual work plan, which will be used to guide implementation and reporting on the activities done in a year. The Division's annual work plan will be drawn from the activities in the master plan for each year. It is important to observe the types of targets envisaged as well as the timeframe and resources provided for carrying out a specific activity.

9.2.1 Monitoring

The Committee will be responsible for monitoring the implementation of the FSMP. It will periodically/regularly audit and monitor the implementation. The Policy and Planning Department is supposed to prepare a master plan monitoring programme and reporting guidelines for all the officers doing various activities/projects related to the FSMP.

9.2.2 Evaluation

There will be two types of evaluations of the FSMP, namely internal evaluation and external evaluation. Internal evaluations will be carried out once every five years using internal evaluators who are responsible for implementing the FSMP. External evaluations will involve both mid-term and terminal evaluations; the former will be done after seven and a half years and the latter at the end of the FSMP period. Both evaluations will use external evaluators. One of the roles of the Committee will be to prepare detailed terms of reference (ToRs) to guide the evaluations. The ToRs will include (i) the subject of evaluation, (ii) technical skills and experience of those evaluating the master plan, (iii) the methodology to be used in data collection, sampling procedures and indicators and (iv) data analysis and evaluation of the achievements and failures.

Both internal and external evaluations will have similar Terms of Reference (ToRs) focusing on the following aspects:

(i) achievement of the set objectives and target outcomes of the FSMP;
(ii) reasons for the success or failure of specific aspects of the FSMP;
(iii) contribution of the master plan to a better fulfilment of the Mission and Vision of the fisheries sector;
(iv) adequacy of the resources being mobilized to implement the FSMP;
(v) how efficient the resources were used to achieve the set objectives;
(vi) the challenges and problems encountered during the implementation of the FSMP; and
(vii) the lessons learnt and experience gained from implementing the FSMP.

The selection and engagement of internal and external evaluators will be done by the relevant Permanent Secretary in collaboration with the Director of Fisheries and the Director of Policy and Planning. The evaluation report

will be shared with various stakeholders for their comments and advice on the way forward.

9.3 Periodic Review of the FSMP

Since the FSMP is not a static document, there will be regular reviews to gauge if it is delivering the outcomes (adaptive management). Therefore, it will be reviewed from time to time, at least every five years, with regular monitoring. The reviews will be done in a transparent and consultative manner to incorporate the views and concerns of different stakeholders.

CHAPTER 10

10.0 CONCLUSIONS

The FSMP (2021/22–2036/37) provides a strategic framework for the long-term management and sustainable development of the sector, and an opportunity for the sector leaders to look ahead, adopt a new vision and directions, set goals and map out plans for the future. It is intended to improve the management and development of the fisheries sector and to increase food security, employment opportunities, economic growth and wealth through poverty alleviation and by safeguarding the environment. This FSMP also acts as a reminder of what the Ministry of Livestock and Fisheries and its stakeholders have agreed to accomplish within the specified period. It is meant to provide guidance to anyone intending to work with or in the fisheries sector in mainland Tanzania, including potential investors, donors, development partners and NGOs.

It is anticipated that the FSMP will be implemented well to attain its objectives, which focus on various issues related to the sector such as food security, poverty alleviation, management, governance, the blue economy, and industrial and sustainable development in the interests of human and ecological wellbeing. There are also positive signs of voluntary implementation of the plan, since various stakeholders were involved in its development. Their involvement created a sense of shared ownership and commitment among them that may bode well for the plan.

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PART II
AQUACULTURE

CHAPTER 1

1.0 INTRODUCTION

1.1 Background of the New Fisheries Master Plan

In 2002, the Government of Tanzania introduced its first Fisheries Master Plan (FMP), which was phased out in 2015. This FMP (2002–2015) was developed with financial support from the Japanese International Cooperation Agency (JICA). It was aimed at ensuring proper development of Tanzania's fisheries sector. In the previous master plan, more emphasis was placed on capture fisheries and on a few cross-cutting issues; the most important aspects of aquaculture development were left out. A good example is the inclusion of only one programme on aquaculture extension in the first FMP. The new FMP was developed following the expiration of the first FMP in 2015. In the new FMP (2021–2036) most of the issues relating to the development of aquaculture in the country will be fully addressed. The main purpose of this new master plan, which will last for 15 years, i.e. 2021–2036, is to provide overall guidance on sustainable management and development of fisheries and aquaculture in mainland Tanzania. The development of the new master plan (aquaculture) was guided by the principles of the Ecosystem Approach to Aquaculture (EAA). The principles of the EAA require the participation of stakeholders along the entire aquaculture value chain and from other related sectors. The EAA also uses an integrated approach that allows for trade-offs when one is balancing the human (socio-economic) well-being and the ecological (fish and environment) well-being through good governance (legal and institutional framework).

The new master plan is an instrument for implementing the National Fisheries Policy of 2015 for improved fisheries governance and management so that there is sustainable development of the sector. The plan is a link to other national strategies and reforms for securing national and household food and nutritional security, reducing poverty, creating employment and improving the livelihoods of the fishing communities. Ultimately its aim is to contribute to the realization of the Sustainable Development Goals 1 & 2.

1.2 Justification and Rationale

The government afforded aquaculture development a higher priority status in the Tanzania Development Vision (TDV) 2025, the Agricultural Sector Development Programme phase II (ASDP II) and Five-Year Development Plan (FYDP, 2021/22–2025/26). ASDP II and FYDP III were developed to propel the country's economic development and to guide the implementation of the prioritized interventions so that aquaculture can contribute to the

achievement of the goals of TDV 2025. Under FYDP III, the development of aquaculture is considered as one of the key interventions for deepening industrialization and improving and expanding social service provision in the country. It emphasizes the transformation of aquaculture through the modernization of the sub-sector and investment in support of infrastructure and facilities, including the promotion of commercial aquaculture production and of research-extension-aquafarmer linkages. Within the framework of the National Fisheries Policy of 2015, this master plan is a comprehensive plan for strategic development of aquaculture in mainland Tanzania for the period from 2021 to 2036. It is aimed at making sure that aquaculture is developed in mainland Tanzania to increase productivity for the purpose of achieving sustainable national food security and nutrition, farmers' income and economic development. It is expected that this master plan will facilitate:

i) long-term, sustainable development of the aquaculture sub-sector;
ii) mobilization of resources for the development of aquaculture;
iii) the effectiveness of the Ministry of Livestock and Fisheries (MLF) and other key stakeholders in enhancing the profile, performance and impact of aquaculture; and
iv) compliance of mainland Tanzania with the requirements of the African Union (AU), East African Community (EAC) and its organs, Southern African Development Community (SADC), and international agreements related to the aquaculture sub-sector.

This master plan focuses on freshwater and marine (mariculture) aquaculture, including the relevant cross-cutting issues.

1.2.2 Trade and market demand for farmed aquatic organisms

Tanzania has the potential to develop aquaculture, since both domestic and foreign market opportunities are available. The country can potentially sell large quantities of fish mainly because of the fast-growing population and the increased purchasing power. Likewise, the increase in population at a higher rate than the fish supply is a key factor for the increase in the demand for fish, which may most likely attract an increase in fish prices over time. Aquaculture products include species with high value such as prawns which have high potential of being exported abroad. Regarding market differentiation, the local market has three main segments, namely low-income, middle-income and high-income consumers. The low-income group prefers small-sized whole fish and small portions of a bigger fish, which enables them to buy one fish or a piece of a bigger fish sufficient for domestic consumption. On the other hand, the middle-income group prefers small to medium-sized whole fish, while the high-income group prefers big fish. The high-income group often includes restaurants or high-end butcheries.

The current market price of farmed tilapia, which is the most common farmed fish species in Tanzania, is about TZS 7,000 to 9,000/kg (USD 3.45

to 3.88). This price is more than twice that of tilapia in Egypt, i.e. USD 1.45-1.50/kg. Egypt is the largest market in Africa. The fish farming value chain in Tanzania also consists of middlemen who buy fish from farmers at a farm gate price of around TZS 6,000/kg (USD 2.59). It is anticipated that the expansion of aquaculture in Tanzania will involve large aquaculture farms, which will bypass the middleman and be able to supply fish directly to consumers. This will be possible if the inputs that are most important to the development of aquaculture are made available. This is one of the main areas on which the new FMP (Aquaculture) focuses. The inputs include feed, which is the most expensive component of operating costs in aquaculture. Tanzania has most of the key ingredients for fish feed-making formulations compared to countries such as Egypt, which imports most of the ingredients. For example, in Kenya the cost of fish feed is around USD 0.97/kg fish. It is most likely that the cost of fish feed production in Tanzania may be like that of Kenya. The cost of feed is around 65% of the total production costs. Total production cost in Kenya therefore, is around USD 1.49 per kilo of fish produced.

1.3 Methodology

1.3.1 Towards the development of the Fisheries Master Plan (Aquaculture)

The fisheries master plan (aquaculture) is an outcome of several processes and the culmination of the government's review of its first fisheries master plan (FMP, 2002–2015). The review was done concurrently with the preparation of a new fisheries master plan. The review of the first fisheries master plan identified key strategic actions and included them in the new fisheries master plan. The new master plan, which will last for 15 years, will serve as a road map and provide direction for the sustainable development of aquaculture. Prior to the development of the new master plan, the government prepared a baseline report on the status of the fisheries and aquaculture industry in the country. The baseline report provided the status of biomass, a description of the marine and inland capture fisheries trends, aquaculture production, the economic importance of the fisheries, fisheries management, training in fisheries-related issues, research and extension services. The other areas covered included fisheries and aquaculture infrastructure; fish and fishery products; quality assurance and standards; market analysis; monitoring, control and surveillance; and opportunities and challenges in the fisheries and aquaculture sector in the country. The baseline study also involved a SWOC (strengths, weaknesses, opportunities and challenges) analysis for the development of aquaculture. The results of the analysis were used in developing the new fisheries master plan.

The baseline report was validated and adopted by principal stakeholders in a series of zonal workshops that were held in Mwanza, Mbeya and Tanga. The workshops attracted representatives of stakeholders from different parts

of the country such as areas around Lake Victoria, Tanganyika and Nyasa, small water bodies, and the coastal areas of the Indian Ocean. During the zonal workshops the participants identified 17 potential issues, prioritized them and developed operational objectives. Thereafter, key interventions were formulated for the operational objectives developed from all 17 issues that had been identified. The interventions were then prioritized at a workshop attended by key stakeholders. The issues and their operational objectives are presented in Section 6 of this master plan.

A situation analysis was also done by reviewing the relevant literature to identify the potential and opportunities to develop aquaculture and the key environmental types, production systems and cultural organisms. All these are also presented in this document. To put Tanzania's aquaculture in context, a global and regional perspective of the development and production of aquaculture was also reviewed; it is also presented in this plan. The preparation of this master plan also benefitted from some cross-cutting issues that were identified in Tanzania's National Plan of Action for the Implementation of the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries–NPoA-SSF (URT, 2020). The key conclusions and specific recommendations are presented at the end of this master plan and in the executive summary.

1.3.2 Ecosystem Approach to Aquaculture

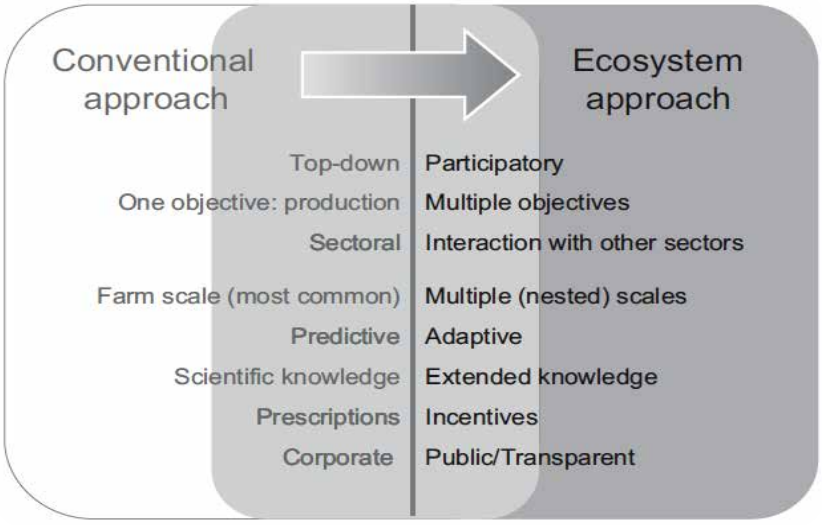
The fisheries master plan (aquaculture) was prepared in a participatory manner using the Ecosystem Approach to Aquaculture (EAA). The EAA was used to implement the principles of sustainable development. The EAA is a "strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems" (FAO, 2010). The basis of this strategy lies in stakeholders' participation in the preparation of the master plan. A shift from a conventional way of doing things to the EAA is depicted in Figure 1. The EAA is an integrated approach that strikes a balance between human (socio-economic) well-being and the ecological (fish and environment) well-being through good governance (legal and institutional framework, and infrastructure). It involves a broader set of objectives and a more participatory, precautionary and adaptive process.

The EAA builds on the conceptual framework formulated to develop the Ecosystem Approach to Fisheries (EAF; FAO, 2003, 2005) which has three main objectives within a hierarchical tree framework. The objectives are:

i) ensuring human well-being;
ii) ensuring ecological well-being; and
iii) facilitating the achievement of effective governance of the sector/areas where aquaculture is practised and has the potential to develop.

The EAA utilizes the principles of sustainable development and under the EAA, the word "sustainable" includes socio-economic considerations and their interaction with ecological ones. In other words, under the EAA, both the social and biophysical or ecological dimensions of ecosystems are closely linked, which means that a disruption of one system is most likely to cause a disruption or change in the other.

Figure 1: Transition from a conventional approach to an ecosystems approach to aquaculture



Source: FAO, 2010

1.3.3 Analysis of strengths, weaknesses, opportunities and challenges (SWOC)

SWOC affecting fisheries and aquaculture in the mainland Tanzania are as indicated in section 7.2 of part one of this Master Plan.

CHAPTER 2

2.0 BRIEF OVERVIEW OF AQUACULTURE

2.1 Global Overview (Scale, Diversity and Recent Profile of Aquaculture)

Worldwide, aquaculture was a growing, vibrant and important sector for producing high protein food. In 2018, the global production of fish from aquaculture, including finfishes, crustaceans, molluscs and other aquatic animals for human consumption, reached 114.5 million tonnes, live weight, with a farm gate sale of USD 263.6 billion (FAO, 2020). The total production of fish through aquaculture was 82.1 million tonnes of aquatic animals, 32.4 million tonnes of aquatic algae and 26,000 tonnes of ornamental seashells and pearls (FAO, 2020).

Freshwater aquaculture production of aquatic animals stood at 51.3 million tonnes in 2018, which was 62.5 percent of the world's farmed food fish production (FAO, 2020). Mariculture and coastal aquaculture production of aquatic animals in 2018 stood at 30.8 million tonnes. Asia has been the biggest producer of fish, worldwide, in the last two decades or so. Its production of farmed aquatic animals stood at 89 percent. Among the major producing countries, Egypt, Chile, India, Indonesia, Vietnam, Bangladesh and Norway have consolidated their share in regional or world fish production to varying degrees over the past two decades. Globally, about 20.53 million people were employed in aquaculture; women comprised 19 percent of the total workforce.

Over the years, the average annual growth rate of total food fish consumption has grown at a fast rate of 3.1 percent compared to the annual population growth rate of 1.6 percent. Per capita fish consumption increased up to about 20.5 kg in 2018 from 9.0 kg in 1961. Increases in aquaculture production, technological advancements, rising incomes, reductions in loss and waste, and increased awareness of the health benefits of fish contribute to the increase in the consumption of fish worldwide. At the global level, fish accounted for about 17 percent of total animal protein and 7 percent of all proteins consumed in 2017. Furthermore, fish provided about 3.3 billion people with almost 20 percent of their average per capita intake of animal protein. During this period, the lowest per capita fish consumption was recorded in Africa, where it peaked at 10.5 kg in 2014, but declined to 9.9 kg in 2017.

2.2 Development of Aquaculture in Africa

In Africa, fish is a major source of animal protein, minerals and micronutrients. In Africa, over 200 million people are said to eat fish on a regular basis (Bene and Heck, 2005). Fish accounts for more than 20% of

animal protein supplies in around 20 African countries (FAO, 2017). Egypt, Nigeria, Uganda and Ghana are the leading aquaculture producers in Africa (if we do not consider the algae production of *Eucheuma denticulatum* in Zanzibar); they contribute about 93% of the total regional fish production (FAO, 2021; Table 1). Like other continents, Africa has recently experienced a diet transformation towards an increasing demand for animal protein such as meat and fish (Zhou and Staatz, 2016). In most countries in sub-Saharan Africa (SSA), this transformation has led to an increase in the consumption of fish to about 25-50% (Cai and Leung, 2017). Most of the fish eaten in many countries in SSA come from inland capture fisheries.

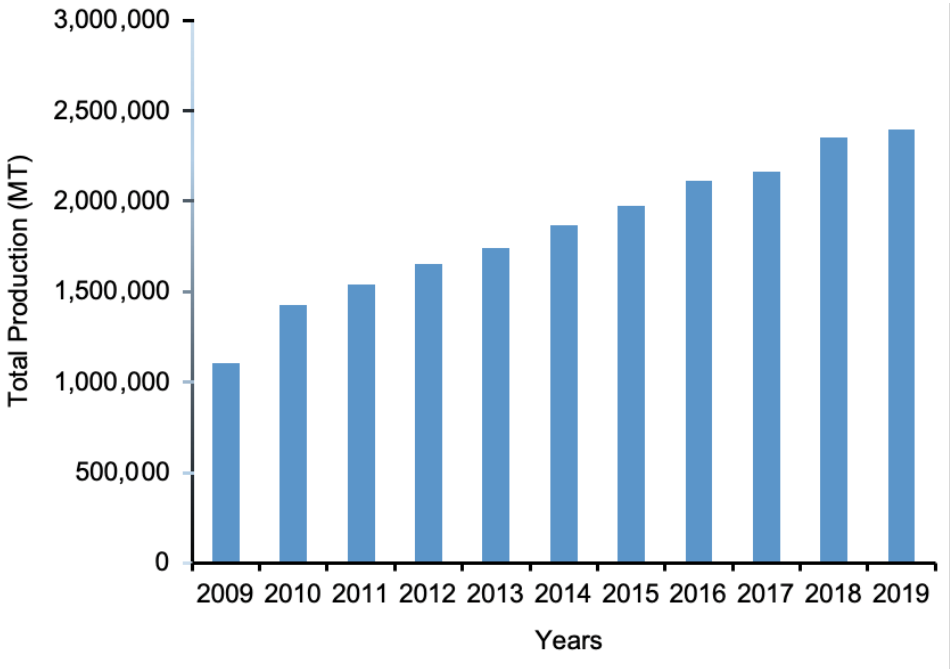
Table 1: Top 10 aquaculture producers in Africa in 2018.

Country	Production (MT)	Regional (Africa) share %	Global share %
Egypt	1,641,949	68.55	1.37
Nigeria	289,543	12.09	0.24
Zanzibar	104,635	4.37	0.09
Uganda	102,943	4.30	0.09
Ghana	52,360	2.19	0.04
Zambia	38,480	1.61	0.03
Tunisia	22,893	0.96	0.02
Kenya	18,950	0.79	0.02
Tanzania, Mainland	18,013	0.75	0.01

Source: FAO (2021). Fishery and Aquaculture Statistics. Global production by production source 1950-2019 (FishstatJ). In: FAO Fisheries Division [online]. Rome. Updated 2021. www.fao.org/fishery/statistics/software/fishstatj/en

The contribution of aquaculture production from Africa to the total global aquaculture production in 2019 was at around 2,395 million tonnes; this represented about 1.99% (FAO, 2021). Despite the low contribution of African aquaculture to the global aquaculture, this sub-sector has shown an increasing trend over time (Figure 2). It is noteworthy that in the last decade, aquaculture production in Africa has grown at an average of 8.28 percent, the global production of aquaculture has grown at 5.3 percent a year (FAO, 2020). In SSA, in particular, the production of tilapia, which is the most important farmed species, has, in the last decade, grown at 15 percent annually, compared to 10 percent globally (Ragasa et al., 2018**)**. However, the annual per capita fish consumption of around 8.5 kg is still lower than the global levels of 20.5 kg.

Figure 2: Aquaculture Production Trends in Africa.



Source: FAO. 2021. Fishery and Aquaculture Statistics. Global production by production source 1950-2019 (FishstatJ). In: FAO Fisheries Division [online]. Rome. Updated 2021.www.fao.org/fishery/statistics/software/fishstatj/en

In 2018, about 386,000 people were employed in aquaculture activities throughout Africa with the majority of those employed being women (FAO, 2020). Mostly, women do post-harvest and marketing activities in the aquaculture value chain. This employment opportunity means that aquaculture has the potential to play a major role in contributing to food security, economic development and unemployment reduction in Africa.

Strengthening infrastructure is an important strategy for developing aquaculture. Some African countries have invested in capacity building and infrastructure development for aquaculture. The development of better infrastructure such as roads, physical markets, fish storage facilities, equipment and communication services has contributed to considerable growth of aquaculture in several countries, including those in SSA. They include Angola, Ghana, Mozambique, Nigeria, Uganda and Tanzania. However, in other sub-Saharan African countries the growth of aquaculture has been slowed down by lack of high quality inputs and markets (Tacon and Metian, 2009; Tacon et al., 2010). The initiatives undertaken by the

government include creating an enabling business environment by taking steps such as expediting, coordinating and adopting policy reforms to create a conducive environment for aquaculture to thrive as a business opportunity (Satia, 2011). Several African countries have developed and adopted aquaculture-centred policies and strategic frameworks to guide the development of aquaculture (Machena and Moehl, 2001).

Soft credits and incentives are provided in some African countries. Initiatives have been undertaken to conduct research on aquaculture in Africa. Specifically, the research focuses on species characterization, selective breeding and low-cost diet production (Satia, 2011). Fast aquaculture technology transfer via farmer-to-farmer pathways and through the on-the-farm participatory research approach using model farms and private enterprises managed under the auspices of the Special Programme for Aquaculture Development in Africa (SPADA) has been witnessed in some sub-Saharan African (SSA) countries (Cocker, 2014). However, extension services are generally inadequate and weak; therefore, there is a pressing need to develop and strengthen the links between research and development (Satia, 2011). Emphasis has also been placed on supporting private sector-led production and delivery of major aquaculture inputs such as seeds and feed. Some countries have also established feed manufacturing plants and aquaculture equipment distribution centres (Koge et al., 2018). Other initiatives include the formation of aquaculture associations for information transfer, knowledge exchange and facilitation of aquaculture-related activities (Satia, 2017). Likewise, in some countries support service delivery, economies of scale, reduction of transaction costs and competitiveness have been facilitated by aquafarmers' clusters (Satia, 2017).

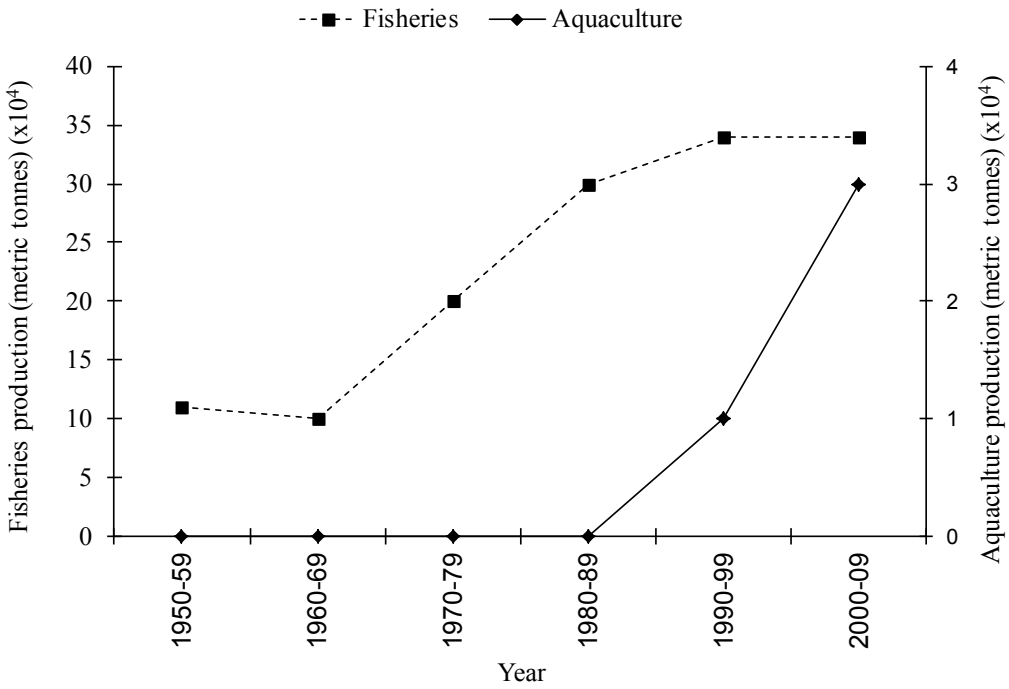
The constraints on the broader growth of aquaculture in the region have been discussed in detail by several authors (see, for example, Brummett et al., 2008). They include poor aquaculture development policies, few fish farming traditions, lack of enough and quality seeds, feed and technical advice, poor market infrastructure and access and inadequate research and extension services. Other reasons include limited coordination of research and development, and inaccessibility of capital. A weak policy that impedes the development of aquaculture; the policy emphasizes central planning over private-sector initiatives, thereby contributing to the under-development of aquaculture (Brummett et al., 2008). Thus, in order for aquaculture to make a significant contribution to the development of the continent, government policy should be geared to eliminating the main constraints and promoting commercial investments.

2.3 Development of Aquaculture in Tanzania

Tanzania has enormous potential and opportunities to develop aquaculture as Section 4.1 of Chapter 4 of this master plan shows. However, the

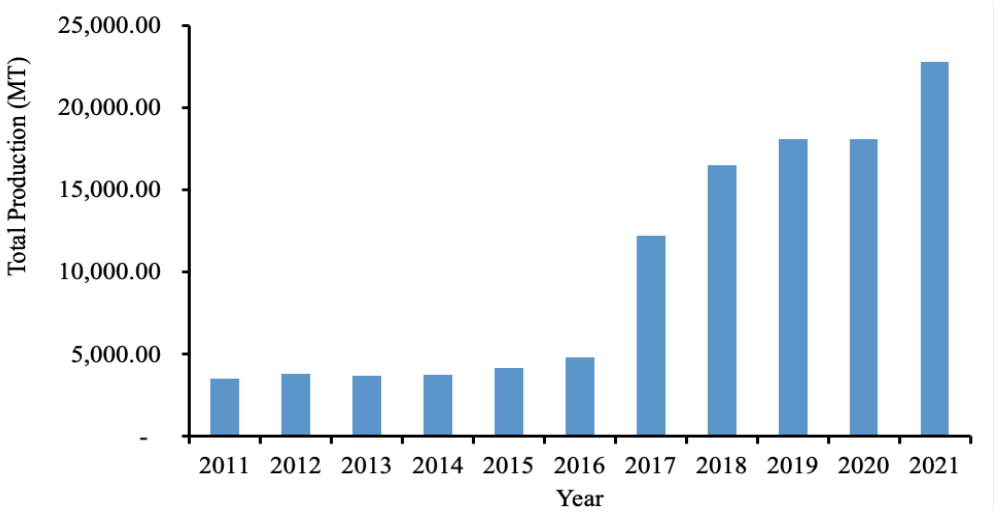
production of fish in capture fisheries and aquaculture reflects a typical global trend. Whereas fish production in capture fisheries has almost stagnated since 1990, aquaculture has been on a steady rise since 1970 (Figure 3). The recent aquaculture production data from the Ministry of Livestock and Fisheries (MLF) shows a similar growing trend (Figure 4). This is an encouraging trend, given the need for more fish in the future due to population growth, increase of income resulting in more animal protein in the diet. The increased demand for fish is coupled with the fact that there is no likely expectation of much growth of fish from capture fisheries (most of the fish stocks are exploited at, or over their MSY). Hence, the needed increase of fish supply will have to come from aquaculture. Therefore, the government is committed to making efforts to promote the development of aquaculture in the country. The government's efforts will mostly be focused on the commercialization of aquaculture through public-private partnerships.

Figure 3: Fisheries and aquaculture production trends in Tanzania from 1950 to 2009.



Source: FAO Statistics, 2012

Figure 4: Aquaculture production trends in Tanzania



Data Source: Ministry of Livestock and Fisheries.

The current total annual fish production in Tanzania (freshwater and marine) is around 473,592 metric tonnes/year. These metric tonnes of fish are worth 2.38 trillion shillings which is equivalent to USD 1.03 billion. Aquaculture contributes 18,717 metric tonnes/year. These metric tonnes of fish are worth 149.7 billion shillings which is equivalent to USD 642,820.18, which is equivalent to about 3.95% of total fish production (URT, 2020/2021). In Tanzania, aquaculture mostly produces Nile tilapia (*Oreochromis niloticus*) and, to some extent, the African sharptooth catfish (*Clarias gariepinus*) as well. Most of the freshwater fish come from pond farming, which is followed by cage farming. The production from these aquaculture systems, which is available to local communities, cannot meet demand. Thus, aquaculture is expected to fill the ever-widening gap between demand and supply. The development of aquaculture will increase the supply of fish in Tanzania and will have other socio-economic benefits to the society, besides reducing fishing pressure on natural waters.

CHAPTER 3

3.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Aquaculture is under the administrative jurisdiction of mainland Tanzania. Aquaculture activities fall under the Department of Aquaculture Development which is currently in the Ministry of Livestock and Fisheries. Therefore, the following are the key policy, laws and regulations related to its management:

3.1 Policy Framework

3.1.1 National Fisheries Policy of 2015

The review of the Fisheries Policy and Strategy Statement of 1997 was concluded in 2015 when the National Fisheries Policy of 2015 was adopted. The overall objective of this policy is to develop a robust, competitive and efficient fisheries sector that contributes to food security and nutrition, national economic growth and improvement of the well-being of stakeholders of the fisheries sector, while at the same time conserving the environment. The policy is used as an instrument for achieving the vision of the sector that is, building a progressive fisheries sector, which is economically, socially and environmentally sustainable.

3.1.2 National Water Policy of 2002

The main objective of this policy is to develop a comprehensive framework for sustainable development and management of the country's water resources. There will also be an effective legal and institutional framework for implementing the policy. The policy is intended to ensure that beneficiaries, including those who have invested in aquaculture, participate fully in planning, construction, operation, maintenance and management of community-based domestic water supply schemes.

3.1.3 National Biotechnology Policy of 2010

The general objective of this policy is to ensure that Tanzania has the capacity and capability to get the benefits arising from the application of biotechnology in the health, agricultural, industrial and environmental sectors, while at the same time protecting and sustaining the safety of the people and the environment. Therefore, the National Fisheries Research Agenda will be implemented to achieve the objective of the National Biotechnology Policy of 2010.

3.1.4 National Aquaculture Strategy (NADS) 2018–2025

The goal of NADS is to reduce poverty and unemployment, and increase income and food security. Its overall objective is to promote the development of aquaculture, which is socio-economically and environmentally sustainable.

3.2 Legal Framework

3.2.1 Fisheries Act No. 22 of 2003

The micro- and macro-economic policy changes, new challenges and opportunities for developing aquaculture have necessitated review of Fisheries Act No. 22 of 2003 and its principal Regulations of 2009. Mostly, the law regulates the development of fisheries, but it has a few clauses that regulate aquaculture.

3.2.2 Tanzania Fisheries Research Institute (TAFIRI) Act No. 11 of 2016

Tanzania Fisheries Research Institute Act No. 11 of 2016 authorises the Tanzania Fisheries Research Institute to carry out research on fisheries and aquaculture in all the water bodies. The purpose is to obtain scientific information and research findings which will inform and guide the management of fisheries resources and aquaculture. The institute conducts a wide range of studies on aquatic ecosystems and biodiversity; aquaculture technologies and fish farming systems; fish and fishery products quality, standards and marketing; climate change and the environment; socio-economics; and marketing. TAFIRI has a centre in Dar es Salaam, Mwanza, Kigoma and Kyela, and a sub-station in Sota. Each centre is responsible for conducting research in the water bodies concerned.

3.2.3 Marine Parks and Reserves Act No. 29 of 1994

The law is aimed at integrating conservation, management and sustainable use of the fisheries resources. Considering that wild fish are potential sources of broodstock for aquaculture, the law contains provisions on the protection, productivity and biological diversity of coastal and aquatic ecosystems through prevention of the destruction of habitats, protection of the fragile ecosystems, pollution prevention and control, and over-exploitation control.

3.2.4 National Environmental Management Act No. 20 of 2004

This act has provisions on environmental management and planning, environmental impact assessment (EIA), strategic environmental assessment (SEA), pollution prevention and control, waste management, compliance with the act and its enforcement.

3.2.5 Tanzania Bureau of Standards Act No. 2 of 2009

The Bureau was established to strengthen the support to institutional infrastructure for the industrial and commercial sectors of the economy. Specifically, TBS is mandated to take measures to control the quality of products of all types and to promote standardization in the industrial and commercial sectors. The law was amended in 2019 so that the Bureau could regulate food and cosmetics, which previously fell within the mandate

of Tanzania Foods and Drugs Authority (TFDA). TBS now regulates the registration of food and cosmetic products, the licensing of premises, import and export activities, inspection of premises, disposal of unfit products, recall of products from the market, post marketing surveillance, surveillance of food-borne diseases and control of advertisements. Therefore, aquaculture products are regulated by TBS.

3.2.6 Tanzania Revenue Authority Act of 2006

Tanzania Revenue Authority is the body responsible for the assessment and collection of revenues, enforcing the laws relating to revenues and to provide for related matters.

3.2 Regional Institutional Frameworks

In addition to the national institutional frameworks, there are regional and international institutions responsible for coordinating and providing funds for aquaculture research and management. The institutions include Lake Victoria Fisheries Organization (LVFO), the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) and the Western Indian Ocean Marine Science Association (WIOMSA).

Other institutions are responsible for providing framework guidance and identifying the strategic steps to be taken by member states to unlock the full potential of fisheries and aquaculture for food security, livelihood and wealth creation. Some of these institutions are the Southern African Development Community (SADC), the African Union New Partnership for Africa's Development (AU-NEPAD), Food and Agriculture Organization (FAO) of the United Nations and related fisheries and aquaculture instruments.

CHAPTER 4

4.0 SITUATION ANALYSIS

4.1 History of the Development of Aquaculture in Tanzania

In Tanzania, modern freshwater aquaculture started in 1949 when the rainbow trout (*Onchorynchus mykiss*) was introduced in the northern and southern highland regions. At the time, the government supported communities through the provision of fingerlings, as well as technical and financial assistance. This arrangement continued to the post-independence period. However, most aquaculture farms collapsed owing to the government's failure to provide fingerlings and extension services due to inadequate personnel and funds. Only a few aquaculture projects such as those in Ruvuma Region continued to provide the Nile tilapia (*Oreochromis niloticus*) fingerlings because they had external technical and financial assistance. The production of farmed fish is very low because farmers do extensive production with little or no application of supplementary feed and because of poor farm management. For example, Ruvuma Region is among the leading regions in fish farming in the country. It had 3500 ponds with a total area of less than 370,000 square meters that produce only 400 metric tonnes of fish annually.

Mariculture, that is the farming of marine organisms, was pioneered by Prof. Keto Mshigeni by promoting and introducing seaweed farming in the 1970s. This type of farming started to gain popularity in 1989 when it was taken over by private investors in Zanzibar, and ever since it has spread along the coastal regions in the country and in the neighbouring countries. Currently, seaweed farming employs over 3,000 people, the majority of whom are women. The farmed species include *Eucheuma denticulatum* (*E. spinosum*) and *Kappaphycus alvarezii* (*E. cottonii*) strains imported from the Philippines. Seaweed cultivation provides significant socio-economic benefits at community level. In 2012, Tanzania exported about 15,000 metric tonnes of dry, unprocessed seaweed worth USD 6.4 million.

Marine finfish and shellfish farming is another popular type of aquaculture. It is mostly practised along the Indian Ocean shores in the country. This was pioneered in 1978 by Prof. Phillip Bwathondi, who did scientific experiments on the cage culture of rabbit fish *(Siganus sutor*). This was followed by integrated mariculture pond systems of finfish, milkfish (*Chanos chanos)* and mullet (*Mugil* sp.); and shellfish (*Pinctada* and *Pteria* spp. (pearl oysters)), cockles (*Anadara antiquata*) and mussels (*Mytilus* sp.). This paved the way for the implementation of several pilot projects in shellfish and pearl farming, milkfish and mullet in Zanzibar. The provision of extension services has made pond farming spread to all coastal districts with varying degrees of success. Crab fattening has also been tried in

Tanga, Mafia, Rufiji, Kilwa and Zanzibar. Prawns/shrimps are cultivated in Mafia.

4.2 Potential Opportunities for Developing Aquaculture in Tanzania

The production of fish in capture fisheries and aquaculture worldwide reflects a typical global trend. Whereas the production of fish from capture fisheries has almost stagnated since 2000, aquaculture has been on a steady rise since 1970. Despite the existence of unexplainable fish resources from natural waters, in the last 20 years, fish production in capture fisheries in Tanzania has ranged from 350,000 to 380,000 metric tonnes a year (URT 2016). Although production increased to 473,592 metric tonnes in 2020/21 from 470,309 in 2019/20, this amount is not adequate to meet the ever-increasing fish demand. The stagnation of fish production from capture fisheries is mainly caused by over-exploitation of natural waters, illegal fishing practices, destruction of the aquatic environment and effects of climate change. By contrast, aquaculture production in Tanzania has been growing from only 220 metric tonnes in 2000 to about 18,717 metric tonnes in 2020 (URT, 2020/2021). Thus, concerted efforts will be made to increase the sub-sector's contribution to overall fish production.

The country has great potential to develop aquaculture. This potential includes basic physical requirements for developing aquaculture, including much land and water. The country has suitable soils and temperature, reliable sources of water, suitable cultured fish species and ingredients for making feed. It is estimated that about 58,000 and 64,300 km^2 of land are suitable for fresh and marine aquaculture, respectively. The land available for developing aquaculture is equivalent to over 30% of the total land area in Tanzania (URT, 1997). The areas neighbouring major lakes of Victoria, Tanganyika and Nyasa are suitable for doing aquaculture activities. There are also several small water bodies such as man-made dams that could be used to do cage and/or pond aquaculture. The country also has several permanent rivers and wetlands that are suitable for the development of aquaculture. Estimates also show that about 5.8% of the total land surface (5,439,000 ha) is covered by lakes and swamps. The total inland water area covers nearly 62,000 km^2,which is around 6.5 % of the total land area. The major lakes alone cover about 7% of the country's land surface area. Cage culture can also be practised in the Indian Ocean. The areas suitable for cage aquaculture development under Tanzanian sovereignty are shown in Table 2below. The presence of water bodies in the country makes it possible to practise different aquaculture production systems such as pond, cage culture and re-circulating aquaculture (RAS). Assessment of these areas need to be made to establish the carrying capacity of the water bodies to allow development of spatial management plan.

Table 2: Potential areas for cage aquaculture in Tanzania.

Water Body	Area (in km^2)
Lake Victoria	35,088
Lake Tanganyika	13,489
Lake Nyasa	5,760
Lake Rukwa	3,000
Lake Eyasi	1,000
Smaller water bodies	1,000

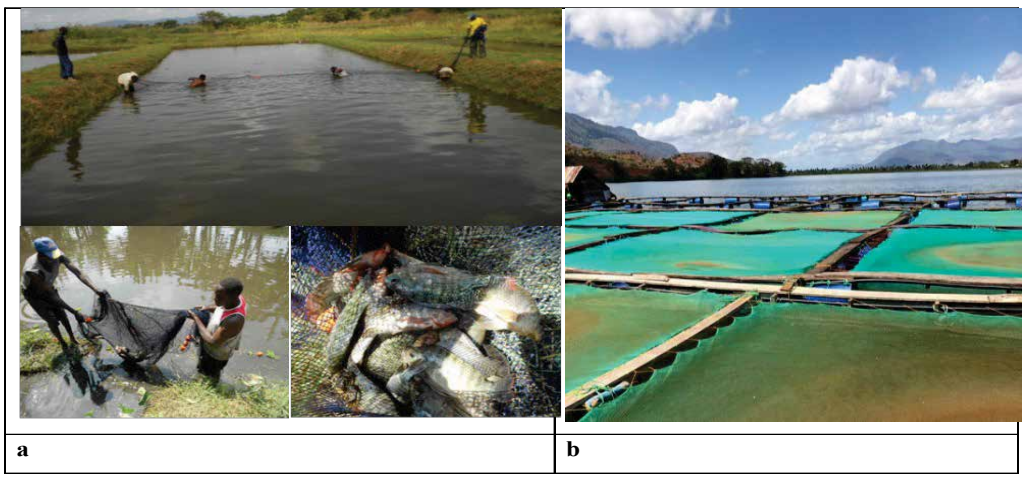
Generally, natural resources (water, land and climate) suitable for the development of aquaculture are available in mainland Tanzania where about 90% of land mass is suitable for commercial fish farming (Aguilar-Manjarrez and Nath, 1998). Despite the presence of such natural resources, this sub-sector has not attained major development mainly because of inadequate affordable quality seeds and feeds, a high price of industrial feeds, inadequate technical knowledge among farmers, unreliable financial capital, a weak data collection system and lack of business skills.

Despite the available potential market assessment there is a need to determine the market and business skills which includes the price of fish and where the fish can be sold to establish the demand for fish and the amount the market would absorb need to be determined. Likewise, a business plan to determine the profitability of the operations, with a high return on investment will be done. This will enable people appreciate the profitability of the sector/operation so that they can join the sector, and make their investments. It is crucial also that business skills need to be added to the skills of potential farmers, so that they can make an informed decision on whether or not they can invest in the sector.

4.3 Key Environmental Types and Production Systems

Currently, pond farming is the most important fish farming system in mainland Tanzania. Other common farming systems include concrete or plastic tanks, cages in major lakes and small water bodies, a recirculation aquaculture system (RAS), raceways and in-pond raceway system (IPRS) (see Figures 6 and 7 for different production systems). The current average size of fish ponds is 300 square metres covering a total of 730 ha. This is based on the prevailing pond management with supplementary feeding and fertilization without any aeration system. Fish farming is also integrated with crops and/or animals through an integrated aquaculture-agriculture (IAA) system to increase farm yields. The distribution of farming systems is determined by several factors; some of these are the availability of water, suitable land, and awareness raising on the economic viability of fish farming.

Figure 5: Pond farming (a) and Cage farming (b).



a	b

Figure 6: Tank farming system.

4.4 Suitable Culture Organisms

Several species, both indigenous and exotic, are used as culture organisms in mainland Tanzania. In mainland Tanzania, freshwater aquaculture is almost totally dominated by tilapias of the genus *Oreochromis*, with *Oreochromis niloticus* (Linnaeus 1758) becoming the most predominant culture species. This is due to its proven superior growth compared to the other freshwater fish species. Other tilapia species farmed include Mozambique tilapia (*O. mossambicus* Peters 1852), Zanzibar tilapia (*Tilapia hornorum* Trewavas 1966) and rainbow trout (*Oncorhynchus mykiss* Walbaum 1792, Madalla, 2009). African sharptooth catfish (*Clarias*

gariepinus) is also cultured in monoculture or in polyculture with tilapia (Figure 8).

Figure 7: Nile tilapia (left) and African sharptooth catfish (right).

The most commonly cultured marine organisms include seaweed species (*Eucheuma spinosum* and *E. cottonii),* prawns (*Penaeus monodon*), pearl oysters (*Pinctada margaritifera*), milkfish (*Chanos chanos*) and mud crab (*Scylla serrata*).

Figure 8: Sea weeds (top left), prawns (top right) and milkfish (bottom).

4.5 Financial Services and Incentives

The government introduced a market-oriented and private sector-driven National Aquaculture Development Strategy (NADS, 2018), a business-friendly law (Fisheries Act, 2003) and a free-market economy policy (Fisheries Policy of 2015). It has also removed either value added tax or import duty or both from most aquaculture inputs, including:

i) Fish nets for hapas, cages, scoop nets, for fry and harvesting nets);
ii) Formulated fish feed (fry, starter, grower and finisher);
iii) Live feed (algae, rotifers, and artemia cysts);
iv) Hormones for sex reversal and artificial propagation;
v) Aerators (air pumps, air blower, paddle wheel aerators, aspirator aerators, air diffusers, submersible aerators, vertical pump aerators);
vi) Fish egg incubation jars; and
vii) Pond liners.

An inception study on aquaculture that was commissioned in Tanzania by the Embassy of the Kingdom of the Netherlands (Larive International and Lattice Aqua, 2019) indicated that there are several financial institutions with a focus on to the agricultural sector. It was further noted that although no specific aquaculture financial products or services exist, the general agricultural finance instruments are also available to the aquaculture sector. Nevertheless, financial institutions have not yet provided much capital to the aquaculture sector due to absence of established and profitable fish farmers in the country. This is due to the fact that banks are generally risks aversive, they will only provide loans and credit after one or more farms have proven to be profitable on a commercial scale. A low-level of farm administration and bookkeeping among fish farmers which further increases risks for banks was also pointed out as another financing challenge. As a strategy to enable small and medium aquafarmers to access financing, the government is encouraging them to form cooperatives. This will enable them to access soft loans at an interest rate of 7-10% from financial institutions guaranteed by the government. As a result of these efforts by February 2021 a total of TZS 679,208,000 (USD 295,307.83) has been disbursed. More money is expected to be disbursed provided loan conditions are met. Recently, National Microfinance Bank (NMB Plc) has put aside TZS 100 billion (USD 43,478,260.87) to support agro, livestock and fisheries value chains at lower than 10% interest rate.

4.6 Development of Aquaculture

In mainland Tanzania, aquaculture development is under the Aquaculture Division in the Ministry of Livestock and Fisheries (MLF) which was established in September 2008. Aquaculture division has two sections: a freshwater aquaculture section and a marine aquaculture section. The division introduced a National Aquaculture Development Strategy (NADS) in 2018. Since the establishment of the Aquaculture division, the government

has continued to set aside funds for the development of aquaculture. For example, apart from other charges (OC), the budget for the development of aquaculture increased from TZS 500 million (USD 215,647.84) in 2018/2019 to TZS 3.0 billion (USD 1,293,887.84) in 2021/2022.

During this period, public hatchery facilities were improved and new ones established. There are six government aquaculture development centres (ADCs) countrywide, out of which five are freshwater centres. They are Kingolwira in Morogoro (Figure 9), Ruhila in Ruvuma, Mwamapuli in Tabora, Nyengedi in Lindi, Rubambagwe in Geita and Machui in Tanga. They are intended to increase the availability of aquaculture seeds. The main functions of these centres are:

i) promotion of investment in sustainable aquaculture production in various parts of the country in the context of rural aquaculture development;
ii) capacity building;
iii) development and transfer of appropriate aquaculture technology; and
iv) distribution of aquaculture inputs to various stakeholders to stimulate the development of aquaculture.

During this period, initiatives were also undertaken to make the private sector produce fingerlings and feed. There are 28 hatcheries and 13 fish feed manufacturing plants owned by private companies. However, the majority of fingerlings comes from private sector, which gives room for the expansion of this sector in the country. The number of people farming aquatic organisms reached 30,064 in 2020/2021 (URT, 2020/2021). Apart from pond farming, cage culture farming is also promoted in various waters. By 2020/2021, a total of 473 cage farms had been opened in the country: Lake Victoria (362), Lake Tanganyika (9), Nyasa (1) and other smaller water bodies (101). The production of fingerlings increased from only 400 in 2002 to about 20,040,000 in 2020/2021 (URT, 2020/2021). Private hatcheries produced 17,206,752 fingerlings and public hatcheries produced 2,833,605 fingerlings. The estimated demand for fish fingerlings in mainland Tanzania stood at around 40,000,000; therefore, there is a deficit of around 19,960,000 fingerlings. In 2020/2021 the amount of fish feed produced stood at 1,182.47 metric tonnes, of which 710 metric tonnes was non-extruded feeds locally produced and 472.47 metric tonnes was imported extruded feeds. The estimated demand for fish feed stood at 6,108 metric tonnes, with a deficit of 4,925.53 metric tonnes (URT, 2020/2021).

Figure 9: Kingolwira Aquaculture Development Centre in Morogoro.

4.7 Aquaculture Extension Services

In mainland Tanzania, aquaculture extension services are provided by the Department of Fisheries and Aquaculture Research, Training and Extension Services (DRTE) in collaboration with Aquaculture Division in the Ministry of Livestock and Fisheries (MLF) and Local Government Authorities (LGAs). There are nearly 477 extension workers distributed in Aquaculture division (58), DRTE (6) and LGAs (413). There are also Non-Governmental Organizations (NGOs) and Community-based organizations (CBOs) who provide training and other forms of support to fish farmers. However, the available staff (477) are not sufficient to provide the required extension services all over the country compared to a total demand of 15,800 staff. Extension workers have among other tasks the role of providing technical advice to aquafarmers. Aquaculture in the mainland Tanzania is characterized by inadequate extension services due to shortage of extension workers and requisite facilities. The level of aquaculture knowledge among farmers about improved aquaculture practices, farm management and a business-like approach to fish farming is not sufficient. Thus, deliberate efforts will be made to improve aquaculture extension services in the country through recruiting more extension staff and training the existing ones.

CHAPTER 5

5.0 THE PREVIOUS FISHERIES MASTER PLAN (2002–2015)

The Fisheries Master Plan (2002–2015) was intended to operationalize the National Fisheries Sector Policy and Strategy of 1997. Thus, it contained only one programme on aquaculture extension (Programme No 7: Morogoro Region – Aquaculture Extension Programme). The extension services often focussed on feasibility survey, which put emphasis on the identification of water resources and suitable soils for aquaculture, and marketing routes for cultured fish. These needed to be adequately surveyed and confirmed before aquaculture activities could be done. Aquaculture extension services also included the provision of training equipment and materials to the fisheries training institutions based on the training needs of both extension personnel and farmers who received training in aquaculture technology.

5.1 Implementation Status

During the implementation of the previous master plan, several feasibility studies were conducted to establish the potential, opportunities and challenges in the development of aquaculture. The studies were mostly conducted in the Lake Victoria basin. Moreover, the facilities at Kingolwira Aquaculture Development Centre were improved.

5.2 Challenges

Generally, most of the activities on aquaculture extension programme, especially those planned for Morogoro Region, were partially implemented because of inadequate funds and lack of proper coordination among the key agencies. The fact that the master plan emphasized more capture fisheries activities resulted in a few aquaculture activities being implemented. Moreover, the master plan itself lacked a clear implementation plan which would have provided specific guidance on how it should be implemented, including a timeframe for each programme.

5.3 Lessons Learnt

The experience gained from the implementation of the previous master plan shows that, if concerted efforts are made, there will be high fish production through aquaculture. Funding is critical to successful implementation of any plan. Inadequate funding caused partial implementation of several programmes included in the previous master plan. It is important that awareness is raised throughout the implementation process so that the plan is known to the key implementing partners.

6.0 ISSUES, OBJECTIVES AND STRATEGIC INTERVENTIONS

The issues related to the development of aquaculture in mainland Tanzania and included in this master plan were identified using the principles of the Ecosystem Approach to Aquaculture (EAA). They were identified during consultative, zonal stakeholders' workshops held in Mwanza, Mbeya and Tanga. Ultimately, a total of 18 issues distributed into Ecological (4), Social economic (7) and Governance (7) issues were identified (Table 3). Thereafter, operational objectives and strategic interventions were formulated.

Identification of the issues also considered cross-cutting issues which were included in the baseline report. The identified cross-cutting issues relate to the whole fisheries sector. However, as far as aquaculture is concerned, the issues involving aquafarmers and all related stakeholders include disaster risks and climate change, youths' development and gender equity, HIV/AIDS and communicable diseases, value chains and post-harvest management and inadequate social services, including health, safe water and sanitation. The cross-cutting issues have also been included in the current master plan.

Table 3: Issues identified during stakeholders' workshops

No.	ISSUE
	ECOLOGICAL ISSUES
1.	Dependence on wild sources for marine fish seeds.
2.	Genetic pollution caused by aquaculture practices.
3.	Environmental degradation of natural water bodies and water sources to and from an aquaculture facility.
4.	Inadequate water for aquaculture in some areas.
	SOCIO-ECONOMIC ISSUES
1.	Inadequate financial capital for carrying out aquaculture activities.

2.	Low investment in commercial aquaculture.
3.	Limited post-harvest handling facilities and market for aquaculture products.
4.	Limited culture of ornamental fishes.
5.	Few and weak cooperatives and associations, as well as low participation of the youth and women in aquaculture activities.
6.	Inadequate awareness of aquafarmers on the existence of communicable diseases such as HIV/AIDS, cholera, bilharzia, STDs and other health hazards associated with aquaculture practices.
7.	Aquafarmers' limited access to social protection, safety at sea (for cage farmers), a decent working conditions scheme (life and cages/insurance), inadequate rescue centres and safety equipment.
GOVERNANCE ISSUES	
1.	Inadequate, unaffordable, low quality aquaculture seeds and feeds.
2.	Inadequate aquaculture data.
3.	Inadequate extension services and inadequate use of research findings.
4.	Inadequate research and training capacity.
5.	Lack of accreditation of aquaculture products and practitioners.
6.	Conflicts among aquaculture practitioners with other stakeholders on use of natural resources (water, land, wetland, forest).
7.	Limited monitoring, control, surveillance and prevention of aquatic disease outbreaks and control mechanisms.

CHAPTER 7

7.0 THE NATIONAL FISHERIES MASTER PLAN FOR AQUACULTURE

7.1 Vision, Mission and Goal of the FMP for Aquaculture

7.1.1 Vision

By the year 2036 there should be an aquaculture sub-sector in the country, which is largely commercially run, vibrant, diversified and sustainable and which uses highly productive aquaculture resources to ensure food security, employment and increased incomes for households and the nation at large, while at the same time conserving the environment.

7.1.2 Mission

Establishing a diverse aquaculture sub-sector in which resources are developed and managed sustainably for maximum economic growth and improved livelihoods.

7.1.3 Goal

To reduce poverty and unemployment, and to increase incomes and food security.

7.2 Guiding Principles

The implementation of this master plan for aquaculture will be guided by the principles in section 8.2 of part one of this master plan.

7.3 Thematic Areas

The issues that have been included in this master plan will be addressed through the nine thematic areas below. Key players, timeframe and indicative budget of implementing this master plan are given in the matrix (Table 5). As shown under section 8, funds for the implementation of this master plan will come from the government and development partners.

7.3.1 Thematic area one: Supply of inputs for commercial aquaculture

The major critical factors facing the development of aquaculture in mainland Tanzania include seeds, feed, technology, capital and markets. While capital and markets cut across all sectors of production, specific considerations are needed in aquaculture seeds, feed and technologies, since they are used in aquatic environments. Efforts will be made to supply adequate quality feed and seeds to meet the growing demand.

The availability of good quality seeds is instrumental to the development of aquaculture. The private sector will be encouraged through subsidies and tax exemption on aquaculture inputs to play a lead role in mass production of quality seeds. The government through the Aquaculture Division will

continue to regulate the quality of seeds being produced by the public and private sector. Research and training institutions will be supported with sufficient funds, personnel and research equipment throughout the implementation period of this master plan so that they can carry out research and provide technology to improve the quality of the already cultured species and develop culture technology for new species of commercial importance. Procedures for establishing seed certification will be put in place by the Aquaculture Division in collaboration with other institutions such as Tanzania Bureau of Standards to prevent the supply of poor quality seeds.

The government will continue promoting feed-based aquaculture and a paradigm shift from semi-intensive to intensive feed-based aquaculture. Feed is a major input in aquaculture production, accounting for around 60% of production costs. The overall benefit of using good quality feed is in low feed conversion ratios (FCRs) with minimal pollution of the environment. Cheap food is not always cheap, since more kilogrammes of feed may be used to produce one kilogramme of fish as compared to a good quality feed. The initiatives made by private investors in the production of feed will be subsidized and supported through creating conducive environment. Efforts will also be made to introduce fish feed technology from places where it is well established. The technology will also include the use of small feed-making machines (grinders, mixers and pelleters) for improving on-the-farm made feed which is commonly used by farmers.

Aquaculture requires several other inputs. The inputs include, *inter alia*, chemicals, equipment such as aerators, graders, water and air pumps, diffusers, various types of fish nets for making hapas and cages, feeders and packing materials. When these inputs are available, aquaculture can be expanded. Incentives will be provided for importers and suppliers of aquaculture inputs and equipment in order to support aquaculture investment. The private sector will be encouraged to invest in the aquaculture input trade under the general framework of attracting investments. Specific operational objectives for addressing issues related to aquaculture inputs are listed below:

Operational objective: To increase local production of high quality and affordable aquaculture seeds and feeds.

Issue

Inadequate, unaffordable, low quality aquaculture seeds and feeds.

Strategic Interventions

(i) Establishing breeding programmes (quality brooders) and centres for raising the production of freshwater and marine farmed species.

(ii) Developing national centres for information system and safeguarding gene banks.
(iii) Establishing hatcheries for freshwater and marine seed production.
(iv) Facilitating access of fish seed and feed.
(v) Supporting building the capacity (experts, funds, technology, facilities) of seed and feed producers.
(vi) Promoting private sector to establish more freshwater and marine hatcheries.
(vii) Promoting private sector to establish more fish feed plants.
(viii) Encouraging local industries to manufacture aquaculture to equipment.
(ix) Developing national freshwater and marine aquaculture best management practice programmes for both breeders and hatchery operators.
(x) Establishing an inventory of chemicals and equipment used in aquaculture activities.
(xi) Enhancing exemption and subsidy taxes and levies on chemicals and
equipment used in aquaculture activities.

Proposed actions

(i) Develop breeding programmes (quality brooders) and establish centres for raising the production of fresh water and marine farmed species.
(ii) Coordinate and promote the establishment of public-private hatcheries.
(iii) Establish and strengthen the existing cooperative unions and associations so that they produce quality and affordable aquaculture seeds and feed.
(iv) Provide incentives to seed and feed producers.
(v) Create an enabling environment to promote investment in hatcheries and feed plants.
(vi) Undertake research to identify suitable cultured marine fish species.
(vii) Improve the fish seed and feed supply chains to ease access among aquafarmers.
(viii) Support capacity building (experts, funds, technology, facilities) of seed and feed producers.
(ix) Sensitize the private sector to establish fresh water and marine hatcheries.
(x) Develop national fresh water and marine aquaculture best management practice programmes for both breeders and hatchery operators.
(xi) Prepare and submit an inventory of chemicals and equipment used in aquaculture activities to the relevant authorities.
(xii) Exempt and subsidize taxes and levies on chemicals and equipment used in aquaculture activities.

7.3.2 Thematic area two: Improving research and training

Aquaculture can be transformed through research innovations, and technology development and transfer. This is because aquaculture is a technology-driven sector. Client responsive research, efficient packaging and the transfer of cost-effective technologies to users are an important lubricant of an aquaculture development process. Sufficient support in research and training, including the technologies needed, will be guided by the National Fisheries and Aquaculture Research Agenda (2020-2025). Research and technology development priorities for aquaculture will be practice-based, foster sustainability and be developed in collaboration with the industry. Aquaculture research and technology development will be closely linked to the private-sector needs to stimulate the development of aquaculture.

Moreover, research that will lead to development of a sustainable aquaculture industry in Tanzania will be undertaken by TAFIRI in collaboration with other research institutions (both local and foreign). Research will also focus on improving the management of water and waste, the development of sustainable systems and practices, economics and marketing, and on improving the quality, safety, and variety of aquaculture products. As pointed out earlier most of the research activities to be undertaken will focus on areas specified in the fisheries and aquaculture research agenda which is reviewed after every five years. There are research and technologies already developed elsewhere. Thus, efforts will be made to explore the possibilities of benefiting from such research and technologies. This will be done through stakeholder exchange visits and scientific exchange programmes organized by the government. Study tours to countries doing well in aquaculture will be encouraged to share and gain experience. The tours will involve representatives from research and training institutions (including higher education institutions), extension officers and the private sector. Efforts will be made to make such countries explore investment opportunities in the country in partnership with the local private sector for ease of adaptation and adoption of technologies.

To attain the highest level of impact, aquaculture research and development programmes will constitute a continuum, from basic and applied research to ultimate commercial adoption. Research findings, technology, and marketing information will be made available and delivered through the provision of effective extension services to the stakeholders. Fisheries and aquaculture training institutions, including higher learning institutions (both public and private), will be supported so that they can provide practical training skills and enable those graduating from fisheries and aquaculture programmes to have sufficient hands-on skills. Curricula will also be reviewed to make them more relevant to the needs of aquaculture industry. Research and training institutions will be provided with office space, computers, vehicles, research and training

vessels, equipment, chemicals, reagents and consumables. The human resources in the research and training institutions will be supported by improving their training and research skills, and by recruiting new ones. A competitive scheme of service should be developed for the fisheries and aquaculture research and training cadres in the public sector. Specifically, this thematic area will be addressed through the following operational objectives:

Operational objective 1: To strengthen basic and applied research for developing sustainable aquaculture industry.

Issue

Inadequate research and training capacity.

Strategic interventions

(i) Supporting training to aquaculture personnel on applied research.
(ii) Supporting capacity building in research centres.
(iii) Supporting capacity building in data collection, processing and analysis, and dissemination of research findings.

Proposed actions

(i) Support the capacity building to do applied research.
(ii) Establish a National Aquaculture Information System (NAIS) to provide vital data for aquaculture planning, monitoring and evaluation.
(iii) Establish new research centres, recruit new staff and train them.
(iv) Supporting research institutions to establish Technology Transfer Units to facilitate use of research findings.
(v) Develop a monitoring and evaluation framework.

Operational objective 2: To build the capacity of research and training institutions.

Issue

Inadequate research and training capacity.

Strategic interventions

(i) Supporting capacity building in research and training institutions.
(ii) Soliciting sufficient funds for fisheries and aquaculture research and training.

Proposed actions

(i) Improve the training and research skills of the existing ones and recruit new ones.

(ii) Develop a competitive scheme of service for the fisheries and aquaculture research and training cadres in the public sector.
(iii) Improve infrastructure in research and training institutions through the provision of research facilities such as buildings, vehicles, research and training vessels, equipment, chemicals, reagents and consumables.
(iv) Provide adequate funds for fisheries and aquaculture research and training (both public and private), so that they can conduct aquaculture, demand-driven, basic and applied research.
(v) Support fisheries and aquaculture training institutions, including higher learning institutions (both public and private), so that they can train more research and extension service personnel.
(vi) Support establishment of Technology Transfer Units by research institutions.

7.3.3 Thematic area three: Improving extension services

Transformation of aquaculture industry can be attained through improving extension services. Aquaculture development has been achieved in countries where government support through extension services has been offered adequately. Deliberate efforts will be made to train more extension services personnel. Moreover, extension officers will be given sufficient working facilities by both central and local government authorities such as vehicles and motorcycles to enable them to provide the services needed. More extension staff will be recruited to provide required services. Just like in research and training institutions, competitive scheme of service will be developed for extension staff. Specifically, this thematic area will be addressed through the following operational objectives:

Operational objective: To enhance extension services in disseminating research findings.

Issues

(i) Inadequate extension services and use of research findings.
(ii) Inadequate aquaculture data and information.

Strategic interventions

(i) Supporting capacity building in aquaculture extension.
(ii) Supporting establishment of new aquaculture development centres (ADCs) in strategic areas along the coast and around major lakes.
(iii) Promoting establishment of aquaculture field schools to facilitate dissemination of aquaculture best management practices (BMPs) and research findings.
(iv) Supporting data collection, monitoring and evaluation of aquaculture programmes.

(v) Supporting seaweed farmers with sufficient technical skills and financial inputs.
(vi) Establishing an enabling environment to boost commercial seaweed farming.

Proposed actions

(i) Strengthen the existing ADCs.
(ii) Improve extension services by re-tooling extension officers with respect to aquaculture BMPs.
(iii) Establish new ADCs in strategic areas along the coast and around major lakes.
(iv) Establish aquaculture field schools to facilitate dissemination of aquaculture BMPs and research findings.
(v) Establish aquaculture field schools in selected districts with potential aquafarmers, including the youth and women.
(vi) Establish annual Aquafarmers' Week for researchers, extension officers, aquafarmers and other stakeholders to enhance information exchange.
(vii) Strengthen the competitiveness of the Aquaculture Division by providing facilities at headquarters and all work stations, and equip staff with required knowledge, resources and institutional support structure for effective, decentralized governance.
(viii) Support capacity building in data collection, processing and analysis, and disseminate findings.
(ix) Support seaweed farmers with sufficient technical skills and financial inputs.
(x) Establish an enabling environment to boost commercial seaweed farming.

7.3.4 Thematic area four: Post-harvest handling, value addition and marketing of aquaculture products

Tanzania has a high fish market potential that is attributed to population growth rate at 2.7% per year and increased purchasing power. However, proper marketing and international trade strategies are crucial to orderly and progressive development of the aquaculture industry. Fish marketing and processing and associated quality and safety assurance and management systems are pivotal in the transformation of the aquaculture industry in the country. A reliable fish marketing system will be developed and the capacity to process and develop fish products to reduce post-harvest losses will be built. Emphasis will be put on market-led aquaculture production by ensuring and guaranteeing the quality and safety of the aquaculture products traded locally or regionally. The following operational objective will be pursued in a bid to address issues related to fish marketing, processing and product development:

Operational objective 1: To support the development of infrastructure for handling, storing and processing fish, and the development of a marketing information system.

Issue

Limited post-harvest handling facilities and market for aquaculture products.

Strategic intervention

Promoting establishment of mechanisms and infrastructure for reducing post-harvest loss of aquaculture products.

Proposed actions

(i) Promote harvesting, storage, transportation and cold chain facilities.
(ii) Establish a marketing information system for aquaculture products.
(iii) Promote and strengthen aquafarmers' organizations to enhance the bulking of produce and collective bargaining power.
(iv) Develop and promote use of protocols for post-harvest handling of aquaculture products to maintain the quality and safety of products.
(v) Develop new aquaculture products.

Operational objective 2: To support the development of codes of conduct and an accreditation scheme for aquaculture practitioners and products.

Issue

Lack of accreditation of aquaculture products and practitioners.

Strategic interventions

(i) Establishing quality control mechanisms to certify and accredit aquaculture products.
(ii) Supporting capacity building for developing codes of conduct, certification and accreditation schemes.

Proposed actions

(i) Develop quality control guidelines to certify and accredit aquaculture products.
(ii) Build capacity to develop codes of conduct, and certification and accreditation schemes.

7.3.5 Thematic area five: Spatial planning and promotion of investment in aquaculture

The development of aquaculture requires effective management of aquatic resources to ensure that services which contribute to improving human well-being are provided efficiently and sustainably. Such effective management can be strategically implemented through the development of aquatic spatial

plans. The process of aquatic spatial planning involves analysing and allocating the spatial and temporal distribution of human activities in particular aquatic areas. Spatial planning helps to achieve specified ecological, economic and social objectives. Through spatial planning decision makers are provided with accurate information and maps regarding the geography, environmental characteristics and activities undertaken in a particular environment. Spatial planning then helps decision makers to better plan for increased existing and new uses. In spatial planning tools such as Geographic Information Systems (GIS), remote sensing and mapping for data management, analysis, modelling and decision-making are used. Thus, spatial planning in aquaculture will be done to prevent conflicts with other stakeholders since physical space is involved. Spatial planning process for aquaculture zoning will be done in accordance with Ecosystem Approach to Aquaculture (EAA) and in applying the VGGT -Guidelines which provide the conceptual guidelines for spatial planning and management.

Strengthening of private-sector investments is of major importance to the successful development of the aquaculture sub-sector. The areas that require particular attention in these investments include; assessment of access to productive land and capital, developing investor friendly policies, and developing skills through incubators. The high risks and uncertainty involved in establishing a new technology cannot be incurred by most entrepreneurs, thus calling for the establishment of public-private partnerships. Successful aquaculture industries have emerged where the government partnered with the private sector in sharing the early risks involved in establishing the sector. This is particularly relevant in the area of technology development.

Thus, successful implementation of this master plan requires a viable plan of action with clear specific strategies for attracting an efficient service and inputs supply industry as well as private led production sectors. More importantly, any investment decision will be based on an appraisal of the risks and returns relative to competing opportunities.

Favourable conditions such as a suitable environment, culture organisms and a market for farmed organisms may make the private sector invest in aquaculture. However, it is equally important that investments in aquaculture should consider a critical understanding of the major constraints that prevent the private sector from entering the industry. In many areas, it has been very hard to access funding for carrying out aquaculture activities owing to the real or perceived high risks associated with aquaculture businesses. Similarly, lack of an understanding of basic aspects of the aquaculture industry on the part of the lending and financial institutions, and the scarcity of reliable data on aquaculture loans contribute to the difficulty in accessing funds for aquaculture. Therefore, all possible efforts will be made to make sure that there is a clear understating of the real constraints on investment

in aquaculture raised by stakeholders and included in this master plan. The following operational objectives will be used to address the issues related to the promotion of investment in aquaculture:

Operational objective 1: To enhance spatial planning in aquaculture.

Issue

Conflicts among aquaculture practitioners with other stakeholders on use of natural resources (water, land, wetland, forest, intertidal).

Strategic intervention

Introducing zonation and spatial planning in aquaculture.

Proposed actions

(i) Develop zoning guidelines.
(ii) Establish spatial mapping, profiling and zoning of aquaculture production sites.
(iii) Provide training and promotion of spatial planning among decision-makers and technical staff.
(iv) Harmonize the coordination of water users.
(v) Develop codes of conduct for zone users to ensure proper management of activities in the zone.

Operational objective 2: To enhance access to finance for aquafarmers.

Issue

Inadequate financial capital for carrying out aquaculture activities.

Strategic interventions

(i) Encouraging financial institutions and credit facilities to provide soft loans and other financial services to aquafarmers.
(ii) Promoting an understanding of basic aspects of the aquaculture industry on the part of the lending and financial institutions.
(iii) Developing mechanisms for reduction of risks associated with aquaculture activities.
Supporting private sector involvement in aquaculture activities by addressing constraints that impede investment.
(i) Establish an aquaculture development fund.

Proposed actions

(i) Sensitize stakeholders to establish aquafarmers' cooperatives.
(ii) Support the establishment of a fisheries and aquaculture cooperative bank.
(iii) Equip aquafarmers with entrepreneurial skills.

(iv) Promote and establish special credit facilities for commercial aquafarmers.
(v) Link aquaculture investors with financial institutions.
(vi) Provide an understanding of aquaculture activities to financing institutions.
(vii) Develop strategies for reducing risks associated with aquaculture activities.
(viii) Create a conductive environment for private sector involvement in aquaculture.

Operational objective 3: To create an enabling environment for investing in commercial aquaculture.

Issue

Low investment in commercial aquaculture.

Strategic intervention

Promoting and supporting private sector to invest in commercial aquaculture.

Proposed actions

(i) Review and harmonize the relevant laws.
(ii) Support the establishment of One Stop Centres (OSCs) to facilitate investment in the industry.
(iii) Create aquaculture investment promotion forums to link the actors along the aquaculture value chain.
(iv) Provide incentives to investors.
(v) Establish aquaculture incubation programmes to nurture new graduates, especially the youth and women.

Operational objective 4: To promote and support the formation of aquafarmer cooperatives and associations with special emphasis on the youth and women.

Issue

Few and weak cooperatives and associations, as well as low participation of the youth and women in aquaculture activities.

Strategic interventions

(i) Encouraging youth, women and marginalized groups to form aquafarmer cooperatives and associations.

(ii) Encouraging aqua-famers to form cooperatives to enable them access soft loan from financial institutions.

Proposed actions

(i) Establish new cooperatives and associations and strengthen the existing ones.
(ii) Create awareness on the benefits accrued from cooperatives and associations.

7.3.6 Thematic area six: Aquatic environmental health

The anticipated expansion of the aquaculture industry in Tanzania should also consider sustainability and compatibility of the industry with the environment. Thus, better knowledge is required regarding possible interactions between aquaculture and the natural environment to minimize the possibility for habitat degradation. Biosecurity measures for monitoring, prevention and control of disease outbreaks and transmission, and the discharge of waste, toxins and excess nutrients into natural environment ought to be taken. Measures will also consider putting in place control of genetic pollution of wild stocks through interbreeding with cultivated strains and introduction of alien species into natural waters.

Water is the main requirement for aquaculture practices. However, this resource is threatened by silting caused by excessive erosion and degradation of wetlands along the main water bodies. Pollution from human and industrial wastes is another threat to this important resource. Thus, any efforts geared towards environmental conservation at various levels will be supported and encouraged because they lead to preservation of the purity of water. Therefore, clear linkages between the public institutions, the private sector, the civil society and local communities involved in environmental protection will be established. Programmes aiming at managing water resources and aquaculture waste, increasing understanding of the environmental risks associated with aquaculture and fostering the development of environmentally sound designs and operating guidelines will be encouraged and supported. The following operational objectives will be pursued to address issues related to aquatic environmental health and spatial planning:

Operational objective 1: To strengthen the mechanisms for controlling genetic pollution.

Issue

Genetic pollution caused by aquaculture practices.

Strategic interventions

(i) Promoting genetic screening programme of wild and hatchery farmed strains.

(ii) Promoting awareness programmes on genetic pollution caused by aquaculture practices.
(iii) Developing guidelines for introducing, stocking and re-stocking in natural water bodies.

Proposed actions

(i) Train aquaculture personnel in fish taxonomy.
(ii) Establish and implement genetic screening programme of wild and hatchery farmed strains.
(iii) Prepare guidelines for management of juveniles, brood-stock and introduction of alien species.
(iv) Create awareness on genetic pollution caused by aquaculture practices.
(v) Reinforce measures and guidelines for transporting fish seeds and brooders for aquaculture practices.
(vi) Prepare and reinforce guidelines for introducing, stocking and re-stocking in natural water bodies.

Operational objective 2: To enhance biosecurity strategies for monitoring, control and surveillance of aquatic environmental health.

Issue

Limited monitoring, control, surveillance and prevention of aquatic disease outbreaks and control mechanisms.

Strategic interventions

(i) Developing biosecurity strategies, programmes and guidelines for monitoring, control and surveillance of aquatic environmental health.
(ii) Promoting screening of parasites and diseases.

Proposed actions

(i) Recruit and build capacity on aquatic animal health professionals.
(ii) Develop a national aquatic animal health strategy and implementation plan.
(iii) Establish and operationalize a national aquatic disease laboratory.
(iv) Develop Standard Operating Procedures (SOPs) for management of aquatic animal health.

Operational objective 3: To enhance adherence with the inter-sectoral collaboration in controlling pollution from aquaculture.

Issue

Conflicts among aquaculture practitioners with other stakeholders on use of natural resources (water, land, wetland, forest, intertidal).

Strategic intervention

Promoting mitigation measures in controlling pollution from aquaculture activities.

Proposed actions

(i) Establish a national inter-sectoral coordination committee to control the quality of water and environmental degradation.
(ii) Harmonize and implement rules and laws to reduce anthropogenic activities.
(iii) Encourage inter-sectoral collaboration in controlling pollution from aquaculture.

7.3.7 Thematic area seven: Aquaculture production technologies

High production of fish through aquaculture can be attained using appropriate technologies. Even though Tanzania has several potential areas for developing aquaculture, some areas face a scarcity of water. Unfortunately, such areas also face a scarcity of fish. Thus, efforts will be made to introduce technologies that use a small amount of water to develop aquaculture in such areas. An example is the recirculating aquaculture system (RAS). Alternative water sourcing technologies such as boreholes will also be introduced for carrying out aquaculture activities. The following operational objective will address aquaculture technologies related to scarcity of water supply:

Operational objective: To support the development of alternative water sourcing technologies in areas with water scarcity.

Issue

Inadequate water for aquaculture in some areas.

Strategic intervention

(i) Developing alternative water sourcing technologies in areas with water scarcity.
(ii) Optimizing the existing culture producing technologies.
(iii) Adopting new technologies to suit our local environments.
(iv) Developing other new aquaculture technologies.

Proposed actions

(i) Establish alternative water sourcing programmes such as rainwater harvesting, boreholes and canals.
(ii) Identify and apply alternative aquaculture technologies.

(iii) Adopt new aquaculture technologies.

7.3.8 Thematic area eight: Ornamental fish culture and trade

Tanzania is endowed with various ornamental fish species. In 2020 alone, Tanzania exported 128,316 metric tonnes of live ornamental fishes worth TZS 386.36 billion (USD 166.6 million); the country earned a royalty amounting to TZS 21.8 billion (USD 9.4 million). Freshwater ornamental fishes are abundant in Lake Victoria, Lake Tanganyika and Lake Nyasa, while marine ornamental fishes are found in the Indian Ocean. The trade in ornamental fishes from natural waters will be explored and improved to enable the country to obtain more royalties. Moreover, people will be encouraged to rear ornamental fish as a business. A national fish aquarium and ornamental fish demonstration farms will be established to spearhead and instil an ornamental fish culture for pleasure, education and income generation purposes. Technologies for harnessing these fish stocks for aquaculture will be explored and adopted so that the private sector can invest in this area. Research will be undertaken to produce an inventory of fish species suitable for establishing an ornamental fish culture. Support services will be provided to the trade in ornamental fish. This thematic area will be addressed by pursuing the following objective:

Operational objective: To promote and support the trade in ornamental fishes.

Issue

Limited culture of ornamental fishes

Strategic intervention

Promoting ornamental fish culture and trade.

Proposed actions

(i) Establish an inventory of ornamental fish species from various water bodies suitable for culture and trade.
(ii) Develop technologies for establishing an ornamental fish culture.
(iii) Provide support services to the trade in ornamental fish from aquaculture.
(iv) Conduct research on ornamental fish from various water bodies.
(v) Promote restocking of threatened ornamental fishes.

7.3.9 Thematic area nine: Cross-cutting issues

As explained earlier, crosscutting issues are those that cut across the whole fisheries sector and several other sectors. These issues, if not properly addressed, may affect the performance of the sector. Thus, concerted efforts will be made to make sure that all cross-cutting issues are properly

dealt with. As far as aquaculture is concerned, the following operational objectives will be pursued in the process of addressing cross-cutting issues:

Operational objective 1: To sensitise aquafarmers on creating awareness on communicable diseases and health hazards associated with aquaculture practices.

Issue

Inadequate awareness of aquafarmers on the existence of communicable diseases such as HIV/AIDS, cholera, bilharzia, STDs and other health hazards associated with aquaculture practices.

Strategic interventions

(i) Creating programmes advocating behavioural change and communicable disease prevention among aquafarmers.
(ii) Provision of adequate health services and facilities for aquafarmer communities.

Proposed actions

(i) Conduct needs assessment and provide awareness and education.
(ii) Develop disease prevention mechanisms in collaboration with the relevant authorities.
(iii) Conduct research on the magnitude of communicable diseases and health hazards associated with aquaculture practices.

Operational objective 2: To enhance awareness creation on the occupational hazards associated with aquaculture activities to aquafarmers.

Issue

Aquafarmers' limited access to social protection, safety at sea (for cage farmers), a decent working conditions scheme (life and cages/insurance), inadequate rescue centres and safety equipment.

Strategic intervention

Enhancing safety at sea, and establishing decent working conditions and social protection schemes.

Proposed actions

(i) Improve infrastructure for cage farmers.
(ii) Support aquafarmers and link them to the relevant social protection schemes.

7.4 The Master Plan Matrix for Aquaculture for the Period 2021/22–2036/37

The main actions to be implemented to achieve outputs and outcomes in the period of 15 years are presented in the matrix below (Table 4). The matrix contains operational objectives, outcomes, outputs, actions with key performance indicators, baseline information, key responsible institutions, time frame and tentative budget. The baseline information indicates the status of each item, which helps to set a clear target of implementation. The new master plan also considers the opportunities and challenges identified at the time of doing the SWOC analysis, the cross-cutting issues in the baseline report and the review of the previous master plan.

Table 4: Fifteen-year master plan matrix for aquaculture: Projected major outcomes and outputs for each operational objective and thematic area.

Thematic Area One: Supply of Inputs for Commercial Aquaculture.							
Operational objective 1: To increase local production of high quality and affordable aquaculture seeds and feed.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Responsible Institutions**	**Timeframe**	**Indicative Budget (USD, '000)**
1.1 Availability of high quality and affordable aquaculture seeds and feeds.	Improved fish breeding centres (hatcheries) are in place.	Establishing breeding programmes (quality brooders) and centres for raising the production of farmed species.	Number of hatcheries constructed and/or rehabilitated.	Most of the freshwater and marine fingerlings used by most farmers are of poor quality.	MLF, TAFIRI, PO-RALG, LGAs, Private sector, NGOs.	2021-2036	10,000
	Established national centres for information system and safeguarding gene banks.	Establish national centres for information system and safeguarding gene banks.	Number of national centres for information system and safeguarding gene banks established.	No centres for information system and safeguarding gene banks.	MLF, PO-RALG, LGAs, Private sector, NGOs.	2021-2036	18,000
	Coordinated proces: of establishing fish	Establishing hatcheries for	The quantity and quality of	Inadequate coordination in	MLF, PO-RALG, LGAs,	2021-2036	300

	hatcheries/breeding centres.	freshwater and marine seed production.	freshwater and marine fish seeds.	establishing hatcheries and breeding centres.	Private sector, NGOs.		
	Established freshwater and marine hatcheries.	Promoting private sector to establish more fresh water and marine hatcheries.	Number of hatcheries for producing marine seeds.	The only two marine hatcheries (Mafia and Machui) cannot produce sufficient seeds for the all coastal communities practising mariculture.	MLF, TCDC, PO-RALG, LGAs, Private sector, NGOs.	2021-2036	350
	Presence of highly motivated fish farmers and seeds/ feed producers.	Facilitating access of fish seed and feed	Number of farmers, seed and feed producers	There are only 12 feed plants in the country, which produce 710 metric tonnes of semi floating feed. The majority of farmers are using on-farm made feed, whose quality cannot be guaranteed.	MLF, PO-RALG, MoF, LGAs, NGOs.	2021-2036	2000
	Enabling environment mechanisms	Supporting building the capacity			MLF, PO-RALG, LGAs, Private sector.	2021-2036	800

	created for all practitioners along the aquaculture value and/or supply chain.	(experts, funds, technology, facilities) of seed and feed producers.					
	Promoted private sector to establish more fish feed plants.	Promoting private sector to establish more fish feed plants.			MLF, PO-RALG, TAFIRI, LGAs, Private sector.	2021-2025	7,650
	Availability of fresh water and marine fish seed hatcheries.	Promoting private sector to establish fresh water and marine hatcheries			MLF, PO-RALG, TAFIRI, LGAs, Private sector.	2021-2025	4,550
	A national fresh water and marine aquaculture best management practice programmes availed.	Developing national fresh water and marine aquaculture best management practice programmes for both breeders and hatchery operators.			MLF, PO-RALG, TAFIRI, LGAs.	2021-2028	1,750

2.1 Aquaculture inputs (other than feeds and seeds) are available and accessible to all farmers.	An inventory of aquaculture inputs and implements developed and shared with the relevant authorities.	Establishing an inventory of chemicals and equipment used in aquaculture activities to the relevant authorities.	List of chemicals and equipment used in aquaculture activities.	Aquafarmers cannot afford aquaculture inputs (other than feeds and seeds) because of taxes and levies.	MLF, Private sector.	2021-2025	160
	Mechanisms of subsidizing and/or exempting tax for aquaculture inputs and implements are in place and implemented.	Enhancing exemption and subsidy taxes and levies on chemicals and equipment used in aquaculture activities.	Number of subsidized and/or exempted items.				
Thematic Area Two: Improving Research and Training.							
Operational objective 1: To strengthen basic and applied research for developing sustainable aquaculture industry.							
Outcomes	**Outputs**	**Strategic interventions**	**Key performance indicators**	**Baseline Information**	**Responsible Institutions**	**Timeframe**	**Indicative Budget (USD, '000)**
1.1 Aquaculture implemented on the basis of the available and reliable data and scientific	Aquaculture-oriented applied research supported.	Supporting training to aquaculture personnel on applied research.	Number of applied research, monitoring, evaluation programmes conducted.	The current data collection system needs further improvement so that the data is reliable and quality scientific information is	MLF, TAFIRI, Higher learning institutions, Private sector.	2025-2030	1,980
	Established/strengthened National	Developing national centres					

information.	information centres and gene banks.	for information system and safeguarding gene banks.	Number of national centres established.	available.			
	Established new research centres and strengthened the existing ones so that they meet requirements.	Supporting capacity building in research centres.					
	Improved and harmonized mechanisms for collecting, processing, analyzing data and disseminating findings.	Supporting capacity building on data collection, processing, analysis and dissemination of research findings.					
Operational objective 2: To build the capacity of research and training institutions.							
2.1 Research and training institutions undertake their functions in accordance with their mandate.	The capacity of research and training institutions to support sustainable aquaculture development built.	Supporting capacity building in research and training institutions.	Number of staff members, infrastructure and amount of funds.	Inadequate funds for undertaking research, providing training, purchasing facilities, building infrastructure and recruiting personnel.	MLF, PO-RALG, PO-PSMGG, LGAs, MoFP, FETA, TAFIRI, Private sector.	2025-2030	3,200

	An on-the-job training programme for aquaculture research and training staff developed and implemented.						
	Allocated adequate funds to fisheries research and training institutions.	Soliciting sufficient funds for fisheries and aquaculture research and training.					
Thematic Area Three: Improving Extension Services.							
Operational objective: To enhance extension services and dissemination of research findings.							
2.1 Availability of high quality aquaculture products for domestic, regional and international markets.	Developed/strengthened aquaculture development centres (ADCs).	Supporting capacity building in aquaculture extension.	Number of extension material, people trained, policy briefs prepared, training material, ADCs, data collected, projects monitored and evaluated.	The quality of aquaculture products needs to be improved by improving the quality of extension. services and the application of research findings.	MLF, PO-RALG, LGAs, FETA, TAFIRI, Private sector.	2025-2030	1,500
	Improved the skills of aquaculture extension officers.						
	Developed incubation programmes for junior aquafarmers.						
	Mechanisms for developing	Supporting establishment of					

	aquaculture in strategic areas are in place	new ADCs in strategic areas along the coast and around major lakes.					
	Strengthened/improved extension institutions.	Supporting establishment of aquaculture field schools to facilitate dissemination of aquaculture BMPs and research findings.					
	Data collection, monitoring and evaluation of aquaculture programmes supported.	Supporting data collection, monitoring and evaluation of aquaculture programmes.					
	Seaweed farmers supported with sufficient technical skills and financial inputs.	Supporting seaweed farmers with sufficient technical skills and financial inputs.	Number of seaweed farmers supported and enabling environment				900

	Enabling environment created to boost commercial seaweed farming.	Creating enabling environment to boost commercial seaweed farming.	created.				
Thematic Area Four: Post-harvest Handling, Value Addition and Marketing of Aquaculture Products.							
Operational objective 1: To promote the development of infrastructure for handling, storing and processing fish, and of marketing information system.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Responsible Institutions**	**Timeframe**	**Indicative Budget (USD, '000)**
1.1 Aquafarmers produce high quality fish and associated products for both domestic and external markets.	Storage, transportation and cold chain facilities are available.	Promoting establishment of mechanisms and infrastructure for reducing post-harvest loss of aquaculture products.	Number of facilities for handling, storing and processing fish established.	The quality of fish and fish products produced for both domestic and external markets is not guaranteed owing to inadequate and unreliable infrastructure for handling, storing and processing the products.	MLF, TNC, TAFICO, FETA, TAFIRI, Private sector.	2025-2030	2,200
	Value addition technologies developed and applied.						
	A marketing information system is in place.						

	Aquafarmers' organizations strengthened and supported. Protocols for post-harvest handling of aquaculture products developed and promoted.						
Operational objective 2: To support the development of codes of conduct, certification and an accreditation scheme for aquaculture practitioners and products.							
2.1 Aquafarmers can produce high quality, certified and accredited products.	Mechanisms for quality control, and certification and accreditation of aquaculture products developed.	Establishing quality control mechanisms to certify and accredit aquaculture products.	Number of codes of conduct, and certification and accreditation schemes.	Currently, there are no mechanisms for certifying and accrediting aquaculture products.	MLF, TNC, TAFICO, FETA, TAFIRI, Private sector.	2025-2030	3,200
	Codes of conduct for certification and accreditation schemes developed.	Supporting capacity building for developing codes of conduct, and certification and accreditation schemes.					

Thematic Area Five: Spatial Planning and Promotion of Investment in Aquaculture.							
Operational objective 1: To enhance an orderly and sustainable spatial planning in aquaculture.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Responsible Institutions**	**Timeframe**	**Amount (USD, '000**
1.1 Aquaculture-related conflicts among water users reduced, to a great extent.	Zoning guidelines developed.	Introducing zonation and spatial planning in aquaculture.	Number of aquatic zones.	Currently, there is no any spatial planning guidelines in aquaculture.	MLF, PO-RALG, VPO-Environment, NEMC, LGAs, Ministry of Water, TAFIRI, Private sector.	2021-2036	**950**
	Mapped and zoned aquaculture potential and production sites.						
	Presence of effective multi-sectoral conflict resolution committees.						
	Harmonized coordination of water users.						
	Decision-makers and technical staff trained and promoted on spatial planning.						
	Developed codes of conduct for zone user to ensure proper management of						

	activities in the zone.						
Operational objective 2: To enhance access to finance for aquafarmers							
2.1 More aquafarmers involve in aquaculture activities	Aquafarmers cooperatives established.	Encouraging aquafarmers to form cooperatives to enable them access soft loan from financial institutions.	Number of cooperatives formed.	Few and weak cooperatives.	MLF, PO-RALG, TAFIRI, LGAs, TCDC, Financing institutions, Private sector.	2025-2036	2000
	Understanding of aquaculture activities to financing institutions gained.	Provide an understanding of aquaculture activities to financing institutions.	Number of financing institutions providing loans.				
Operational objective 3: To create an enabling environment for investing in commercial aquaculture.							
3.1 More people (local and foreign aqua-farmers) invest in commercial	Aquaculture related-laws formulated, reviewed and harmonized on the basis of needs.	Promoting and supporting private sector to invest in commercial aquaculture.	Number of investors.	Most of aquaculture practices are of a small scale and are undertaken mainly by local farmers.	MLF, PO-RALG, TAFIRI, LGAs, TCDC, Financing institutions, Private sector.	2025-2036	900
	Established and operationalized one-stop centres (OSCs).						
	Aquaculture						

	investment forums promoted.						
	All actors along the aquaculture value chain linked together.						
	Tax incentives to investors provided to investors	Provide tax incentives to investors					
Operational objective 4: To promote and support the formation of aquafarmer cooperatives and associations with special emphasize for youth and women.							
4.1 The youth, women and marginalized groups participate fully in aquaculture activities.	Aquafarmer special groups' cooperatives, and associations strengthened and new ones established.	Encouraging youth, women and marginalized groups to form aquafarmer cooperatives and associations.	Number of cooperatives, associations and incubation programmes.	Aquaculture activities are dominated by men while women do most of the downstream, post-harvest and marketing activities.	MLF, PO-RALG, LGAs, TCDC, financing institutions, Private sector.	2025-2036	1,950
	Established incubation programmes for improved aquaculture hands-on skills.						
Thematic Area Six: Aquatic Environmental Health.							
Operational objective 1: To strengthen the mechanisms for controlling genetic pollution.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Responsible Institutions**	**Timeframe**	**Indicative Budget (USD, '000)**

1.1 Genetic pollution caused by aquaculture practices controlled.	Increased awareness of genetic pollution caused by aquaculture practices.	Promoting awareness programmes on genetic pollution caused by aquaculture practices.	Number of trained personnel, centres, established, guidelines developed, and seminars conducted.	There are no mechanisms for controlling genetic pollution caused by aquaculture practices.	MLF, PO-RALG, NEMC, LGAs, TAFIRI, FETA, Higher learning institutions, Private sector.	2025-2030	1,550
	Developed and enforced guidelines for transporting fish seeds, brooders, stocking and re-stocking in natural water bodies.	Developing guidelines for introducing, stocking and re-stocking in natural water bodies.					
Operational objective 2: To enhance biosecurity strategies for monitoring, control and surveillance of aquatic environmental health.							
2.1 Existence of an improved aquatic environment health.	Biosecurity strategies for monitoring, control and surveillance of aquatic environmental health developed.	Developing biosecurity strategies, programmes and guidelines for monitoring, control and surveillance of aquatic environmental health.	Number of strategies developed, programmes and guidelines.	There are no specific biosecurity strategies, programmes and guidelines for improving aquatic environment health.	MLF, PO-RALG, NEMC, LGAs, TAFIRI, VPO, FETA, Higher learning institutions, Private sector.	2021-2030	850
	National aquatic animal health strategy and implementation plan developed.						
	Guidelines for						

	controlling brood stock, gametes and juvenile production, and introduction of alien genotypes developed.						
	Established and operationalized programmes to monitor, control and prevent aquatic diseases, parasites and toxins.						
	Genetic screening programme of wild and hatchery tilapia strains established and implemented.	Promoting genetic screening programme of wild and hatchery farmed strains.	Number of genetic screening programmes.				
Operational objective 3: To enhance adherence with the inter-sectoral collaboration in controlling pollution from aquaculture.							
3.1 Environmental degradation owing to poor water quality control.	Adherence with the inter-sectoral collaboration.	Promoting mitigation measures in controlling pollution from aquaculture activities.	Measures for controlling water quality and environmental degradation.	At present, there is no reliable mechanism for controlling environmental degradation caused by poor water quality	MLF, PO-RALG, VPO-Environment, NEMC, LGAs, Ministry of Water, TAFIRI, Private sector.	2030-2036	380
	Harmonized and implemented laws,		Number of rules and laws				

	regulations and rules to control anthropogenic activities.		harmonized and implemented.	control.			
Thematic Area Seven: Aquaculture Production Technologies.							
Operational objective 1: To promote development of alternative water sourcing technologies in areas with a scarcity of water.							
Outcomes	**Outputs**	**Strategic intervention**	**Key performance indicators**	**Baseline information**	**Responsible Institutions**	**Time Frame**	**Amount (USD,000)**
1.1 Aquaculture activities undertaken in areas with a scarcity of water.	Alternative water sourcing technologies established.	Developing alternative water sourcing technologies in areas with scarce water.	Number of alternative water sourcing and aquaculture technologies.	Currently, there are areas with high demand for fish, but they face water scarcity.	MLF, TAFIRI, FETA, Ministry of water, Ministry of Land.	2021-2036	620
	Existing aquaculture technologies optimized.	Optimizing the existing aquaculture technologies					
	New technologies adapted or adopted.	Adapting new technologies to suit our local environment.					
	New aquaculture technologies developed.	Developing other new aquaculture technologies.					

Thematic Area Eight: Ornamental Fish Culture and Trade.							
Operational objective 1: To promote and support the trade in ornamental fish.							
Outcomes	**Outputs**	**Strategic intervention**	**Key performance indicators**	**Baseline information**	**Responsible Institutions**	**Time Frame**	**Amount (USD, 000)**
1.1 Trade in ornamental fish from the capture and aquaculture.	Ornamental fish culture and trade promoted.	Promoting ornamental fish culture and trade.	Number of ornamental fish culture and trade.	Currently, the trade in ornamental fish is allowed in various water bodies, except for Lake Victoria.	MLF, TAFIRI, Private sector.	2025-2036	570
Thematic Area Nine: Cross-Cutting Issues.							
Operational objective 1: To sensitise aquafarmers on creating awareness on communicable diseases and health hazards associated with aquaculture practices.							
Outcomes	**Outputs**	**Strategic Interventions**	**Key Performance Indicators**	**Baseline Information**	**Responsible Institutions**	**Timeframe**	**Indicative Budget (USD, '000)**
1.1 Healthy and productive aquafarmers and related stakeholders because of behaviour change.	Needs assessments done, and awareness and education provided. Relevant authorities have disease prevention mechanisms. Research on the magnitude of	Creating programmes advocating behavioural change and communicable disease prevention among aquafarmers.	Number of programmes	Prevalence of communicable diseases and health hazards associated with aquaculture activities.	MLF, Ministry of health, PO-RALG, VPO-Environment, LGAs, Social Protection Schemes, OSHA, TAFIRI, MUHAS and other Higher	2025-2036	650

	communicable diseases and health hazards associated with aquaculture practices conducted.				learning institutions.		
Operational objective 2: To enhance awareness creation on occupational hazards associated with aquaculture activities to aquafarmers.							
2.1 Aquafarmers' (including cage farmers) decent working conditions and access to social protection schemes, safety services and equipment.	Safety infrastructure for cage farmers developed	Enhancing safety at sea, and establishing a decent working conditions and social protection schemes for aquafarmers.	Number of schemes on social protection, safety at sea (for cage farmers) and decent working conditions.	Aquafarmers, especially cage farmers, have limited access to social protection schemes, safety services and equipment, and do not have decent working conditions.	MLF, Ministry of health, PO-RALG, VPO-Environment, LGAs, Social Protection Schemes, OSHA, TAFIRI, Private sector.	2025-2036	350
	Aquafarmers linked to social protection schemes.						
	Aquafarmers are supported and linked to relevant social protection schemes.						
TOTAL (USD)							**69,310**

CHAPTER 8

8.0 FUNDING AND THE IMPLEMENTATION FRAMEWORK

8.1 Funding

The government will set aside sufficient funds from its own sources and from development partners for implementing this master plan. It is estimated that a total investment amounting to USD 69,310,000 will be required to implement the new master plan (aquaculture) over a period of 15 years.

8.2 Implementation Framework

The new master plan presents a clear road map for addressing complex and multifaceted issues hindering the development, growth and expansion of Tanzania's aquaculture. The plan puts in place measures to consolidate and turn Tanzania's aquaculture into a vibrant, economically viable and sustainable industry. The operationalization of this master plan will involve the government and other stakeholders, especially in implementing cross-cutting issues. Consultation with relevant external experts from fisheries and aquaculture organizations is also important in implementing the plan. In addition to the tentative timeframe and budget indicated in this master plan, it is hoped that a realistic and cohesive time-bound activity plan will be formulated in consultation with various stakeholders. The master plan will also be distributed to various implementing agencies within the Central Government and the Local Government Authorities (LGAs) with a mandate to develop and regulate aquaculture activities. The master plan will also be accessible to various national and regional agencies responsible for supervising, coordinating and funding aquaculture activities.

A plan of action for the new master plan will be developed in the initial stages of its implementation. The master plan will be implemented according to the plan of action and the government's policy. Among other things, the implementation will involve the following:

(i) Making follow-ups on and reviewing the implementation of the master plan, as well as devising a good strategy for its implementation.

(ii) Working with relevant government authorities to make sure that the master plan is adopted as a government document.

(iii) Developing follow-up projects and oversee their implementation.

(iv) Working with the relevant authorities to solicit funds for implementing the master plan.

(v) Engaging development partners so that they support the implementation of the master plan.

(vi) Reviewing the master plan every year to ensure that its implementation is on track.

CHAPTER 9

9.0 MONITORING AND EVALUATION

Monitoring and evaluation (M&E) involves assessing the progress and achievement made towards the implementation of the master plan. Specifically, M&E involves determining the achievements attained against the overall and operational objectives set. The information will show adjustments that need to be made immediately. M&E will be done twice a year to determine the relevance, effectiveness and impact of programmes in the light of the set objectives. The evaluation done towards the middle of the year will show the adjustments needed to improve upon the activities being done. The evaluation done towards the end of the year is for assessing the progress made towards achieving the expected benefits and impact of programmes. The information obtained can also be used to improve current and future planning, programming, decision-making and programme execution.

The National Fisheries and Aquaculture Master Plan Implementation Committee (NFMPIC) will oversee M&E activities on a regular basis, preferably twice a year. The committee will develop methods to generate the information and data needed during M&E exercises. The report and any recommendations made by the committee during M&E exercises will be submitted to the government for action.

CHAPTER 10

10.0 CONCLUSIONS

The new Fisheries Master Plan (Aquaculture, 2021–2036) provides a road map for the government and all other stakeholders to fully participate in the development of aquaculture. The road map is mainly based on the need to strengthen the aquaculture institutional capacity and to increase the productivity of aquaculture. Basically, this master plan is intended to ensure that aquaculture production in mainland Tanzania increases from the current 22,793.20 metric tonnes to the projected 150,000 metric tonnes in 2036. This is an increase of 10 metric tonnes a year. This is an achievable projection based on the current aquaculture production trend from only 4,000 metric tonnes in 2017 to about 18,717 metric tonnes in 2020, an increase of about 368% for a period of less than five years.

Tanzania has enormous but untapped aquaculture potential. Interestingly, the fish supply in the country is about 473,592.24 metric tonnes, while the demand is around 700,000 metric tonnes. On the other hand, the supply of fish from capture fisheries has almost stagnated, while the demand for fish is increasing steadily. This is exacerbated by continued growth of the human population, appreciation of fish as a healthy food product and the existing fish trade opportunities. Thus, concerted efforts will be done to fully develop aquaculture so as to bridge the gap between demand and supply. The government intends to utilize the available aquaculture potential and opportunities to ensure job and wealth creation. This will in turn, contribute to economic development whilst ensuring food and nutritional security for Tanzanian fishing communities.

Efforts will also be made to make sure that there is a smooth collaboration between the Central Government and the LGAs so as to develop aquaculture. The availability of inputs such as quality seeds and feeds will be given priority. Likewise, continued efforts will be made to make sure that inputs, other than feeds and seeds, are readily available and affordable. The government will also make sure that the private sector and all other stakeholders collaborate and participate in making efforts to increase aquaculture production.

As indicated in the master plan major investments will be made in infrastructure for research and training institutions. The government will consolidate and provide resources for undertaking needs-driven research that is aimed at increasing and diversifying the production of fish. It will also concentrate on promoting innovative market research, developing and piloting low-cost fish production systems, developing on-the-farm trials and post-harvest value addition techniques, as well as quality and food safety. Efforts will be made so that the human resources needed are available through recruitment of and provision of appropriate training to Tanzanians.

The master plan will be implemented successfully through an effective monitoring and evaluation system. Monitoring and evaluation measures will be established following the agreed performance indicators and benchmarks to track progress.

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APPENDICES

Appendix 1: Fisheries Stakeholders and their Responsibilities

No.	Stakeholder	Status and Duties Performed in the Fisheries Sector
1.	Fish processors	These preserve fish to maintain good quality for human consumption. They are divided into three categories: Domestic (local) processors – These are involved in fish frying and sun-drying, salting, icing and smoking fish. Their stake in this area is economic improvement. People of different age and gender are involved in processing fish. There are a number of these in marine and fresh water bodies, although their statistics are not yet known, since research is yet to be done. Regional processors – They buy processed fish from local processors and sell it to regional markets such as DRC and Sudan. Their stake in the business is based on their intention to improve their economic status, since they sell the products to regional markets. Most of them are men, but few women are also involved in the business. International processors – There are 17 international fish processors owning fish processing factories. The plants collect fish products from small-scale fishers through their agents. Their main preservation methods are filleting, freezing, chilling and then packing and exporting the products to international markets. Their main stake is based on their intention to improve their economic conditions and to contribute to the country's economic growth, since all of these legally exist so that they pay royalties (tax) for every consignment. These are Tanzanian big entrepreneurs, but, in some cases, foreign shareholders also participate in the business.
2.	Fishers (small-scale and semi-industrial)	These are direct stakeholders who are grouped into two, small-scale and semi-industrial groups. Both depend on fishery resources for their food security, especially for protein and cash. Small-scale fishers mainly use fish for subsistence, but some commercial fishers, fish products like lobster,

		crabs and prawns for export. Semi-industrial fishers – These are the trawlers who catch prawns and sell to those who export prawns to international markets. In most cases, fishing is done seasonally, depending on the availability of fish species and the direction of wind.
3.	Fish processing plants (domestic, regional and export markets)	These are fish factories for processing fish and transporting it to other places; most of these plants process fish and other species and transport them to different areas. The main processing methods used are freezing, filleting and chilling for local, regional and global markets. These plants collect fish products from small-scale fishers and show the importance of small-scale fishers to the global market. Most of these plants are for commercial purposes and fish is their primary source of profit. Fish processors depend very much on the availability of fish and the demand for it.
4.	Fish traders (domestic, regional and export markets)	They transport fish products from landing sites/areas to the markets. They are divided into three categories: those who transport products to local markets known as domestic traders (inside Tanzania) and those who transport products regionally (within Africa and in the adjacent countries) and exporters who transport fish to the global market, outside the African continent. The products are transported to China, Europe, the US, etc. The trade they do is commerce-oriented and they can buy fish from different fishers and sell it to consumers.
5	Fishing equipment owners	These are owners of fishing vessels and gear. In most cases, these do not fish. They sometimes wait at landing sites or work closely with the captains of vessels to manage and run their business. It is the owners who choose what to fish, depending on the type of gear used. They benefit more than the fishers who do the hard/difficult/tedious job.
6.	Women carrying fish from boats to auctioning areas	These are women who carry fish/sea products from vessels when they return to the auctioning areas, for the landing sites which auction fish. When the vessels

		land at the sites, fishers do not carry fish to the auctioning areas; women do so instead. In most cases, this practice is common among sardine fishing vessels and vessels fishing a few other finfish species. The women get money for their livelihoods by doing this work.
7.	Auctioning people	These people sell fish during auctions. They sell fish to buyers/traders during auctions. They get paid by the fishers (some percentage from the fish they sell and institutions like BMUs).
8.	Consumers	These are indirect stakeholders. Consumers are those who use sea products for eating, decoration, etc.
9.	LVFO	The Lake Victoria Fisheries Organization (LVFO) is a specialized institution of the East African Community (EAC) whose mandate is to coordinate the management and development of fisheries and aquaculture resources in the EAC region. The region is made up of Tanzania, Kenya, Uganda, Burundi, Rwanda and Sudan South.
10.	LTA	Lake Tanganyika Authority (LTA) is responsible for overseeing the implementation of regional, integrated fisheries management programmes based on the provisions of the Convention on Sustainable Management of Lake Tanganyika. The LTA has established a cooperative and collaborative approach for sustainable development and management of the fisheries resources of Lake Tanganyika and its basin by the four Lake Tanganyika riparian countries of Burundi, DRC, Tanzania and Zambia.
11.	Local Government Authorities	These are government organs that manage fisheries resources and use them sustainably within the territorial sea in their area of jurisdiction. They are the ones that manage small-scale fisheries and issue licences to the fishers as they are the custodian of fisheries resources in their areas.
12.	Tanzania Revenue Authority (local and national)	Tanzania Revenue Authority is a government agency which is charged with the task of managing the assessment, collection and accounting of all Central Government revenue. It is a semi-autonomous body that operates along with the Ministry of Finance and

		Planning. In small-scale fisheries, revenues are collected by the Local Government Authorities. They collect revenue from small-scale fisheries because they manage the resources.
13.	TAFICO	Tanzania Fisheries Corporation – TAFICO (2018) is a public corporation fully owned by the Government of Tanzania under the Ministry of Livestock and Fisheries, particularly the Fisheries Development Division. The corporation is mandated to undertake large-scale commercial fishing in the territorial waters, Exclusive Economic Zones (EEZ) and high seas. TAFICO will also be involved in aquaculture and fish processing. The corporation will also sell fish and fish products to domestic and international markets.
14.	TAFIRI	Tanzania Fisheries Research Institute carries out research in the fisheries area and is mandated to advise the government on the best practice based on research results.
15.	Marine Parks and Reserve Unit (conservationists)	The Marine Parks and Reserves Unit was established under the Marine Parks and Reserves (MPRU) Act 29 of 1994. It is managed by a Board of Trustees whose role is, among other things, to oversee the management of the marine parks and reserves operating under the auspices of the MPRU and to formulate policies on Marine Protected Areas (MPAs) and related facilities.
16.	Fishing communities (including BMUs)	These are communities found along the coast of any water body. In collaboration with the government, they manage fisheries resources and the coast. They are guided by the Beach Management Unit guidelines and the management plans on what to do and how to manage their resources. They are responsible to the village government.
17.	Universities (academia)	These are responsible for capacity building and producing the human resources that manage fisheries resources and all the value chain processes of fish products. Universities also give awards at different levels, that is, Bachelor's, Master's, and doctorate (PhD) degrees to those who qualify. They also

		participate in research and other fisheries studies.
18.	Vocational training centres	These are responsible for capacity building and producing the human resources that manage fisheries resources and the value chain processes of fish products. VTCs also give awards at different levels, including short courses that are important to the fisheries sector. They also offer refresher training.
19.	Ministry of Livestock and Fisheries	The Ministry has overall responsibility for managing and developing fisheries resources. Further, the Ministry is the policy maker and oversees all matters related to fisheries resources.
20.	Vice-President's Office (Environment)	The Ministry is responsible for making policies and environmental laws. However, it has given its mandate to the National Environmental Management Council (NEMC). NEMC was established in response to the national need for an institution that oversees environmental management issues and implements the resolutions of the Stockholm Conference (1972), which called upon all nations to establish and strengthen national environmental councils so that they could advise governments and the international community on environmental issues. NEMC is mandated to undertake enforcement, compliance, review and monitoring of environmental impact assessments, research, facilitate public participation in environmental decision-making, raise environmental awareness and collect and disseminate environmental information. NEMC provides a legal and institutional framework for sustainable management of the environment, preventing and controlling pollution, waste management, environmental quality standards, public participation in environmental compliance and enforcement of laws and regulations.
21.	Ministry of Planning and Finance	To promote sustainable and shared economic growth, macro-economic stability by developing robust social-economic policies, ensuring prudent financial management and enhancing professionalism and optimal use of ICT. The Ministry established a Planning Commission, which, in collaboration with staff from the Ministry of Livestock and Fisheries, develops all fisheries projects.

22.	NGOs	These help the government carry out its activities at different levels; they are responsible for advocacy and they assist in any policy improvement. They are responsible for building the capacity of government officials and communities with respect to natural resources management and all the fish chain. They sometimes assist in marketing products and harmonizing issues that need addressing by different sectors. Included in this group are WWF, Sea Sense, IUCN and TNC, among others.

Appendix 2: Checklist for the Key Informants

1. The relevancy of policies, objectives, laws, regulations, rules and procedures that govern the previous master plan and its implementation
2. The role of local communities and other fisheries key stakeholders in implementing the previous master plan
3. Essential things/components which were overlooked in the previous master plan
4. Implementation status of the previous master plan

S/No.	Programme	Implementation Status (partially implemented or not implemented)	Reason
1.	Programme 1: – (Dar es Salaam, Bagamoyo and Island): Marine Fisheries Sub-Sector Capacity Building Programme		
2.	Programme 2: – (Dar es Salaam): Fisheries Infrastructure Improvement Programme		
3.	Program 3: – (Lake Victoria, Mwanza): Lake Victoria Fisheries Sub-Sector Capacity Building Programme		
4.	Programme 4: – (Mwanza, Musoma, Kirumba): Lake Victoria Fish Marketing Improvement Programme		
5.	Programme 5: – (Kigoma): Lake Tanganyika Major Landing Beach Improvement Programme		
6.	Programme 6: – (Mbeya, Ruvuma and Iringa): Lake Nyasa Planked Canoes Extension Programme		
7.	Programme 7: – (Morogoro): Aquaculture Extension Programme.		
8.	Programme 8: – (Kigoma and Mafia Island): Fisheries Financial Support Programme		
9.	Programme 9: – (National Level): Fisheries Co-management Programme		
10.	Programme 10: – (National Level): National Fish Export Promotion Programme		
11.	Programme 11: – (Musoma, Mwanza and Bukoba): Major Landing Beach Improvement Programme.		
12.	Programme 12: – (Southern Part of Pwani		

	Region): Fisheries Communities Development Programme		
13.	Programme 13: – (Dar es Salaam): Information System Improvement Programme		
14.	Programme 14: – (Nyegezi and Mbegani): Training Institute Improvement Programme		
15.	Programme 15: – (National Level): Fisheries Master Plan Implementation Training Programme		

5.0 Challenges/problems encountered during the implementation of the previous master plan

6.0 Experience gained/lessons learnt from the implementation of the previous master plan

7.0 Which programmes should be part of the new master plan, especially the programmes which were partially or not implemented at all?

Appendix 3: Questionnaire

A: UNIVERSITIES, FISHERIES AND RESEARCH INSTITUTIONS, FISHERIES NGOs

A1. FISHERIES MANAGEMENT

1. Mention the main challenges facing the management of fisheries in Tanzania?

a) ……
b) ……
c) ……
d) ……

2. What should be done to improve the management of fisheries in Tanzania?

a) ……
b) ……
c) ……
d) ……

3. What type of fisheries management system(s) should be given priority?

a) ……
b) ……
c) ……

4. What technologies or management models can be applied successfully in the management of fisheries in Tanzania?

a) ……
b) ……..
c) ……
d) ……

5. Do you think the management of fisheries by the Ministry and the Local Government Authorities is effective? Why?

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……...

6. What should be done to make the current fisheries management systems efficient and effective?

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……...
……...

A2: FISHERIES DEVELOPMENT

1. What challenges hinder the development of the fisheries sector?

a) ..……
b) ……
c) ……
d) ……

2. What should be done to hasten the development of the fisheries sector in Tanzania?

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3. What should be done to empower artisanal fishers?

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4. How best could investment in EEZ fishing be done?

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5. How best could the fisheries infrastructure be improved or established?

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6. What is your vision for Tanzania's fisheries in the next 15 years?

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7. What fisheries opportunities are available in Tanzania but are not used?

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8. What should be done to empower the youth and woman in the fisheries sector?

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9. What model is practical to encourage Tanzanians to invest in fisheries sector?

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10. What is the practical mechanism for empowering Tanzanian small fish processors, farmers and traders?

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11. What business environment is necessary for improving the fish and fishery products business?

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A3: FISHERIES PROCESSING INDUSTRIES

1. What are the major challenges facing fish processing industries?

a) ……
b) ……
c) ……
d) ……

2. How could the capacity and efficiency of fish processing industries be improved?

a) .....
b) .....
c) .....
d) .....
e) .....

3. What type of environment could promote the development of fish processing industries?

a) .....
b) .....
c) .....
d) .....
e) .....

A4: FISHING VESSELS, GEAR AND FISH HANDLING TECHNOLOGIES

1. What challenges are facing fish handling technologies?
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2. What should be done to empower the local fishing vessel and gear manufacturers?
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   .....
3. Which local fishing gear, techniques and vessels need to be improved for sustainable fishing?
   .....
   .....
4. Is it necessary to mechanize our fisheries?
   .....
   .....
5. What environmentally and user friendly fish handling facilities and technologies could be used in Tanzania's fisheries?
   .....
   .....

A5: FISHERIES RESEARCH & EDUCATION

1. What fisheries research areas should be given priority and why?
   .....
   .....
2. What should be done to fund fisheries research?
   .....
   .....

3. What are the main challenges facing fisheries research in Tanzania?
   ……
   ……
4. Which field in the fisheries profession require more skilled personnel? Why?
   ……
   ……
5. Which courses in the fisheries science should be given priority? Why?
   ……
   ……
6. What training programmes should be introduced in the fisheries training institutions and universities to build the country's capacity to develop fisheries?
   ……
   ……

B. FISHERS, PROCESSORS AND TRADERS

B1: Fisheries development and trade in fishery products

1. What do you think should be done to make the fisheries sector progress?

(i) **……**
(ii) **……**

2. Mention the challenges that are holding back the development of the fisheries sector in the country.

(i) ……
(ii) ……

3. What should be done to boost the economy of small-scale fishers?

(i) ……
(ii) ……
(iii) ……
(iv) ……

4. What challenges do small-scale fishers encounter/face?

(i) **……**
(ii **……**

5. What should be done to develop vendors and small-scale processors of fishery products?

(i) ……

(ii) ……

6. What challenges do vendors face?

(i) ……

(ii) ……

7. What challenges does the fishery products business face?

(i) ……

(ii) ……

8. What challenges does the fishery infrastructure face?

(i) ……

9. What challenges does the domestic and foreign (export) fishery products business face?

(i) ……

(ii) ……

10. What fishery products should not be exported to maintain food security?

(i) ……

(ii) ……

11. What are the best ways to promote the involvement of women and youth in fisheries activities?

……

B2: Management of Fisheries Resources

1. What type of fishing should be fully managed to protect it and strengthen the economy of fishers?

(i) ……

(ii) ……

(iii) ……

2. Mention the challenges facing the management of fisheries resources in the country?

(i) ……

(ii) ……

(iii) ……

3. What should be done to improve effectiveness in the management of fisheries resources?

(i) ……
(ii) ……

4. Mention the advantages and disadvantages of participation/co-management (BMUs) of fisheries resources.

4a. Advantages (pros)

(i) ……
(ii) ……
(iii) ……
(iv) ……

4b. Disadvantages (cons)

(i) ……
……

5. What should be done to find and collect accurate statistics for fisheries?

(i) ……
(ii) ……
(iii) ……

6. What type of fishing techniques are dangerous to sustainable fisheries?

(i) ……
(ii) ……
(iii) ……

7. What type of fishing gear is dangerous to sustainable fisheries?

(i) ……
(ii) ……
(iii) ……

8. What system of fisheries resource management should be strengthened to have sustainable fisheries?

9. What type of fish or fishery products should not be harvested to improve other fisheries?

(i) …….. (immature fish).

10. What type of fish/organisms could be indicators of fishing conditions?

(i) ……

B3. Quality and storage of fishery products

1. What indigenous technology for storing fishery products should be improved?

(i) ……

(ii) ……

2. What methods/techniques for storing fish products currently in use endanger the health of consumers?

(i) ……

3. What are the challenges facing the storage of fishery products?

(i) ……

4. What methods for storing fishery products should be used by vendors and small-scale processors?

(i) ……

(ii) ……

5. What instruments are supposed to be in fishing vessels to maintain the quality of fishery products?

(i) **……**

6. What are some of the ways in which fishery products are stored at the markets or landing sites to protect the quality and health of consumers?

(i) ……

(ii) **……**

7. What methods used to process fishery products reduce the quality of the products?

(i) ……

8. What are the modern technologies/techniques that should be used in storing fishery products?

(i) ……

(ii) **……**

9. What should be done in storing fishery products to protect the quality and health of consumers?

(i) ……

10. What should be done to control the smuggling of fishery products?

(i) ……
(ii) ……
(iii) ……

B4. Education and Training for Fisheries Stakeholders

1. Do you think the education and training provided to fisheries stakeholders is adequate? Are the methods used to provide the education/training appropriate?

……

2. What is the best way to get fisheries education/training?

(i) …….. ii) …….. iii) …….. iv) …… v) ……
vi) …… vii) Other ways; ……

3. What are the aspects of fisheries that necessitate providing more education/training for fisheries?

(i) ……
(ii) ……

4. What areas in the fisheries sector have a shortage of professionals?

(i) ……
(ii) ……
(iii) ……

5. Where have you been getting fisheries education/training?

i) …… ii) …… iii) ……
iv) I have never received any training/education
v) Name others ……

B5. Fishing gear and vessels

1. How has the fishing vessel you use been designed/made?

i) What materials?.....
ii) Indigenous artisans? Mention them……
iii) Institution/factory……
iv) Domestic or foreign (imported)……

2. What is the lifespan of your vessels?

……

3. What problems are facing the indigenous artisans manufacturing fishing vessels and gear?

(i)……...
(ii)……
(iii)……
(iv)……

4. What fishing vessels do you use? If they are indigenous, mention them

……

5. What should be done to develop the indigenous technicians/artisans manufacturing fishing vessels or gear?

(i) To provide education on manufacturing of transportation vessels/vehicles

(ii)……
(iii)……
(iv)……

Factories

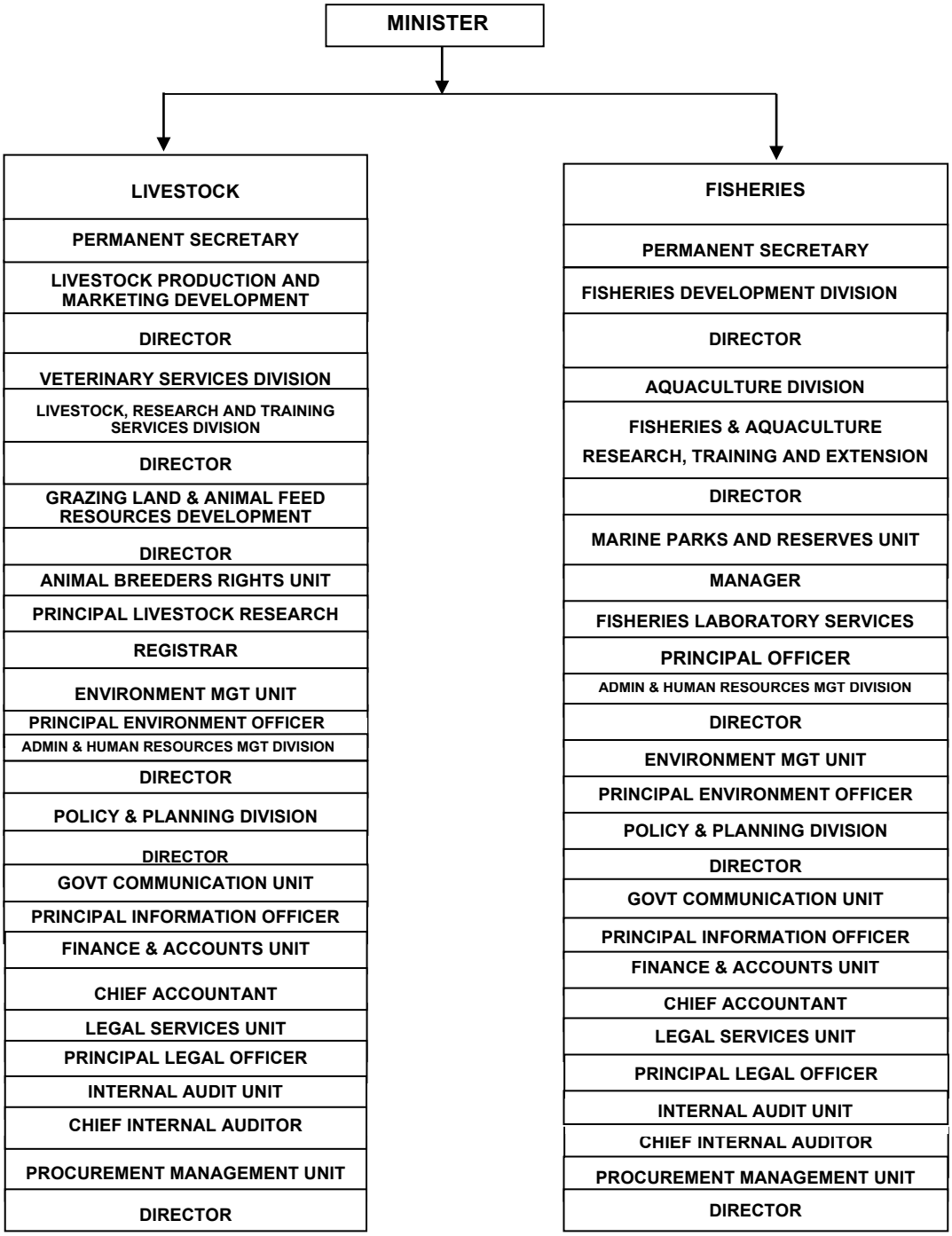
6. What challenges are facing the factories that manufacture vessels and fishing gear?

(i)……
(ii)……
(iii)……

7. What prevents investment in vessels and fishing gear?

(i)……
(ii)……
(iii)……
(iv)……

Appendix 4: Organogram of the Ministry of Livestock and Fisheries



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