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Integrating the Blue Economy framework into Sustainable Fisheries Management and Maritime Development in the Lake Victoria region of Kenya

By

Margaret Akello

Acknowledgments

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Abstract

The Blue Economy framework represents a strategic approach to harnessing the economic potential of ocean resources in a sustainable manner. The framework is crucial in Kenya's Lake Victoria region as it enhances food security, promotes sustainable economic growth, and creates decent employment opportunities for the local community. Lake Victoria supports millions of people through activities like agriculture, fishing, and transportation. However, the region faces vital issues such as illegal fishing practices, pollution, poor infrastructure development hindering trade and market access, and weak governance that undermines the sustainability and use of its resources.

Two methods are used to examine the good practices and gaps to enable Lake Victoria to unlock its Blue Economy potential. First, comparative case studies of good practices of successful Blue Economy initiatives were selected due to their explicit Blue Economy policy in place and addresses on "what is being governed" in line with infrastructure, ecosystem, and transport corridor in Lake Victoria region in Kenya. Additionally, Ethiopia's Blue Nile initiative, a geopolitical aspect, highlighted the negative outcome because of uncollaborative efforts on governance from nations sharing a water resource. Moreover, a gap analysis highlighted the current state of the Blue Economy in the Lake Victoria region of Kenya and identified some key hinderances to its development, like limited cold chain and processing infrastructure, poor transportation connectivity, and inadequate collaborative stakeholder engagement.

Findings reveal that integrating the Blue Economy framework in Lake Victoria, Kenya, requires improving transport networks, modernizing ports, and investing in cold chain systems. Hence, it is vital to enhance and strengthen collaborative governance and foster public-private partnerships to achieve blue economy policy execution and efficient resource management. Collaborative efforts among government, local communities, non-government agencies, and SMEs stakeholders can transform the lake's blue economy into a model of sustainable development, boosting regional trade, improving the local communities' livelihoods, and preserving the lake's ecosystem.

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Abbreviations	Explanation
AfCFTA	African Continental Free Trade Area
BPI	Blue Ports Initiative
BE	Blue Economy
DAFF	Department of Agriculture, Forestry, and Fisheries
DMRE	Department of Mineral Resources and Energy
DRC	Democratic Republic of Congo
EAC	East African Community
EIAs	Environmental Impact Assessments
EMCA	Environmental Management and Coordination Act
FAO	Food and Agriculture Organization
FMDA	Fisheries Management and Development Act
GERD	Grand Ethiopian Renaissance Dam
GDP	Gross Domestic Product
IAD	International Analysis and Development
ICOMMP	Integrated Coastal and Ocean Management Monitoring Program
ILECF	International Lake Environmental Committee Foundation
IMTA	Integrated Multi-Trophic Aquaculture
IUU	Illegal, Unreported and Unregulated
KALRO	Kenya Agricultural and Livestock Research Organization
KMA	Kenya Maritime Authority
KMFRI	Kenya Marine and Fisheries Institute
KPIs	Key Performance Indicators
LREB	Lake Region Economic Bloc
LTTC	Lake Tanganyika Transport Corridor
LVBC	Lake Victoria Basin Commission
LVFO	Lake Victoria Fisheries Organization
MPAs	Marine Protection Areas
NDP	National Development Plan
NEMA	National Environmental Management Authority
NGOs	Non-Governmental Organizations
SAMSA	South African Maritime Safety Authority
SDGs	Sustainable Development Goals
SME	Small and Medium-Sized Enterprise
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VMS	Vessel Monitoring System

CHAPTER 1: INTRODUCTION

1.1: Introduction

The concept of Blue Economy (BE) was first popularized by Belgian economist and entrepreneur Gunter Pauli (2010), who advocated for sustainable use of ocean and freshwater resources as a way of dealing with economic challenges and the global environment. It was later discussed in the Rio+20 Third Earth Summit Conference in June 2012, where the United Nations (UN) simplified the two terms' being *blue* signifying to the sea or the marine and *economy* to the general economy. It refers to the sustainable utilization and management of marine resources and economic activities related to oceans, seas, and coastal areas (United Nations, n.d.).

The United Nations conference institutionalized the concept to be originally seen as a policy idea, which was later adopted and defined differently by institutions and researchers in reference to the lakes and oceans. In simple academic terms, the blue economy can be defined as "an approach that promotes economic development through the sustainable use of ocean resources, while ensuring the long-term health and adaptability of marine ecosystems" (Keen et al., 2022, p. 2).

1.2: Background

The emphasis of the blue economy lies within the lake region of Kenya, Lake Victoria **(see Figure 1),** which shares its shores with three East African nations, namely Kenya, Uganda, and Tanzania. Lake Victoria in Kenya, with a take-up of 28,700 km2, is the world's largest tropical lake and the world's second largest freshwater lake by surface area. Due to its outstanding nature, it is crucial to the lives of about 30 million people as a source of food security, water provision and supports several industries like manufacturing, transport, and tourism, which in turn enhances economic growth within the region. And for this reason, it is important to understand the three levels of blue economy to shed light on Lake Victoria's particular dimension.

Figure 1: The map of Lake Victoria

Source: Google Maps, 2024

It is vital to incorporate the three blue economy levels in the Lake Victoria region of Kenya, which are international, national, and regional. The concept of the "international blue economy" highlights the need for international cooperation, governance structures, and coordinated efforts to manage shared water resources effectively and protect the marine ecosystem across state boundaries. The national blue economy involves economic activities and industries related to sustainable use and management of water resources within a particular country's domain, aiming at balancing economic growth and environmental conservation alongside social equity. Regional blue economy emphasizes economic activities and initiatives related to sustainable use and conservation of water resources within a specific geographical region, which requires regional collaboration alongside governance frameworks. Projecting a blue economy in the lake region is perceived to be a complex task; however, the benefits of such an approach are being acknowledged (Outa et al., 2021). Hence, for the implementation of the regional blue economy in the Lake Victoria region, Kenya, the crucial actors who formulate the governance and policy frameworks need to collaborate to ensure sustainable use of the lake's ecosystem.

This section sheds light on policymaking, which plays a crucial role in shaping and implementing blue economy policies, specifically in the context of the Lake Region in Kenya. These include: the county governments of the lake region counties, such as Kisumu, Siaya, Homabay, Migori et. al., who work together in developing the Lake Region Economic Blueprint to leverage the shared lake's resources; the Lake Region Economic Bloc (LREB) plays a crucial role in fostering collaboration, economic blueprint development, and improving governance

amongst its 10-member state counties. The Kenya Maritime Authority (KMA), a state corporation under the Ministry of Transport, takes up the role of advice on policies related to the blue economy. The recently established State Department for Fisheries, Aquaculture, and the Blue Economy is responsible for the development of policies, legal frameworks, and institutional structures related to the fisheries industry and blue economy; the Kenya Fisheries Service coordinates and manages matters related to the fisheries sector, which is a key element in the blue economy; Lastly, non-state actors like the Wavuvi Association represent the fishermen and fishing communities in policy discussions and the community groups who provide grass-roots perspective.

1.3: Statement of Problem

The Lake Victoria region of Kenya is among the most densely and congested places in Africa. Despite the lake's potential of a diverse ecosystem and rich natural resources to leverage the blue economy principles, the region faces significant challenges that are related to food insecurity, economic growth, job creation, the possibility of small and medium-sized enterprises (SMEs), and infrastructure development.

Food security is a key concern within the lake region. This is due to fluctuations of fish stock because of illegal, unreported, and unregulated (IUU) fishing practices, industrial pollution, and the impacts of climate change. This has a direct effect on the livelihoods of local communities who depend on fishing as a primary source of income and nutrition (Obiero et al., 2020). SMEs, which are vital for economic diversification and resilience, face numerous barriers, including limited access to finance, poor market linkages, and regulatory challenges (Ikiara, 2020). This results in unemployment within the region since the community, particularly the women and youth, rely on small and medium-sized enterprises (SMEs) for the creation of jobs. Lastly, a lack of infrastructure such as an efficient transport network, cold storage facilities, and transport logistics, hinders the region from competing on a global scale.

This is why the potential success of unlocking the blue economy in Lake Victoria's region in Kenya largely depends on addressing these challenges in collaboration with the key stakeholders. It is for this reason that the Government of Kenya and key stakeholders like the local community, non-government organizations (NGOs), and small and medium-sized enterprises (SMEs) associated with the blue economy regional development collaborate to take measures that will promote food security, economic growth, job opportunities, and infrastructure development.

1.4: Purpose of the Study

The general objective of the study is to provide a broad understanding of the challenges and opportunities of the blue economy within Kenya's Lake Victoria region through the development of an integrated blue economy policy framework. The specific objectives are: first, to determine the current challenges and opportunities concerning blue economy initiatives in Lake Victoria, Kenya. Secondly, to identify gaps for implementation of an effective strategy to achieve an integrated blue economy development policy framework in Lake Victoria, Kenya. Lastly, the objective is to incorporate the effective initiatives from other African nations that are of good practices to address the specific challenges faced in Lake Victoria, Kenya.

1.5 Research Question and Sub-Research Questions

The main research question is:

How can the integration of blue value chains into the Blue Economy framework promote economic growth, enhance food security, and create employment opportunities in the Lake Victoria region of Kenya?

Furthermore, the following sub-research questions will be analyzed:

a) What are the current challenges and opportunities concerning blue economy initiatives in the Lake Victoria region of Kenya?
b) What are the gaps for implementation of an effective strategy to achieve an integrated blue economy development policy framework in the Lake Victoria region of Kenya?
c) Drawing the initiatives from other African nations, what good practices can be adapted to address the specific challenges faced in the Lake Victoria region in Kenya?

1.6 Significance of the Study

The significance of this study is to unfold the key contributing factors needed to achieve sustainable blue economy development in Lake Victoria region, Kenya. These include economic growth, food security, and environmental sustainability.

Economic growth, which as a significant contributing factor attributes to the economic potential of the lake region that is driven by sectors such as fisheries, trade, and tourism. However,

these sectors face challenges like unequal distribution of resources, poor infrastructure development, and weak governance frameworks to unlock the region's full economic growth. For these challenges to be improved, promoting the blue economy is essential to mobilize trade facilities and develop small and medium-sized enterprises (SMEs), which in turn leads to the creation of jobs, transforming livelihoods of the communities living within the area, and growing the region's economy.

The second significant contributor to sustainable development of the lake relates to food security, more specifically to fisheries. Responsible fisheries management procedures and sustainable aquaculture have the potential to provide food security for years to come as the renewable fish stocks of Lake Victoria can be maintained and regulated. This enhances the community's rich diversity in forms of food favored by them for their survival, and industries thrive in the region. Nevertheless, obstacles like trade barriers and border management problems create food waste, particularly at the distribution level (Mohanty & Dash, 2020). For example, delivering the fisheries from the small-scale fishermen to the end consumers using unequipped cold storage trucks faces hurdles such as time utility and lowers 10% quality in the fish nutrition. In Kenya, post-harvest losses occur at every level of the fish value chain and are known to decrease the quality of food available to consumers while maintaining small-scale fisherfolk, who account for most of the inland fish landings in Kenya, in persistent poverty (Odoli et al., 2019). The losses are attributed to poor handling practices, hygiene, and sanitation, and failure to reach markets within the fish's shelf-life due to the prolonged border control clearance procedures, hence contributing to unequal food distribution, increased poverty, and high economic loss to the local fishing economy. For these hurdles to be solved, it is important to invest in cold truck logistics and enforce improved border control measures, especially pertaining to the transportation of fish, to improve food quality and prevent food waste to enhance food security.

Economic growth and food security cannot be sustained if the lake ecosystem is not cared for. Therefore, environmental sustainability is considered a vital contributor to sustainable development. For this to be achieved, it is important to develop sustainable port infrastructure, promote eco-friendly operation standards, and impose penalties and taxes on overfishing practices. By so doing, the marine protected areas and biodiversity reverse its decline and protect the lake's health ecosystem for the long run.

1.7 Limitations and Delimitations of the Study

The study focusses on the areas around the Lake Region in Kenya and does not extend to other regions. It draws on findings by proposing the implementation of effective blue economy initiatives in nations like South Africa, Lake Tanganyika in Tanzania, and Zanzibar. The limited data availability on Lake Victoria's blue economy infrastructure, fishing operations, trade, and small and medium-sized enterprises (SMEs) in Kenya may restrict the depth of analysis and results. Time and resource constraints may limit the extent of data collection, analysis, and interpretation, hence allowing for a partial exploration of some relevant perspectives. Since the researcher encountered challenges reaching out to the decision-makers in the government agencies and private sector due to the political unrest in the country during the thesis period, the primary information and insights needed for the study may be limited. The methodology used for data collection might be influenced by personal opinions and observations, as accessing credible primary sources was difficult. Measures will be taken to minimize such flaws to ensure the findings' reliability and integrity. As a result, the integration of qualitative and quantitative data may be needed to meet the necessary standards of quality (Mohanty & Dash, 2020).

The study mainly focusses on identifying the gaps in the blue economy and adopting good practices from other nations for effective integrated blue economy development, limiting its scope to policy frameworks. The initiatives drawn from the blue economy policies of South Africa, Lake Tanganyika, and Zanzibar may not directly apply to the lake region of Kenya with its shared water resource with Uganda and Tanzania, regardless of their similar governance structures of the lake, socioeconomic conditions, and environmental conditions.

1.8 Organization of the Thesis

Following the introduction in Chapter 1, Chapter 2 looks at the literature review on the development and significance of blue economy. Chapter 3 discusses the research methodology in a transparent and rigorous manner and a conceptual framework for blue economy development. Chapter 4 presents an overview profile of the Lake Victoria region in Kenya, its significance, and future development needed for the implementation of the blue economy. Chapter 5 discusses the case studies of blue economy initiatives from different African nations and analyzes and compares the results against Lake Victoria. Chapter 6 discusses findings from the gap analysis to identify

and address the present discrepancies of Lake Victoria to other successful Blue Economy initiatives and the potential impact of adopting these practices into the Lake Victoria region. Chapter 7 concludes by presenting the summary of the research, limitations of the study, and recommendations for policy practitioners and academia.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The literature reviews academic publications on the development and significance of blue economy in Lake Victoria region in Kenya. The literature review highlights the value drivers that contribute to the development and significance of Lake Victoria to bring an understanding to the study. Subsequently, a discussion on the governance structure of the Lake Victoria region in Kenya and the significance of the blue economy. The section ends with discussions on the integration of policy indicators and inclusive actors to achieve an effective and integrated blue economy development.

2.2 Development, Governance, and Significance of the Blue Economy

In the context of Lake Victoria, the blue economy framework integrates environmental sustainability, economic viability, and social inclusion to ensure the lake's resources are utilized effectively and sustainably (World Bank, 2017). The environmental aspects comprise biodiversity and ecosystem services, pollution and water quality, and climate change impact. Lake Victoria, known for its biodiversity, is home to over 500 fish species. The lake's ecosystem services are very essential for maintaining water quality, supporting fisheries, and providing habitat for wildlife. However, the ecosystem has been severely affected by environmental degradation, overfishing, and pollution. The introduction of the Nile perch in the 1950s, while economically beneficial, has led to the decline of native fish species, disrupting the ecological balance (Ogutu-Ohwayo et al., 1997). Secondly, pollution from industrial discharge, domestic waste, and agricultural runoff poses threats to Lake Victoria's water quality. Nutrient loading has led to eutrophication, resulting in algal blooms and the proliferation of invasive species like water hyacinth. Efforts to manage pollution include regulatory measures and community-based initiatives aimed at reducing waste and promoting sustainable practices (Njiru et al., 2012). Thirdly, climate change poses additional risks to Lake Victoria with fluctuations in increased temperatures, water levels, and changing precipitation patterns affecting the lake's ecosystem. These changes impact fish populations, water quality, and the livelihoods of communities dependent on the lake. Adaptive management strategies and resilience-building measures are essential to mitigate these impacts (Lake Victoria Fisheries Organization, 2016).

Moving from the environmental aspect to the economic viability, which comprises fisheries and aquaculture, transport and trade, and tourism. Lake Victoria primary supports fisheries, which are a fundamental component of the blue economy, resulting in the creation of job opportunities, the provision of income, and food security for millions of people. The lake's fish, particularly Nile Perch and Tilapia, are valuable commodities in regional and global markets (Obiero et al., 2014). In Kenya, the fisheries sector contributes towards the national economy. However, overfishing, illegal fishing practices, and declining fish stocks pose serious threats to the industry's sustainability (Obiero et al., 2014). Secondly, aquaculture has become recognizable in Kenya's blue economy as a response to the declining fish stocks. Sustainable aquaculture practices, including the establishment of fish breeding centres, training programs for fish farmers, and research into improved techniques, are essential for boosting fish production and supporting economic growth (Munguti et al., 2014). The implementation of the sustainable fishing practices maintains the fish population and contributes to long-term food security and nutritional health for the local communities. Lake Victoria serves as a transportation route for Kenya, Uganda, and Tanzania in the facilitation of trade connectivity. Hence, it is essential to improve transport infrastructure like ports to boost economic integration and regional trade. The development of efficient and safe water transport systems can significantly reduce transportation costs and improve access to markets (Njuguna et al., 2010). Transport and trade contribute to tourism, which has been a rising component of the blue economy around Lake Victoria. The lake's beauty, diverse cultural heritage, and wildlife along its well-known islands like Mfangano, Rusinga, and Takawiri have been attributed to the tourism sector. In Kenya, tourism development initiatives focus on creating eco-friendly resorts, promoting water sports, and organizing cultural events that highlight the region's natural and cultural assets (Odunga et al., 2005).

Lastly, the environmental sustainability and economic aspects of the blue economy of Lake Victoria cannot be viable without the local communities to ensure sustainable utilization of resources. Community involvement is key since the blue economy initiative affects their livelihood, and hence, it is vital to empower the community through access to resources, capacity-building programs, and participatory governance to enhance adaptability and resilience. Projects that involve communities in conservation and resource management have shown promising results in improving environmental outcomes and socio-economic benefits (Abila, 2000). The vital role

of women in the fisheries sector, particularly in fish processing and marketing, makes it important to address the gender issues and ensure equality and inclusivity. Ensuring equal access to resources, training, and decision-making opportunities for women can enhance their contributions to the blue economy and improve household incomes and food security (Béné et al., 2009).

2.3 Governance of Lake Victoria's Blue Economy

It is important to understand the governance model and the relationship with the lake's performance for the effective development of blue economy in Lake Victoria, Kenya. The governance model of Vieira et al. (2014) applied entails an examination of how different governance structures impact the management, operations, and the overall efficiency of the ports. Hence, the application of an extensive analysis of the port governance model by Vieira et al. (2014) to answer the four basic questions surrounding governance, namely: Who governs? What is governed? How is it governed? And for what purpose is it governed? Qiang Zhang et al. (2018). This is to depict a clear picture of the governance structure of Lake Victoria, Kenya.

The first governance pillar of the lake involves a collaborative approach among national government agencies, regional bodies, and local institutions to understand the governance aspect of the lake. The Kenyan government plays a critical role in the governance and management of the lake through the Ministry of Mining, The Blue Economy, and Maritime, mandated to oversee the policies and regulations related to fisheries, aquaculture, and coordination and development of national oceans and blue economy strategy and policy. The National Environmental Management Authority (NEMA), a government agency, ensures sustainable environmental management by addressing conservation and pollution issues in the lake. Kenya Marine and Fisheries Institute (KMFRI), a government agency, conducts research and provides scientific data for the sustainable management of the lake. Kenya Maritime Authority (KMA), a government agency, regulates and oversees maritime operations and ensures safety and security of the transport on the lake while also being involved in the development and modernization of the ports along Lake Victoria. On the regional level, the Lake Victoria Basin Commission (LVBC) coordinates the sustainable development and management of Lake Victoria, as it is mandated to coordinate policies and actions among its member states: Kenya, Uganda, Tanzania, Burundi, and Rwanda. This is actioned by implementing regional programs and projects aimed at improving the health of the

lake's ecosystem and livelihoods of local communities and promoting sustainable economic development and environmental conservation. In addition, local governance and community participation are important for the effective management of Lake Victoria. Local governance includes the respective county governments bordering Lake Victoria, while the community is represented by beach management units that function as local co-management structures, which involve communities in fisheries governance. The lake's resources are meant to be sustainably managed through this multifaceted system of governance, so that economic development can balance environmental conservation alongside social welfare.

Effective governance is essential to ensure the lake's resources are sustainably utilized to support the ecosystem and enhance economic activities. Second, to understand what is being governed within Lake Victoria, Kenya, focus is on vital infrastructure components like ports and harbours, transport infrastructure, water supply and sanitation facilities, the transport corridor, and the ecosystem. Kisumu Port, known as the main port in Lake Victoria, Kenya, is an important hub for transportation and regional trade. The governance in this area involves upgrading facilities to ensure operational efficiency and safety standards. On the harbours, fish landing sites governance focusses on infrastructure improvements and maintenance standards. The transport infrastructure consists of marine transport, which focusses on improving standards of ferry services, regulating the efficiency and safety of boat operations across the lake and road networks focuses on spot improvement of tarmacked road connectivity. The water and sanitation governance are directed to provide safe water and appropriate hygienic facilities for communities around the lake, as well as the execution of water treatment plans and sanitation projects for the better health of the community.

The second governance pillar relates to the diverse ecosystem of Lake Victoria, requiring comprehensive governance to address the environmental challenges. These include biodiversity conservation, pollution prevention, and invasive species management. Governance for the protection of biodiversity involves implementing conservation programs, establishing protected areas, and enforcing regulation against illegal, unregulated, and unreported fishing practices. Secondly, it is important to address pollution control from domestic waste and industrial discharge for the sustainability of biodiversity. The governance aspect involves enforcing environmental regulations and implementing community awareness programs on waste management. Lastly,

management of invasive species like the water hyacinth requires governance strategies like biological control, mechanical removal, and community engagement in efforts on monitoring and management.

The third governance pillar relates to effective governance, which involves a range of instruments consisting of policies, regulations, management frameworks, and community engagement. These instruments ensure the resources are managed sustainably, development of infrastructure, and the protection of the health of the ecosystem. On policy and legislation, the National Oceans and Fisheries Policy (2012) provides a framework for the sustainable development and management of marine resources while emphasizing sustainable fishing practices, aquaculture development, and community participation. Fisheries Management and Development Act (FMDA) 106 establishes the legal requirement for the development and management of aquaculture and fisheries in Kenya. It sets out provisions for licensing, fishery management plans, and enforcement mechanisms (Kenya Fisheries Services, 2020). The environmental policy consists of the Environmental Management and Coordination Act (EMCA) that provides a framework for environmental management and conservation in Kenya. NEMA 2020 mandates environmental impact assessments (EIAs), pollution control measures, and environmental conservation efforts. Further, the Water Act (2016) governs and manages the use of water resources in Kenya by setting standards for water quality and addressing pollution to safeguard Lake Victoria's ecosystem.

The last governance pillar relates to the significance of the value drivers in the Lake Victoria region of Kenya. The primary purpose of governance on the lake is for food security, economic development, environmental sustainability, and biodiversity conservation. It is important to implement regulations that control fishing activities, protect fish habitats, and ensure fish stocks are maintained at sustainable levels to ensure sustainable practices. This is crucial for providing a reliable source of protein for local communities (Obiero et al., 2014). It is also vital to promote aquaculture as a complementary activity that helps to diversify sources of fish and reduce pressure on the wild fish stocks. Sustainable aquaculture practices are supported through training and research (Munguti et al., 2014). Supporting small-scale fishermen to access markets for their produce enhances their productivity and income. Ensuring efficient supply chains for fish and

other aquatic products from Lake Victoria to markets enhances food security by making nutritious food more accessible and affordable (Béné et al., 2009).

It is vital to achieve food security in the Lake Victoria region of Kenya through its fisheries and the creation of aquaculture industries, as it leads to economic growth and development. Proper governance guarantees that fishery and aquaculture sectors are managed sustainably with an aim at maximizing economic benefits. The fisheries sector supports thousands of jobs and generates significant income for local communities (Obiero et al., 2014). The lake's inherent aesthetic appeal and rich biodiversity make it attractive for tourism, hence contributing to the economy. In conclusion, the lake serves as an important trade route within Kenya, Uganda, and Tanzania. Enhancing port infrastructure and improving maritime safety are key governance priorities to boost regional trade and economic integration (Njuguna et al., 2010).

For the implementation of an effective strategy to achieve an integrated blue economy development policy framework in the Lake Victoria region of Kenya, several conditions need to be met**.** That is, the integration of the policy indicators consisting of environmental sustainability and conservation infrastructure development, trade and market access, lake security, and inclusive actors like local community, SMEs, and government stakeholders for a desired outcome of an effective and integrated blue economy development.

2.4 Infrastructure Development

Infrastructure in this context refers to roads, rail, cold logistics, electrical grids, and telecommunication and water supply. Kisumu Port is a vital port in the Lake Victoria region of Kenya, serving as a transportation hub and station for intra-East Africa Community (EAC) trade. Despite its vital importance, the port faces numerous challenges such as poor transport infrastructure since less than 50% of roads are tarmacked, around 30% of the region's population have limited access to electricity, and limited access to water and sanitation that needs to be addressed to increase the region's overall productivity since no changes have been witnessed in the past few years. Another challenge faced in the goods movement includes the lack of cold chain logistics and the ineffective railway network linking the 14 Lake Region Economic Bloc (LREB) counties and neighboring nations. Part of these challenges in the infrastructure stem from the counties being predominantly in rural areas.

Despite the challenges that face Lake Victoria port development, it has potential benefits for the blue economy. First, the marine development is a vehicle of trade facilitation that contributes to improved trade flows. The operations of Port Miira and Mwanza then become smoothly streamlined, and goods and commodities are transported faster and in an efficient manner (Multi-Agency Action Plan, 2021). This, in turn, creates the traffic of goods across the regions, which results in economic growth and the availability of markets for the local producers and exporters. This implies that a range of opportunities come through the modernization of the port, which becomes the critical point for connecting the Lake Victoria Basin with the broader regional and global markets (Idara, 2022). Better connectivity facilitates transportation of goods and people, opportunities to integrate economically, and promotes tourism development and cultural exchange practices within the region and beyond.

2.4.1 Trade and Market Access

The reliance of trade activities within Lake Victoria to improve the communities' livelihoods is evident in major trading centers like Kisumu, Kakamega, Migori, and Kisii town among others which are known for rice and sugarcane farming. The local trade expands beyond neighboring countries through its inter-linkage and is evident by Tanzania sourcing most of its products from Kenya and Uganda, which depend on the lake, while Burundi and Rwanda depend on the re-export of petroleum products. These trade patterns and market linkages serve as an essential platform and contributor of economic growth, job creation opportunities, and regional integration.

There are several landing sites located along the Lake Victoria region in Kenya that are centers for various economic activities. Homa Bay landing site is well known for Nile Perch fishing, an essential node for transportation and trade both locally and to international maw trade markets such as Asia and Europe. Sori landing site in Migori is one of the busy economic centers (Sector Plan for Blue Economy, 2018), while Kendu Bay is a leading destination for transportation of commodities and supports fishing and small-scale trade activities along lakeshores. Additionally, Mbita in Rusinga Island is well known for trade and communication between the island and mainland. In conclusion, these landing sites are the condensed lifelines of local communities that highly depend on fishing for food security, access to trade markets, and job creation opportunities.

The two main determinants of the regional trade in Lake Victoria consist of formal trade channels, which deal with legal transactions linked to supply chains, regulations and customs, and informal trade channels which deal with unregulated cross-border markets and informal networks and practices. These challenges are associated with the trade dynamics due to transboundary disputes over the exploitation of the water resources, particularly the fish stocks between Kenya and Uganda, which hinders the Lake Victoria basin from unlocking its full economic potential. As a result of the restrictions brought about by the disputes, there is inadequate fish quality for local consumption, inefficient logistics, regulatory barriers contributing to border delays and in turn food insecurity.

To address these challenges, there should be an urgent implementation of the fish management plan to counter the transboundary dispute over fish regulation, set limits on volume of fish exports, invest and implement cold chain logistics services for small-scale fish retailers to reduce post-harvest losses and reach a wide market range.

2.4.2 Lake Security

Lake Victoria is a vital ecological and economic resource shared among Kenya, Uganda, and Tanzania. Though its future is obstructed by security issues like illegal, unreported, and unregulated (IUU) fishing practices, robbery, transboundary disputes, and overexploitation of the lake's resources. Unregulated fishing refers to fishing activities in areas without management or conservation measures (Shaver & Yozell, 2018). IUU is an increasing challenge within the Lake Victoria basin as it hinders the management of fishing, weakens fishing operations, and tends to compromise development investments. To get a clear perspective, unreported fishing is an activity that has not been reported to the authority, and it undermines management in the fishing sector by tilting the accuracy of fish stock assessments upon which regulations are based (Shaver & Yozell, 2018). IUU poses six main threats to stability and security (Shaver & Yozell, 2018).

The absence of socio-economic factors like education, employment, and economic opportunities among communities living along the Lake Victoria basin has increased their vulnerability to engage in illegal fishing practices and piracy, contributing to maritime insecurity. Poverty is a fundamental driving force that has attributed to many young school-going children to drop out of school and engage in illegal fishing practices to feed their families. This also results in the rise of criminal gangs operating along the shores of the lake region due to the high rate of unemployment among the youth.

The territorial disputes in Lake Victoria are an illustration of the lack of regional arrangements over the sharing of transboundary natural resources like water and fish (Fiorella et al., 2015). Transboundary disputes between Kenya and Uganda over the exploitation of shared lake resources, particularly the fish stocks, have been a long-standing dispute in Lake Victoria. Beginning in 2003, the exploitation of lake resources has become increasingly contentious, with several incidents resulting in the harassment and arrest of fishers accused of trespassing in the transboundary waters (M. Mwinyi, et al., 2022). In 2009, Kenya and Uganda were on the verge of war due to the transboundary dispute over the Migingo Island located in Lake Victoria's region. The contention resulted in incidents of arrests and harassments of fishermen accused of trespassing neighboring waters, forcing some Kenyan fishermen to venture into risky waters in pursuit of a profit-making market due to the unreliable income.

To combat insecurity in the Lake Victoria region of Kenya, the government needs to deploy security personnel to assist in the fight against IUU practices. Controls, regulations, and sanctions need to be coordinated and enforced consistently in all forms of levels - regional, national and international. Lastly, resolve transboundary disputes and come up with comprehensive inter-regional approaches among the nations exploiting the lake resources.

2.4.3 Enabling conditions

The blue economy idea has been actively embraced and acknowledged in the Lake Victora basin as it offers prospects leading to an upsurge in economic activities, sustainable environmental conservation, and improved livelihoods. For the implementation of blue economy initiatives in the Lake Victoria region of Kenya, influence by various actors and stakeholders, such as the local community, private companies, NGOs, SMEs, and government stakeholders each with their own roles, interests and influence on the blue economy is required.

The first key actor being the local community's interdependency on the lake for their livelihoods has vested interest in blue economy initiatives. The challenges the community faces, such as poverty, unemployment, and limited access to markets, influence their engagement and participation in blue economy efforts. To spur economic growth and job opportunities in the Lake Victoria region, it is vital for a symbiotic relationship with second actors such as trading companies and investors functioning as private sector. Hence, the need to strike a balance involving the private sector as their objectives are mainly profit-making but may be contradict environmental sustainability principles. Third actors are NGOs as an intermediary between different stakeholders

and local communities to necessitate sustainable practices and advocate for their rights while championing capacity-building initiatives. Fourth actors are SMEs viewed as the value drivers of economic growth, job creation opportunities, and sustainable practices contributing to attainment of SDG1 (No poverty) and SDG2 (Zero hunger). Lastly, growth and success of SMEs require national and regional government entities to support the development of local skills, capacity and ensure access to resources creating an enabling environment.

In conclusion, close collaboration among the actors is essential to address institutional challenges in the blue economy, decision-making in resource management, transboundary issues, and policy harmonization to promote effective and sustainable development in the region.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Case study research is crucial in the acquisition of in-depth details that can help understand various policies in a better way and evaluate their effectiveness. Creswell's (2018, p. 241) lucid and comprehensive definition of case study strategy is quoted below:

"Case studies are a qualitative design in which the researcher explores in depth a program, event, activity, process, or one or more individuals. The case(s) are bound by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time."

The purpose of this strategy is to explore complex phenomena more deeply within their natural settings. Subsequently, case study research remains an invaluable qualitative data collection and policy analysis technique used in different fields. Lastly, case study research has been identified as a comprehensive qualitative approach that provides detailed, contextual, and holistic insights, making it appropriate in the qualitative data collection and policy analysis.

The study aims to incorporate professional insights specializing in operations and technology management and researchers. Hypotheses of a general framework through methodological and analytical lenses for designing, implementing, and evaluating case study research and analysis of multiple case initiatives used to test the framework. The rest of the study is organized as follows: First, definition of a case study; second, discussion of issues relating to methodology in carrying out case studies; later, presentation of different perspectives on case studies by researchers summarized in Table and lastly, to ascertain the contents of framework **(see Table 1)** as examined by different publications.

Table 1: Case Study Framework

Purpose of Case Study Research	Reasons to use Case Study Research	Types of Case Study Research	Methods of Gathering Data	Data Analysis in Case Study Research
Practice oriented Theory oriented (Dul & Hak, 2008)	Exploration Theory building Theory testing Theory extension/refinement Hypothesis testing Hypothesis building Description (Dul & Hak, 2008; Stake, 1995; Voss et al., 2002; Yin, 1994)	Exploratory case study Explanatory case study Descriptive case study Intrinsic case study Instrumental case study Collective case study Single case study Multiple case study Interpretive case study Evaluative case study (Dul & Hak, 2008; Stake, 1995; Yin, 1993; Zainal, 2007)	Document reviews Questionnaires Surveys Interviews Archival records Participant observation and physical artifacts Use multiple sources of data Create a case study database Maintain a chain of evidence Observations (Dul & Hak, 2008; Stake, 1995; Yin, 1993)	Data reduction Data display Conclusion drawing and verification Pattern matching Program logic method Explanation building Time series analysis Cross-case synthesis Categorical aggregation Direct interpretation Ethnographic analysis Narrative analysis Phenomenological analysis Constant comparative analysis Content analysis Analytic induction Cross-case analysis Within-case analysis Visual inspection (Eisenhardt, 1989; Huberman & Miles, 1994; Stake, 1995; Yazan, 2015)

Source: International Journals of Qualitative Methods, Vol.17, 2018

The case study aims to offer insights and recommendations for policies and management strategies that aid in enhancing Lake Victoria. The study seeks best practices from other regions' successful blue economy initiatives that can be adopted to address the lake's challenges. This exploratory case study stems from a need to know the concept of blue economy in the Lake Victoria region, what gaps are present and the reason for their existence, and the necessary actions needed to close the gaps. The study will explore how different methods of aquaculture development, infrastructure development, as well as environmental conservation have been used elsewhere in relation to Lake Victoria. Additionally, the study will review academic articles, government reports, policy documents, field observations, and case studies from other regions to gather relevant information about interventions in blue economies and their applicability to Lake Victoria.

The literature below contains several theoretical insights on the development, governance, and significance of the blue economy. The next section presents the conceptual framework that sheds light on the causal mechanisms between the theoretical concepts. Furthermore, a multiple case study approach will be applied to learn from good practices of blue economy initiatives in Africa and worldwide institutions.

3.2 Conceptual framework

The International Analysis and Development (IAD) framework was developed by Elinor Ostrom and uses a structured approach and conceptual map for analyzing actors, institutions, and policy dynamics to manage resources. The institutions are defined in terms of rules, norms, and patterns of decision-making processes that explain the relationships between actors within the context of the IAD Model. These institutions include formal regulations that are put in place by government bodies and informal rules and procedures that are determined by the various stakeholders in the case of Lake Victoria (**see Figure 2**) local community, SMEs, NGOs and government stakeholders. A common foundation of the IAD framework is that resource management problems are defined and determined by individuals who have relevant and conflicting perspectives. This implies that the stakeholders surrounding an environment such as Lake Victoria are diverse and include the state, the local and fishing community, conservation groups, and NGOs. All these actors are in a system of institutional mechanisms that govern their

actions and the level of their participation in using lake resources and the potential to help enhance sustainability in the use of the resources.

Figure 2: An Integrated Conceptual Framework for Blue Economy Development

Source: Author, 2024

The policy indicators used in the conceptual framework are interconnected elements that contribute to the holistic development of a region by addressing the aspects of economic, environmental, and social and fostering a sustainable blue economy framework. Infrastructure development is a foundational element for any economic activity, including the blue economy, as adequate infrastructure like efficient cold storage facilities, ports, and roads impacts the efficiency of trade and market access and economic growth. Trade and market access ensures that products from the blue value chain sectors like aquaculture products and fish reach both the local and international market as it assesses the ability of the region to engage in regional and global trade, hence impacting economic growth and stability. Environmental sustainability is at the core of the Blue Economy emphasising the need to balance economic development and environmental conservation to evaluate the management of natural resources and ensure long-term conservation. Lake security is vital in safeguarding the water resources and persons involved in Blue Economy activities as it combats illegal fishing practices, ensures safe navigation in the lake, and offers protection for the livelihoods depending on the lake. Lastly, the creation of decent and sustainable employment opportunities is a key objective of the Blue Economy as it assesses the impact of the Blue Economy framework contributing towards income creation and stability of the local communities.

The IAD serves as an important instrument for policy analysis as it: (i) provides comprehensive analysis of complex policymaking by breaking down into manageable components for detailed examination of how different variables interact within an institutional setting. (ii) focusses on institutions in shaping the policy outcomes. (iii) supports multi-level analysis from individual to collective decisions in understanding how decisions at one level influence outcome at another, providing a holistic view of policy processes. (iv) helps in the identification of key variables affecting policy outcomes, which are essential for designing effective policies. (v) enables the use of cross-contextual application, which allows for a comparative analysis and understanding the reasons behind the success or failure of specific policies in different contexts, whereas (vi) the focus on engagement among diverse stakeholders promotes inclusive engagement that results in fairer and more sustainable outcomes in terms of policies.

3.3 Case-based approach to better understand good practices

The essence of a case study, the central tendency among all types of the case study, is that it tries to illuminate decision or set of decisions, why they were taken, how they were implemented, and with what results (Schramm, 1971, cited in Yin, 1989, pp. 22, 23). Gummesson (1988) argues that: "An important advantage of case study research is the opportunity for a holistic view of the process." Additionally, Gummesson (1998) goes ahead to state:

"The detailed observations entailed in the case study method enable us to study many different aspects, examine them in relation to each other, view the process within its total environment and also use the researchers' capacity for 'verstehen'".

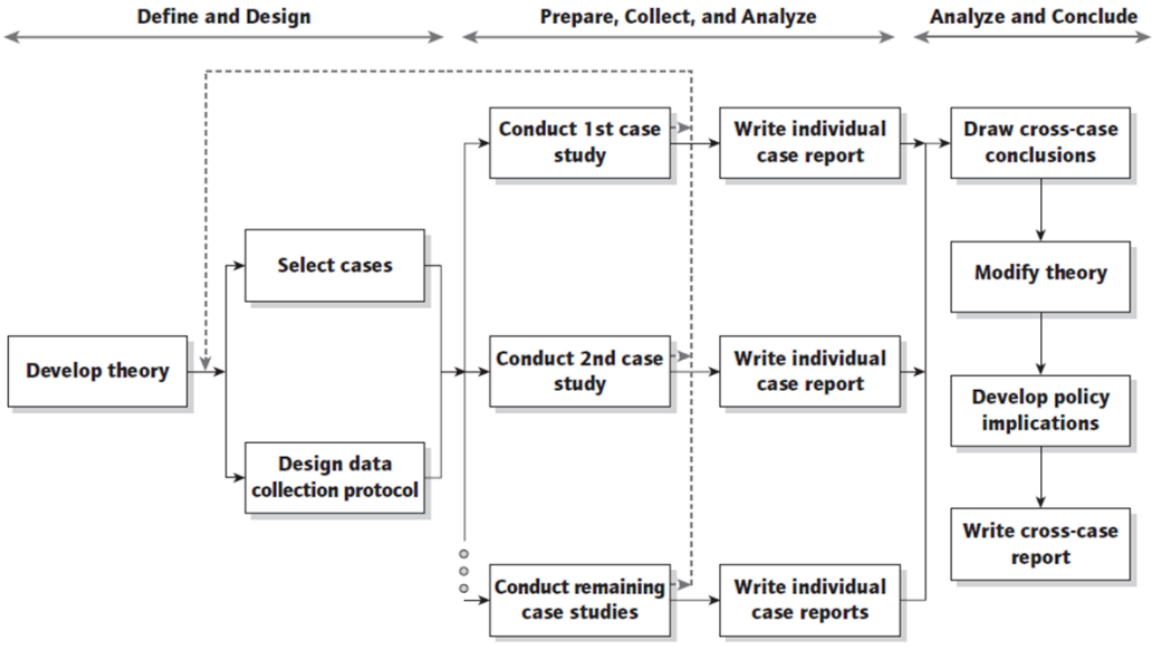
Besides that, a detailed examination of a case study has the potential to focus on either one case or several cases, which aim at comprehending how things work and giving explanatory details about it. Research questions and objectives depend on the case studies to be deployed and take these main forms, amongst others: (i) descriptive :provides a detailed account of a subject within its context: (ii) explanatory :seeks to explain casual relationships within the case and focusses on answering the "how" and "why", which is useful for understanding the dynamics of complex systems and (iii) exploratory :explores new areas particularly in research questions not wellunderstood or defined.

Table 2: Seven-step Case Study Methodology

Case Study Steps	Description	Authors
1) Define research questions and objectives	Articulate purpose of study and aim of investigation Develop specific research questions to guide the inquiry	Yin, R. K. (2018). Case study research and applications: Design and methods (6th ed.). Sage Publications
2) Select the cases	Choose single or multiple cases based on research goals. The cases ought to be diverse enough to provide comprehensive understanding and allow meaningful comparison Decide on data collection methods (i.e documents, interviews or observations)	Stake, R. E. (1995). The art of case study research. Sage Publications.
3) Develop case study plan	Clear objective of the study Criteria for choosing cases Explanation of analysis techniques (i.e explain relationships between variables)	Yin, R. K. (2014). Case Study Research: Design and Methods (5th ed.). Sage Publications.
4) Data collection	Design comprehensive data collection process from multiple sources using chosen methods Triangulation is often applied to ensure validity of findings; multiple data sources are cross verified to create an accurate picture of the subject	Creswell, J. W., & Poth, C. N. (2018). Qualitative inquiry and research design: Choosing among five approaches (4th ed.). Sage Publications. Stake, R. E. (1995). *The Art of Case Study Research*. Thousand Oaks, CA: Sage.
5) Data analysis	Analyze using systematic and rigorous methods (i.e thematic analysis and cross-case analysis)	Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). Qualitative data analysis: A methods sourcebook (3rd ed.). Sage Publications.

6) Report findings	Synthesize data to develop coherent narrative addressing research question (i.e detailed descriptions, key themes and insights)	Yin, R. K. (2018). Case study research and applications: Design and methods (6th ed.). Sage Publications.
7) Disseminate results	Share results Provide implications and future recommendations	Stake, R. E. (2006). Multiple case study analysis. Guilford Press.

Figure 3: Explanatory Case Study Process



Source: COSMO Corporation cited in Yin, 2014, p.60

Following the steps for conducting a case study, the following indicators are considered essential to look out for in comparison of good practices: (i) contextual factors in examining the context in which each policy is implemented, such as social, economic, political, and environmental factors. (ii) gather perspectives from various stakeholders involved in the policy to understand different viewpoints. (iii) identify mechanisms and processes that drive successful implementation of policy to understand the achievement of certain outcomes. (iv) assess the impact and outcomes of the policies, and lastly (v) compare different cases to compare common patterns, differences, and good practices providing valuable insights for policymakers.

“Good practice” in the blue economy refers to implementing ecologically friendly and efficient procedures, rules, and plans for promoting sustainable utilization of sea and ocean resources in a manner that meets the goals of economic growth, environmental health, and social equity. Good practices aim to balance economic development, preservation of marine ecosystems and well-being of coastal communities through job creation. Examples of good practices in the blue economy include (i) sustainable fisheries management practices, (ii) sustainable marine protection areas, (iii) sustainable aquaculture best practices, (iv) pollution control and waste management, and (v) sustainable tourism. The blue economy initiatives that have proved to be of good practice and effective for sustainability include South Africa’s Operation Phakisa, Zanzibar’s Aquaculture, Lake Tanganyika’s initiative and Food Agriculture and Organization’s (FAO’s) Blue Port initiative. These initiatives have been selected as they explicitly have a blue economy policy in place and address “what is being governed” in line with the infrastructure, ecosystem, and transport corridor in Lake Victoria.

South Africa’s Operation Phakisa initiative seeks to unlock the economic potential of South Africa. The initiative is a good example in practice of blue economy as it deals with sustainable development and reached significant milestone of contribution to preserving South Africa’s rich marine biodiversity through creation of MPAs (Sink, K., & Harris, L. 2016). Highlighting the initiative’s commitment to economic growth, sustainable development, and community empowerment.

Secondly, sustainable aquaculture is considered a good practice in promoting sustainable resource management, involving stakeholders, and contributing to food security and livelihoods. That is evident in Zanzibar’s good practice in Aquaculture initiative, as it aims in promoting sustainable marine resources to support economic growth, improve livelihoods and ensure environmental sustainability. The initiative’s notable success is particular in seaweed farming and sustainable aquaculture practices. Research indicates that seaweed farming has provided a stable and substantial income for local farmers, helping to reduce poverty levels in coastal areas (Msuya, F. E., 2013). Utilization of ecologically sustainable aquaculture practices, including integrated multi-trophic aquaculture (IMTA) and seaweed farming, has contributed to a decrease in the environmental impact of aquaculture operations.

Thirdly, initiative exemplifying good practice in blue economy is Lake Tanganyika's "Turning Corridors into Sustainable Opportunities" through its integrated approach to economic development, environmental sustainability, and regional cooperation. Lake Tanganyika Transport Corridor (LTTC) creates direct and indirect job opportunities and is projected to increase trade facilitation and intra-regional trade, boosting regional GDP growth while focusing on environmental sustainability to preserve the ecological balance of the lake. Lastly, FAO's Blue Port initiative is considered a good practice of blue economy as it integrates various sustainability dimensions, fosters stakeholder collaborations, and implements innovative projects to achieve the benefits of economic, environmental and social.

In conclusion, a comparison of the Lake Victoria region will be conducted with other initiatives based on a policy framework specifically looking at community and ecosystem development, sustainability, transport, and infrastructure development. The case study aims to also compare regulatory measures along the Lake Victoria region as it looks at restoring the ecosystem biodiversity to prevent depletion of resources.

3.4.4 Analysis of the case studies in relation to various elements

The proposed changes in Lake Victoria demand an understanding of the lake and its influential dynamics, comprising of policy indicators and policy actors as an interconnected process. Hence, analysis of the case studies **(see Table 3)** is conducted in relation to food security, decent employment, trade, infrastructure, and security indicators.

Table 3: Case studies analysis based on the policy indicators

Key Indicators	South Africa's Operation Phakisa	Zanzibar's Aquaculture	Lake Tanganyika's Transport Corridor	FAO's Blue Ports
Environmental Sustainability and Conservation	Successfully manages to enhance food security through sustainable fisheries management and marine spatial planning. Implementation of marine spatial planning and creation of Marine Protected Areas (MPAs) helps conserve fish populations and maintain biodiversity (Paterson, 2017).	In Zanzibar, the projects involving aquaculture boost food availability and broadens food choices. Seaweed farming and sustainable aquaculture practices have improved food availability and nutrition (Msuya, 2013).	The project acknowledges that Lake Tanganyika has potential to improve food stability in the area. The LTTC states "The entire lake ecosystem provides an untapped potential for life in many ways: for biodiversity, for humanity and for economy" (Erasmus Centre for Urban, Port and Transport Economics, 2019).	Elevation in food quality and safety have resulted in enhanced food supply through enhanced port infrastructure. Ports have played a critical role in ensuring the safety and traceability of fish products (FAO, 2023).
Decent Employment Opportunities	The initiative has led to creation of job opportunities in different sectors. Significant employment opportunities through projects like sustainable aquaculture and port infrastructure development. (De Vos & Kisting, 2019).	Livelihoods have been enhanced due to job creation mainly among women and youth. Significant employment opportunities in seaweed farming and aquaculture have empowered women and youth economically (Msuya & Porter, 2014).	The future job creations for the society are not directly stated, but advancement of LTTC has a high probability of generating employment. The LTTC states the initiative can "boost regional markets and trade and could lead to job creation for	Creation of job opportunities and working conditions improved in ports and related sectors. Initiatives to ensure decent work and gender equality have resulted in better employment opportunities and conditions (FAO, 2023).

			different kinds of transportation, trading, and related service industries" (Erasmus Centre for Urban, Port and Transport Economics, 2019).	
Trade and Market Access	The initiative has enhanced port infrastructure and market access. Increased exports of fish and marine products due to better processing facilities and compliance with international standards (De Vos & Kisting, 2019).	Availability of better markets for aquaculture products has improved economic stability. Increased exports of seaweed to international markets have positively impacted trade balances (Msuya, 2013).	The initiative's focus on trade aligns with the blue economy principles on sustainable economic development. The LTTC drives to strengthen "opportunities for cross-border and intra-regional trade and investment as well as deeper regional economic integration" (Erasmus Centre for Urban, Port and Transport Economics, 2019).	Improved port infrastructure has enhanced market access and the capabilities of trade. Increased exports and efficient port operations have enhanced trade performance (FAO, 2023).
Infrastructure Development	Investments in maritime and port infrastructure boost operational efficiency. Modernized ports and integrated marine spatial planning have enhanced trade capacity and infrastructure reliability	Construction of frameworks for aquaculture has paved way for maintaining farming habits that are environmentally sustainable. Investments in farming setups and processing	Infrastructure is a key development for LTTC as it mentions elements particularly ports, vessels and connectivity between different transportation modes.	Development and modernization of port facilities have facilitated sustainable operations and efficient trade. Strategic investments in infrastructure have improved the capacity

	(Sowman & Malan, 2018).	facilities have facilitated the growth of the aquaculture sector (Mmochi et al., 2005).	The initiative highlights the need for "infrastructure investments to develop African transport corridors" (Erasmus Centre for Urban, Port and Transport Economics, 2019).	and efficiency of port operations (FAO, 2023).
Lake Security	Improved security at sea and the proper enforcement of environmental regulations. Strengthened legal frameworks and monitoring systems have improved safety and reduced illegal fishing activities (Paterson, 2017).	Amended laws for regulation have guaranteed environmental safety and sustainable development. Adoption of sustainable farming methods has minimized environmental degradation and supported ecosystem health (Msuya & Porter, 2014).	There are possible effects of the initiative's improvement on the security of the region. The LTTC suggests "economic and transport integration could even lead to a stronger peace dividend, when stakeholders try to avoid conflicts to keep the transport corridor together" (Erasmus Centre for Urban, Port and Transport Economics, 2019).	Improved safety and environmental preservation have enhanced the achievement of sustainable development. Implementation of safety measures and environmental sustainability practices have improved overall security in port areas (FAO, 2023).

**Good practices are obtained from documented articles of the initiatives*

Source: Author's elaboration of good practices from articles and academic research

A comprehensive blue economy framework should:

Offer protection of the local biodiversity and health of the ecosystem as its main concern, as it includes environmentally sustainable practices. This aligns with the blue economy sustainability

on fishing ports, as such principles should be applied. Secondly, dedicated to building a local human resource that is fair, empowering, connected, and transparent. This leads to a sustainable fishing port which is defined as a meeting place for various actors and activities promoting social, economic and environmental objectives. Lastly, viewed as an important factor for promoting effective development of circular economy solutions. In fostering development in other blue (ocean-related) economy sectors, it is essential to consider blue value chain activities. In addition, economic growth and wealth are created by supporting the positive direct and indirect economic benefits within a region.

CHAPTER 4: PROFILE OF LAKE VICTORIA

4.1 Introduction

This chapter gives an in-depth analysis of the profile of Lake Victoria and its significance in Kenya and the broader East African region. The focus will be mainly on the following dimensions: geographical and hydrological, ecological, biodiversity and environmental challenges, and socio-economic contributions in Kenya. This is important to further discuss the lake's development and the conditions needed for the implementation of an integrated blue economy development.

4.2 Geography and Hydrology

Lake Victoria is the largest of all African lakes with a surface area of approximately and the second widest freshwater lake in the world after Lake Superior, located in North America. It stretches its extensive surface to three countries and is distributed as follows: Tanzania 49% (33,700 km2), Uganda 45% (31,000 km2), and Kenya 6% (4,100 km2). The lake's extensive size makes it a central geographical feature in the region as it influences biodiversity, climate change, and the livelihood of the local communities around the shoreline. Named after the former British Queen, the lake is referred to differently amongst the three nations; the indigenous Luo people of Kenya and Tanzania refer to the lake as *Nam Lolwe* and in Uganda as *`Nnalubaale.*

According to the International Lake Environmental Committee Foundation's (ILECF) World Lake Database, the lake has a volume of about 2,750 cubic kilometers, a maximum depth of 84 meters (276 feet), an average depth of 40 meters (131 feet), and a shoreline length of 3,440 kilometers (2,138 miles). Its shoreline comprises ecosystems that support a range of flora and fauna, that is, plants and animals within the region. The vast size of the lake has key implications for the ecology, hydrology, and socio-economic activities within the region. The lake volume plays a critical role in regions climate patterns and water cycle, which also provides a key resource for the millions of communities depending on it for their livelihood.

4.2.1 Ecology, Biodiversity and Environmental Challenges

Lake Victoria is well renowned for its rich biodiversity, especially the fish species. It is home to around 500 different fish species, such as Tilapia, Nile Perch (locally known as *Moga*), silver sardine (locally known as *Omena*), and cichlids which have undergone extensive adaptive

radiation within a short period, leading to a variety of different forms. The Nile Perch introduction into the lake by the British colonial authorities in the 1950s has had a great impact on the lake's ecosystem, leading to a decline of many native fish species in the lake. The primary reason for the introduction of the Nile Perch was to improve the fishing potential of the lake at a time when the small cichlids were not considered commercially available to meet the growing demand for fish. Another invasive species that has greatly altered the lake's ecosystem is the water hyacinth (*Eichhornia crassipes*), which chokes the waterways by absorbing nutrients from the lake and draining oxygen and light from other aquatic life, hence altering the lake's ecosystem and its quality of water.

Despite its rich biodiversity, the lake also suffers environmental challenges that pose a threat to its biodiversity. These include pollution from industrial discharge, domestic sewage, and agricultural runoff characterized by excessive nutrient loads resulting in dense growth of algal blooms, which deplete oxygen in the lake, harm aquatic life, and affect water quality. The second challenge is attributed to habitat destruction characterized by land reclamation and urbanization due to rapid population growth around the lake basin. The third challenge is that climate change, characterized by fluctuations in weather patterns and temperatures affecting the ecology and hydrology of the lake, has an impact on fish populations, water levels, and the health of the ecosystem. The last challenge is attributed to overfishing, which is characterized by the decline of fish species caused by the inability to reproduce and sustain population and its ripple effect on the lake's unstable ecosystem.

4.2.2 Economic contribution and socio-economic benefits

According to the information from the African Great Lakes Information Platform, the lake supports the largest freshwater fishery in the world, producing 1 million tons of fish per year and employing 200,000 people in fishing activities, fish processing, marketing, and transportation supporting the livelihoods of 4 million people. While Kenya has only 6% surface area allocation in the lake, fishing is still an important economic activity that supports the livelihoods and generates income for local communities and the country's economy. The income generated by fishermen and traders involved in the supply chain is attributed by Nile Perch and Tilapia to reduce poverty and improve living standards among local communities. Additionally, the processed fish

products from Nile perch – maw trade exports to international markets in Asia and Europe are a source of foreign exchange earnings for Kenya, contributing to the country's GDP.

The socio-economic benefits attributed to Lake Victoria include agriculture, fishing, and tourism. The Lake Victoria region's favorable climate and fertile soil and the availability of water support agriculture of crops like rice and sugarcane and irrigation schemes promoting agricultural practices. The second benefit is fishing, a contributor to food security and a major dietary need and source of protein for local communities; hence, the importance of affordable, hygienic, and nutritious fish. The third benefit is tourism, as Ndere Island National Park and Rusinga Island attributed to their diverse ecosystem, rich cultural heritage from local communities, and watersport activities, boosts local economy for domestic and international tourists.

In conclusion, the Lake Victoria region offers a lot of socio-economic advantages in Kenya. This region possesses Lake Victoria, which is incorporated with income-generating activities such as fishing and farming as well as attracting tourists or water supply transportation. By noting that many communities depend on it, they will have put forward arguments for its sustainability when they say that it is a key player in their social and economic lives at large. The fisheries sector has pushed the development of infrastructure in the region that is not quite efficient like roads, markets, ports, and limited cold storage facilities.

4.3.3 Transport infrastructure and Trade

In East Africa, Lake Victoria is strategically located at the center of regional trade and transport for Kenya, Uganda, and Tanzania. This includes big transport roads with rail networks that pass over key ports such as Kisumu, thereby making it simple to transport goods and people. The lake region in Kenya is served by major roads like the Kisumu-Nairobi highway, linking the lake region to different parts of the country and enhancing the region's accessibility and economic integration. The revival of the Kisumu port includes plans to integrate the national railway network to enhance commodity movement efficiency. Close to that is the rail network between Kisumu and Naivasha, and a proposed phase 2 of rail connecting Naivasha-Bomet-Kericho-Nyamira-Kisumu and Malaba is essential for reducing transport cost and improving efficiency (Kenya Ports Authority, 2020). Additionally, the port infrastructure signified by Kisumu port plays a crucial role in blue economy development by facilitating transportation and regional trade within East Africa. The port handles significant volumes of cargo, including fish, agricultural products, and

manufactured goods (Kenya Ports Authority, 2020). In addition to the main port, smaller ports like Homa Bay and Mbita play an important role in supporting local trade and transportation primarily on agricultural and fisheries produce.

The presence of transport network connectivity results in the emergence of local, regional, and international trade. Local trade comprises of fisheries, a major activity particularly Nile Perch and Tilapia among the local communities processed locally and traded within Kenya and exported to regional and international markets. Fish from the lake is a significant source of income and food security for local communities (Aura et al., 2020). Agriculture crops like rice and sugarcane are vital products transported locally from farms to local markets within the lake region and beyond. Regionally, the lake facilitates intra-regional trade of economic activities like fishing and agriculture among East Africa Community (EAC) countries while supporting cross-border commerce and enhancing integration within the region. Internationally, fish exports, particularly Nile perch by products through maw trade to Asia and Europe markets enhance foreign exchange earnings and the country's GDP.

In conclusion, enhancing the infrastructure link of Lake Victoria in Kenya would boost the capacity of the region in transport connectivity and fisheries. This will in turn boost economic growth, food security, social cohesion, and regional development. Furthermore, addressing infrastructure deficiencies, environmental threats, and policy gaps will enhance the potential of these sectors, hence ensuring their sustainability and improved livelihoods for communities around Lake Victoria.

CHAPTER 5: CASE STUDIES OF BLUE ECONOMY INITIATIVES

5.1 South Africa's Operation Phakisa Initiative

Operation Phakisa initiative, launched in 2014 with the South African government, seeks to unlock the country's economic potential. The term "Phakisa," meaning "hurry up" in Sesotho signifies the goal of the initiative in accelerating the delivery and impact of the program. Phakisa was modelled after Malaysia's Big Fast Results methodology, as it has been successful in addressing the complex national challenges. Operation Phakisa was introduced to mitigate the significant challenges like slow economic growth, a high unemployment rate, and socio-economic inequalities in South Africa. This case study examines the objectives, strategies, outcomes, challenges, and prospects of Operation Phakisa in the context of South Africa's blue economy initiatives.

The primary objective of the initiative is to tackle the potential of South Africa's maritime resources to create jobs and to ensure the sustainable use of its resources to boost South Africa's GDP by exploiting the marine resources. Moreover, the program is part of South Africa's broader National Development Plan (NDP), which seeks to get rid of poverty and reduce inequality by 2030. The initiative focuses on the following main areas:

(i) Aquaculture Development

The promotion of sustainable aquaculture practices has been a key component of the Phakisa initiative. This is because the initiative seeks to develop projects to boost food security, create job opportunities for small-scale fishermen and stimulate growth. Studies by Britz et al. (2016) assesses the viability and sustainability of various aquaculture projects under Operation Phakisa. The Department of Agriculture, Forestry, and Fisheries (DAFF) has been actively involved in supporting aquaculture initiatives through policy development, capacity building, and providing technical assistance to small-scale fishers (DAFF, 2018).

The actions that have been implemented to promote the expansion and growth of the aquaculture sector include: (i) creations of zones dedicated for aquaculture and providing a conducive environment for the aquaculture business through addressing the regulatory bottlenecks and ensuring a streamlined licensing process. (ii) investments in aquaculture infrastructure like establishment of hatcheries and processing facilities and production plants aimed to improve

production efficiency and reduce operational costs for the small-scale fishers (iii) introduction of capacity building programs to train small scale fishers in aquaculture techniques and sustainable practices to enhance their skills to be more competitive and able to manage their successful aquaculture businesses. Lastly, (iv) the efforts made to ensure the aquaculture products get access to domestic and international markets include promoting locally produced fish in restaurants, supermarkets, and export markets for economic opportunities for small-scale fishermen.

DAFF has been actively involved in aquaculture development by: (i) ensuring that policies in the regulatory framework support sustainable growth and protecting the environment through the establishment of guidelines and regulations to streamline aquaculture ventures. (ii) providing technical support to small-scale fishermen and aquaculture entrepreneurs on practices considered best, disease control measures, as well as environmental management for sustainable operations that comply with national standards. (iii) facilitating access to funding through grants and loans that aid in the starting up and expansion of aquacultural projects to help mitigate the initial expense incurred when setting up an aquaculture business. Lastly, (iv) regular follow-up on fishing projects so that they can meet sustainability and productivity objectives to ensure the sustainability and productivity targets are met to identify challenges early and provide solutions that might hinder growth.

Development of aquaculture is accompanied by offering protection and governance of those areas. That is why the initiative emphasizes the importance of marine protection and effective ocean governance. In 2019, 20 new MPAs were declared, increasing the protected area of South Africa's ocean territory from 0.4% to 5% (DEA, 2019). Reports by the Department of Environmental Affairs (DEA) have signified progress in establishing MPAs and enhancing marine law enforcement capabilities to combat illegal fishing and other maritime crimes (DEA, 2019).

DEA has achieved these by expanding South Africa's network of MPAs. DEA has achieved this by (i) implementing zoning strategies specifically for different users, like sustainable fishing areas and areas for research and tourism, to balance conservation efforts with the sustainable use of marine resources and to ensure aquaculture and fishing activities do not destabilize biodiversity. (ii) investing in advanced surveillance technologies like radar systems and patrol vessels to combat and monitor illegal fishing and other maritime crimes; hence, the department formed the Integrated Coastal and Ocean Management Monitoring Program (ICOMMP) to provide real-time data on

marine activities. Lastly, the implementation of a vessel monitoring system (VMS) for all commercial fishing vessels to reduce illegal fishing practices.

(ii) Maritime Transport and Manufacturing

This is one of the primary goals for the initiative since it encompasses the development of maritime transport and manufacturing sectors. This involves the expansion capacity of South Africa's ports to improve their operational efficiencies. With that in mind, the initiative has focused on improving shipbuilding and repair facilities, which is essential in supporting the maritime industry. The South African Maritime Safety Authority (SAMSA) states that these initiatives should result in many job opportunities and boost economic growth (SAMSA, 2016).

The primary goal of the development of maritime transport and manufacturing sectors has been actively implemented through several actions focusing on (i) expansion and infrastructure upgrade of South Africa's Port to increase capacity and enhance operational efficiency; for example, the Port of Durban, Africa's busiest port, has embarked on a R7 billion project to increase its container handling capacity and accommodate larger vessels (Transnet, 2020). (ii) improvement of shipbuilding and repair facilities has attracted repair contracts from international shipping lines, as seen in Port of Cape Town, hence boosting local employment.

This has followed with several vital strides witnessed in the main areas that the initiative has impacted, like (i) the establishment of new marine protection areas (MPAs), which has expanded the existing ones to cover 5% of South Africa's marine territory while ensuring protection of the critical habitats and marine biodiversity; (ii) the revamping in port efficiencies and the expansion of port infrastructure, notably in Cape Town and Durban, to handle large cargo volumes and improve operational efficiency, leading to increased job creation in the maritime sector. Additionally, many aquaculture farms have been constructed in coastal locations to produce species like oysters and mussels. This helps in the contribution of food security and offering the local communities' economic opportunities.

Despite its success, Operation Phakisa faces several barriers, like (i) regulatory and governance issues due to the complexity in enforcement of the regulatory framework, hence the need for coordinated governance across multiple sectors and stakeholders. (ii) economic and social challenges witnessed in the high cost associated with infrastructure development and innovation

in technology, which ensures equitable distribution of economic benefits, especially to coastal communities.

To address the challenges for prospects to enhance the sustainability and effectiveness of Operation Phakisa, several recommendations emerged for its long-term success. (i) streamlining interagency collaboration to guarantee strong enforcement measures and stakeholder participation in the regulatory procedures; (ii) strengthening environmental conservation initiatives by boosting funding for maritime monitoring and research while endorsing eco-friendly products and sustainable methods; and lastly, (iii) utilizing technology to promote technological advancements in the maritime and coastal industries by funding research and development projects that spur innovation.

5.2 Zanzibar Blue Economy Sustainable Aquaculture Initiative

Tanzania's independent Zanzibar area has adopted the blue economy idea to manage its abundant marine resources for sustainable growth. The main component of the project is sustainable aquaculture, which aims to improve livelihoods, increase economic growth, boost food security, and support sustainable management of marine resources. This case study examines the objectives, strategies, outcomes, challenges, and prospects of a sustainable aquaculture initiative in the context of Zanzibar's blue economy initiatives. The primary objective of this initiative is to develop aquaculture to become economically viable and sustainable for the environment. And by so doing, the initiative seeks to exploit the aquaculture's contribution potential to economic development and food security. These sustainable aquaculture practices in Zanzibar include fish farming, seaweed farming, and shellfish cultivation. Research by Shoko et al. (2011) examines the technical and economic viability of fish farming in Zanzibar. This is because fish farming focuses on species like Tilapia. Seaweed farming is a vital part of Zanzibar's aquaculture sector since it touches base of offering employment to many coastal communities, particularly women. Studies by Msuya (2013) highlight the socio-economic benefits of seaweed farming and its contributions to poverty alleviation and women's empowerment. These are the focus areas for the initiative:

(i) Development of Aquaculture Infrastructure

A key element of the program has been the construction and expansion of aquaculture infrastructure, including fish farms and processing plants. supplying both commercial and small-

scale aquaculture businesses with the infrastructure assistance they require (Zanzibar Blue Economy Policy, 2020).

(ii) Advocating for Sustainable Practices in Aquaculture

The application of best practices in aquaculture to reduce environmental effects occurs after the establishment of infrastructure for the industry. This can be accomplished by promoting the use of eco-friendly technologies, sustainable farming methods, and organic feed (UNDP, 2021).

(iii) Capacity Building and Training

It is imperative to provide fish farmers and local communities with training programs on sustainable aquaculture techniques to achieve sustainable practices and the growth of aquaculture. Enhancing abilities and understanding in fields including farm management, fish breeding, and environmental conservation can help achieve this (FAO, 2021).

(iv) Research and Development

For the promotion of sustainable practices in aquaculture to be viable, supporting research initiatives to improve aquaculture productivity and sustainability is very important. Collaborating with universities and research institutions to develop innovative solutions to aquaculture challenges (World Bank, 2020).

(v) Market Access and Value Addition

For the commodities to find market access and add value, it is important to improve access to markets for aquaculture products through better infrastructure and logistics. Promoting value addition through processing and packaging, thus increasing the economic returns from aquaculture (DAFF, 2018).

Zanzibar has achieved significant strides in areas such as boosting fish and seafood aquaculture output, which improves food security by giving the local population a consistent supply of food. This is demonstrated by the initiative's expansion beyond conventional fish farming to include a variety of high-value species, such as seaweed, prawns, and crabs, which increase overall production and reduce the dangers brought on by climatic and environmental change. Furthermore, it guarantees that aquaculture adds to food security without harming the marine ecology and supports sustainable methods that blend ecologically complementary species.

Finally, the growing popularity of seaweed and fish farming in local communities gives households—especially those headed by women—direct access to wholesome food and a source of money. Additionally, the effort has promoted community development and enhanced livelihoods (World Bank, 2020).

Zanzibar may have advantages, but several obstacles prevent it from realising its full potential for sustainable aquaculture: (i) ecological issues such as climate change. Research by Hoegh-Guldberg et al. (2017) discusses these climate-related threats in depth. (ii) socio-economic barriers witnessed by the limited access to finance and markets, inadequate infrastructure, and insufficient technical knowledge are significant barriers and the studies by Torell et al. (2010) draw attention to these socioeconomic issues and offer possible remedies. The (iii) strong institutional and regulatory framework comes last and is essential to attaining sustainable aquaculture. Strong regulations and enforcement mechanisms are crucial, as stressed by the United Nations Environment Programme (UNEP).

These suggestions arose to address the obstacles facing opportunities to improve the sustainability and effect of aquaculture initiatives. (i) It is crucial for aquaculture practitioners to improve their knowledge and abilities. Researchers such as Brugère et al. (2010) recommend aquaculture programs that emphasise innovation and best practices. (ii) strengthen linkages between local communities, the government, and academic institutions to support ongoing studies on species selection, sustainable practices, and environmental monitoring. (iii) it's crucial to fortify policy frameworks and guarantee efficient application and enforcement. Authors such as Pomeroy et al. (2016) advocate for participatory governance frameworks and multi-stakeholder participation.

5.3 Lake Tanganyika Maritime Corridor Development

Lake Tanganyika, known to be the second largest lake in the world, has great significance to the entire region by providing water, food, and transportation routes to promote trade. The lake's composition of a rich ecosystem with a variety of species of animals and plants supports fisheries, which is essential for food security and livelihoods of the local communities in the region. The development of Lake Tanganyika Maritime Corridor is a strategic project aimed at enhancing regional connectivity and economic integration among countries bordering the lake, like Burundi, the Democratic Republic of Congo (DRC), Tanzania and Zambia. This case study examines the

objectives, strategies, potential outcomes, challenges, and prospects of the development of Lake Tanganyika's Maritime Corridor initiative. The primary objective of this initiative is to (i) develop an efficient and sustainable transport corridor that improves trade flows by encouraging modal shift from road to water transport, (ii) foster cross border and intra-regional trade by reducing transport costs and transit times and promoting regional economic integration.

The initiative accordingly strives to achieve its objectives with emphasis on (i) infrastructure development through upgrading and modernizing port facilities at strategic sites and enhancing rail and road links to increase accessibility to the ports for improved connections and operate better in terms of efficiency. The major ports that are set for considerable investments for enhancing smooth trade movements include the lake—Bujumbura (Burundi), Kigoma (Tanzania), Kalemie, and Kalundu (DRC), besides Mpulungu (Zambia). (ii) sustainable transport solutions accomplished by applying practices that are eco-friendly with fewer environmental effects encouraging cleaner fuel usage, and energy efficient vessels (iii) trade facilitation to be achieved through streamlining customs and border procedures to reduce delay and enhance efficiency and improving logistics and supply chain management to support trade. (iv) regional collaboration to be achieved through strengthening collaboration among the riparian countries for continuity of coordination development efforts and establishing joint frameworks for the sustainable management of the lake's resources and (v) capacity building to be achieved through providing capacity building and training programs to local workers and officials in logistics, transport, and trade while enhancing skills and knowledge to support efficient operation and maintenance of modern infrastructure.

Several of the initiative's objectives have been met, including the enhancement of port infrastructure through continuing modernisation initiatives. It has been suggested that the adoption of sustainable practices will aid in the preservation of the environment. Furthermore, ongoing efforts are made to streamline customs processes and logistics within borders to facilitate more smooth trade flows within the area. Future gains in economic integration could also come from improved transportation connections, which can speed up trade between domestic and foreign markets and cut down on expenses and delays associated with transit. Transportation can be made more sustainable by switching from land to water transportation, which can lessen its negative effects on the environment and increase the sustainability of the local transportation network.

Finally, the growth of economic interconnectedness fostered by improved links can contribute to regional peace and stability.

Despite the significant step towards harnessing the blue economy potential of one of Africa's most important freshwater resources, several barriers have been identified in (i) infrastructure deficits, where many ports around Lake Tanganyika suffer from inadequate infrastructure, insufficient vessel capacity, and outdated port equipment to efficiently handle large trade volumes. (ii) political and regulatory hurdles witnessed due to differences in coordination of regulatory frameworks and operational standards between the riparian countries. (iii) the political instability within the region, which can affect the improvement of navigational safety, ensuring the security of transport corridor operations, and (iv) securing sufficient funding for large-scale infrastructure projects remains a major hurdle. Limited financial resources can constrain the expansion and modernization of port facilities and transport networks (Erasmus Centre for Urban, Port, and Transport Economics, 2019).

Addressing the challenges is key for the expected development of Lake Tanganyika's maritime corridor to have a profound impact on the blue economy in the region. The following are the recommendations of the impact on the blue economy that emerged from the study: (i) for enhanced fisheries, improved transport infrastructure can facilitate better market access for fish and fish products, therefore supporting the local fisheries and communities' livelihoods. (ii) The lake's distinctive biodiversity and scenic beauty present substantial opportunities for ecotourism, which can be expanded with improved transportation infrastructure; and (iii) to promote trade, effective transportation infrastructure can raise the competitiveness of local goods on the global market, thereby promoting economic growth and development.

5.4 FAO's 2023 Blue Economy Roadmap to a Blue Port

The Food and Agriculture Organization of the United Nations (FAO) Blue Economy initiative, dubbed "Blue Ports Initiative" (BPI), seeks to harness the potential of port hubs for sustainable development in coastal areas and marines. This initiative was developed following the recommendation of the FAO committee in 2019 to explore the role of fishing ports in promoting sustainable growth. This case study examines the objectives, strategies, potential outcomes, challenges, and prospects of FAO's 2023 blue economy roadmap to a sustainable blue port initiative. The primary objective of the initiative is to (i) promote sustainable development by

enhancing the role of fishing ports in adopting sustainable economic activities that preserve environmental and marine conservation and social inclusivity. (ii) strengthen food security by improving the quality of fish products to improve food security and nutrition.

The initiative focuses on the four main areas namely (i) eradicating poverty and ensuring access to food by enhancing food quality and environmental conservation, (ii) fostering blue port operations that support coherent coastal development by promoting sustainable exploitation of marine resources and enhancing synergies among sectors within blue economy like energy, fisheries and tourism, (iii) strategic and operational planning by integrating inclusiveness in the port planning and improve relationship between ports and the local community while emphasizing on decent work on fishing vessels and in ports, (iv) foster innovation and investment by attracting potential investors and improving commercial operations for the value chain of the ports.

Since its inception, the initiative has achieved significant strides like global engagement with the 20 port representatives from Africa, Asia, and Latin America and regional organizations in a participatory consultative process to address the needs and challenges faced by different ports in coastal areas, rivers and lakes around the world. Outlined a comprehensive workplan needed for the strategic steps needed for the ports to take to integrate sustainability in their operations to maximize their contributions to sustainable development. And promoted the establishment of technical resources to facilitate continuous learning and technical assistance projects.

The significant step towards harnessing FAO's 2023 transformation of fishing ports into blue ports involves addressing several barriers that were recommended from the initiative for long-term prospects:

(i) Environmental sustainability

Ports must tackle issues such as the impact of climate change, habitat degradation, and pollution. The study recommends implementing clean and renewable energy sources, managing marine litter, and enhancing fishery resource management while tackling the critical IUU fishing practices.

(ii) Social sustainability

Ensure safe working conditions, decent labor standards, and social development for communities that are linked to the ports. This includes compliance with international labor standards and promoting gender equality.

(iii) Sustainability of the economy

Bring in cutting-edge technologies, make sure markets are competitive, and encourage entrepreneurship. This entails boosting open innovation, utilising public-private partnerships, and improving port operations' digitalisation.

(iv) Governance and coordination

Coordination among various stakeholders is necessary for effective governance to handle regulatory complexity and provide open communication and decision-making procedures.

5.5 Ethiopia's Blue Nile Mega Dam

The Blue Nile Mega Dam is an African hydropower project that has generated the greatest amount of debate; it is also referred to as the Grand Ethiopian Renaissance Dam (GERD). The GERD was started in 2011 to boost Ethiopia's ability to generate electricity and make it the power supplier for Africa, according to an Aljazeera 2024 Explainer article. With just around half of the population having access to electricity and even lower rates in rural areas, the dam symbolizes a revolutionary national initiative for Ethiopia that might pull millions out of poverty. Despite its transformation, the project has sparked intense opposition, particularly from Egypt, as it relies on water supply. Egypt fears that the dam will reduce the country's water allocation and threaten its water supply and security. These tensions among Ethiopia, Egypt, and Sudan reflect the disputes over the ownership of the Nile. This is because Egypt has historically claimed ownership of the Nile based on the colonial-era agreements, which Ethiopia rejects, hence the unresolved issues brought to the forefront of regional politics.

This case study analyzes GERD in terms of the blue economy by focusing on its objectives, outcomes, difficulties, as well as broader implications. The GERD's main objective is (i) hydropower production with a capacity of 6,000 megawatts that aims at providing millions of people and neighboring nations with dependable and affordable energy. (ii) it is expected that the initiative will stimulate economic growth, generate jobs, and facilitate industrialization through electricity production. (iii) energy trading may be promoted, thereby enhancing regional

collaboration, and (iv) unlike fossil fuels, this green energy source can help cut down on greenhouse gas emissions.

The GERD is expected to have numerous benefits not only for Ethiopia but also border countries in the following ways:

(i) Energy provision and security

Once finished, the GERD is predicted to be the biggest hydroelectric dam in Africa that will double up Ethiopia's electricity generation capacity and offer steady as well as reliable power for domestic purposes and export. Through their study, Ahlers et al. (2017) postulate that improved access to energy can propel economic growth. With reliable electricity supply, several sectors within the blue economy, including aquaculture, shipping, and tourism, will be able to thrive thanks to necessary energy supportive infrastructures. Moreover, the availability of large amounts of electricity will also aid in achieving industrialization objectives set by Ethiopia and enhance accessibility for millions.

(ii) Economic growth and development

The GERD is anticipated to draw large investments in infrastructure, such as roads, bridges, and transmission lines, which are essential for economic development since it will provide a consistent power supply. Trade will be facilitated with this kind of infrastructure while at the same time increasing connectivity within and without the country of Ethiopia. According to studies conducted by Gebre et al. (2019), the dam is likely to have a significant positive effect on the economy through job creation that will spur growth in gross domestic product (GDP). The project is also expected to create additional employment opportunities with the establishment of industries and services after its construction phase. Regional integration and cooperation

The possibility of the GERD acting as a trigger for regional cooperation and sustainable water resource management is covered in The Nile Basin Initiative (2017). Water resources in the GERD have a big impact on transboundary water management between Sudan and Egypt, which could improve regional integration through shared energy projects and water sharing.

(iii) Environmental and social benefits

The GERD project represents a shift towards renewable energy, hence reducing the reliance on fossil fuels. This contributes to climate change and aligns with the global sustainability goals while enhancing Ethiopia's environmental stewardship. Additionally, the project includes measures to mitigate environmental impacts and promote sustainable water management, which results in enhancing agricultural productivity and food security in the region.

The current potential of GERD is faced with a variety of obstacles, which include (i) serious environmental issues regarding its construction and governance. Yihdego et al. (2017) emphasized the need for comprehensive environmental impact evaluations and management approaches. (ii) In accordance with International Rivers' (2018) study, resettlement schemes as well as trying to revive the means of living indicate that there are social implications to consider. Key matters have been the displacement of communities that were directly affected by the establishment of the dam and subsequent changes in the means of making a living. (iii) Political tensions, drawn-out talks, and foreign policy disputes have arisen from the infrastructure project-induced controversies.

5.6 Contribution of the initiatives towards the study

These initiatives contribute significantly towards the research question in the following ways: demonstrate the role of infrastructure development in unlocking the economic potential of aquatic ecosystems. For example, the modernization and development of maritime transport in Operation Phakisa and Lake Tanganyika's Maritime Corridor initiative have facilitated and enhanced market access and stimulated economic growth. Similarly, the Blue Nile Mega Dam highlights the transformative impact of the large infrastructure projects on a regional economic development level. The examples emphasize the importance of investing in infrastructure like ports and transport networks to improve connectivity and economic activity with the Lake Victoria region in Kenya.

The initiatives emphasize the need for integrating environmental sustainability into the blue economy strategies, as seen in Operation Phakisa's expansion of MPAs and Zanzibar's sustainable aquaculture practices, illustrating the impact conservation efforts have on supporting economic activities. These initiatives align with Lake Victoria's need to adopt a robust measure on environmental and conservation to ensure the long-term sustainability of its ecosystem.

Operation Phakisa's emphasis on aquaculture and maritime industries and Zanzibar's focus on community-based aquaculture have created job opportunities, particularly for women and the youth. The initiatives serve as a model for Lake Victoria by demonstrating that strategic investments in the blue economy can generate job creation and improve the communities' livelihoods.

Effective governance and regional cooperation are the recurring aspects across the initiatives. Operation Phakisa's coordinated governance approach and the regional collaboration in Lake Tanganyika's Maritime Corridor highlight the importance of strong governance and stakeholder involvement. Hence, establishing an integrated blue economy governance structure and fostering cooperation among Kenya, Uganda, and Tanzania will be vital for the sustainable management of the shared resources.

Lastly, leveraging the public-private partnership like FAO's Blue Port demonstrates the potential to mobilize resources and drive sustainable development. Lake Victoria can attract investments from PPPs in critical infrastructure, promoting an enabling environment for the growth of blue economy activities.

In conclusion, this section elaborates the different blue economy initiatives and how they contribute towards the research question and the next steps on the lessons learnt into actionable strategies for the Lake Victoria region in Kenya. Chapter 5 elaborates and describes the good practices, which feeds into Chapter 6 of the discussion for the comparison of the different initiatives in the Lake Victoria region of Kenya.

CHAPTER 6: DISCUSSION

6.1 Introduction

This chapter seeks to provide a gap analysis to identify and address the present discrepancies of Lake Victoria to other successful Blue Economy initiatives. By examining the gaps in areas such as environmental sustainability and conservation, decent employment opportunities, infrastructure development, and lake security, the chapter aims to explore the potential impact of adopting these practices in the Lake Victoria region. Therefore, close the gaps to improve Lake Victoria and exploit its Blue Economy potential by promoting stability in the area, environmental protection, and economic growth.

6.2 Gap Analysis for Lake Victoria, Kenya

Gap analysis highlights major distinctions between present practices in the Lake Victoria region and standard procedures from other successful Blue Economy initiatives. There are challenges such as infrastructure development, environmental sustainability, trade and market access, decent employment, and lake security facing Lake Victoria. Addressing these gaps requires targeted investments, strengthened governance, and the adoption of proven good practices from other regions. Implementation of these recommendations can better harness Lake Victoria's potential as a blue economy resulting in sustainable development and improved livelihoods for the communities relying on the lake. A maturity grid will be utilized to provide a structured approach to evaluate the current state of Lake Victoria and propose actionable improvement areas to address the identified gaps. The maturity grid (**see Table 4**) outlines the gaps depicting potential aspects of improvement for Lake Victoria using maturity levels ranging from level 1 (initial), level 2 (developing), level 3 (established), level 4 (advanced), and level 5 (leading practices).

Table 4: Summary of the maturity grid matrix

Policy Indicators	Key Performance Indicators	Level 1 - Initial	Level 2 - Developing	Level 3 - Established	Level 4 - Advanced	Level 5 - Leading Practise
Infrastructure Development	Modernization of port facilities		✓		O	
	Improvement of transportation connectivity		✓		O	
	Investment of cold chains and processing infrastructure	✓			O	
	Leveraging private-public partnerships and resource management	✓			O	
Trade and Market Access	Port infrastructure and capacity		✓		O	
	Market connectivity and logistics		✓		O	
	Product diversification	✓		O		
	Regional trade integration		✓		O	
Environmental Sustainability and Conservation	Pollution control and waste management	✓			O	
	Fisheries management and sustainable practices		✓		O	
	Biodiversity conservation and habitat protection		✓		O	
	Water quality monitoring and management		✓		O	
	Community engagement and awareness		✓		O	
Decent Employment Opportunities	Job formalization and workers protection		✓		O	
	Wages and job security		✓		O	
	Gender equality and inclusive employment		✓		O	
	Vocal skill development and training		✓		O	
	Entrepreneurship and small business support		✓		O	
Lake Security	Law enforcements and patrols		✓		O	
	Illegal fishing and smuggling control		✓		O	
	Maritime safety and emergency response		✓		O	
	Community engagement in security		✓		O	

* ✓ represents the current state of Lake Victoria while O represents the desired outcome level

The analysis seeks to identify gaps in infrastructure development and propose good practices from other initiatives that could enhance the Lake Victoria region in Kenya to better harness its economic potential using a maturity grid. In accordance with the five maturity levels, addressing the gaps in modernization of port facilities, improvement of transportation connectivity, investment in cold chains and processing infrastructure, leveraging private-public partnerships, and integration of resource management, Lake Victoria can enhance its economic potential and sustainability of the ecosystem. Currently, Kisumu Port known as the hub of the Lake Victoria region in Kenya, is at a developing level as it tends to lack modern facilities and capacity to handle large volumes of throughput for the region's growing trade needs. Bridging the gap from the current developing level to the desired advanced level requires Kisumu Port to modernize its port facilities and integrate advanced logistics systems to improve efficiency and increase trade volumes. Secondly, the transport connectivity aspect is also at the developing level, as the lake region suffers from poor integration between different modes of transport, resulting in an increase in the cost and time of cargo movement. Bridging this gap from the current developing level to the desired advanced level calls for the development of an integrated transport network connecting Kisumu port with key inland and regional markets for improved efficiency and reduced cost of cargo movement. Thirdly, the cold chain and the processing infrastructure in the Lake Victoria region of Kenya are still at the initial level as it grapples with the minimal facilities available. As a result, there is a witnessed post-harvest loss, which limits the ability to locally consume and export high quality fish products. Bridging this gap from the initial level to the desired advanced level highlights the need to invest in the development of cold chain infrastructure and modern fish processing facilities to improve the quality of local fish consumption and exports, reduce losses, and improve income for the local communities. Moreover, the use of public-private partnerships in infrastructure development is still at the initial stage in Lake Victoria, as the region lacks significant private sector involvement in funding, investing, and managing the infrastructure projects. Bridging this gap from the initial level to the desired advanced level requires the region to develop a framework that attracts private sector investment in the modernization of ports, transport connectivity, and processing facilities to accelerate the region's infrastructure development.

The second aspect is trade and market access as determined by these key performance indicators (KPIs): port infrastructure and capacity, market connectivity and logistics, product diversification, and regional trade integration as to provide recommendations to bridge the gap. The port infrastructure and capacity in Kisumu port and other landing sites are at a developing level, as they suffer from outdated facilities and limited capacity hindering their ability to handle large volumes of cargo. To bridge the gap from the developing level to the desired advanced level indicates the need to improve and modernize infrastructure in Kisumu port and other regional facilities to increase efficiency and support capacity of large cargo volumes. Market connectivity and logistics at Lake Victoria area the developing level as the region still struggles with a poorly integrated transportation system, resulting in inefficiency and high costs of transporting goods to the markets. To bridge the gap from a developing to the desired advanced level requires investment in the development of integrated transport and logistics systems such as rail, road, and water connections to link the lake to other regional and global markets to boost trade. Currently, product diversification and value addition in the Lake Victoria region is at its initial level, as most exports to the international market are raw fish and other unprocessed goods, limiting the region's economic benefits. To bridge the gap from an initial to the desired established level requires investment in processing facilities, support value additional initiatives to diversify product range, and reduce dependance on raw exports to increase the economic value of exports from the Lake Region. The regional trade integration is at the developmental level, as there is limited participation in intra-African trade and integration into regional trade frameworks. To bridge the gap from a developing to the desired advanced level reflects the need to improve participation in regional trade agreements like the African Continental Free Trade Area (AfCFTA) and enhance cross-border trade facilitation to leverage the perks of regional economic integration.

The third aspect is environmental sustainability and conservation as determined by these key performance indicators (KPIs): pollution control and waste management, fisheries management, and sustainable practices, biodiversity conservation and habitat protection, water quality monitoring and management and community engagement and awareness. Currently, the lake suffers from high levels of pollution from domestic and industrial waste due to inadequate systems to manage pollution and waste control management. To bridge the gap from the initial to the desired advanced level requires the implementation of stricter regulations on industrial waste disposal and improving the effective waste management systems to protect the ecosystem's health.

Overfishing and other unsustainable activities are still rampant, and the limited enforcement of laws protecting fish stocks and fisheries management in the lake region is still at its developmental level. Hence, there is a need for the establishment of Marine Protection Areas (MPAs), and the enforcement of sustainable fishing laws is necessary to bridge the gap between a developing and the desired advanced level. This is because MPAs protect local communities' livelihoods and the long-term sustainability of fish populations. Water quality monitoring and management attributed to inadequate monitoring systems, which leads to deterioration of water quality, are at a developing level in the lake region as they pose threats to the ecosystem and human health. To bridge the gap from the developing to the desired advanced level requires the improvement of water monitoring systems and the implementation of effective management practices to cool nutrient runoff and improve the enforcement of water protection regulations. Lastly, the limited public participation by the local community in awareness and engagement on environmental sustainability is at the development level. To bridge the gap from a developing to the desired advanced level requires implementation of environmental education programs, and local participation in conservation efforts, and fostering a practice of environmental stewardship. Due to insufficient monitoring methods, which cause the water quality to deteriorate and endanger both human health and the ecosystem, water quality monitoring and management are at their developing level in the lake region. The improvement of water monitoring systems, use of efficient management techniques to reduce fertilizer runoff, and better enforcement of water protection laws are necessary to close the gap between a developing and the intended advanced level. Lastly, public participation in conservation efforts and general environmental awareness in the community are both low, making community engagement and awareness a crucial component of environmental sustainability in the lake region. It takes the application of environmental education programs and local participation in conservation efforts to close the gap between a developing and the intended advanced level.

The fourth aspect is decent employment opportunities as determined by these key performance indicators: job formalization and worker protection, wages and job security, gender equality and inclusive employment, development and training, entrepreneurship and small business support. Most employment in the fisheries and other related sectors at the developing level is informal with low job security and poor working conditions. To bridge the gap from a developing to the desired advanced level requires significant efforts to formalize jobs through policy support, enforce labor regulations, and enhance conducive working conditions to improve job security. The high levels

of unemployment in the informal sector contribute to low wages in the Lake Region hence it being at the developing level. To bridge the gap from a developing to the desired advanced level requires the implementation of policies that ensure enforcement of minimum wages and improve job security through formal job employment security. Gender equality and inclusivity at the developing level in the Lake Region is evident in the unequal distribution of employment opportunities with significant gender disparities. To bridge the gap from a developing to the desired advanced level, needs implementing targeted programs that support women's participation in the workforce and equal pay and opportunities that encourage inclusive opportunity practices across the sectors to reduce gender disparities. Access to vocational skill development and training is at a developing level, as it leads to low productivity and limited opportunities for career advancement. To bridge the gap from a developing to the desired advanced level highlights the need to expand access to vocational training and skill development, particularly in aquaculture, fisheries and marine industries and develop partnerships with institutions that offer training in line with the region's economic needs. Lastly, entrepreneurship and small businesses support a vital driver of the lake's economy, which is at the developing level and is attributed by the challenges entrepreneurs face like, limited access to finance, market and training opportunities. To bridge the gap from a developing to the desired advanced level entails the need to reduce regulatory barriers and improve market access for products and services to support programs for entrepreneurs.

The fifth aspect assesses the current state of lake security across key performance indicators like law enforcement and patrols, illegal fishing and smuggling control, maritime safety and emergency response, and community engagement in security. Currently, the security in the Lake Region is at its developing level as there is inadequate presence of law enforcement and limited patrols to monitor the region. To bridge the gap from a developing to the desired advanced level highlights the need for an increase in the number of patrols and to invest in more resources to improve the presence of law enforcement on the lake. The current level of control of IUU fishing, smuggling, and illicit activities is at the developing stage, as there are high levels of such practices due to weak enforcement and ineffective monitoring. To bridge the gap from a developing to the desired advanced level suggests the need for robust enforcement mechanisms by imposing strict penalties and enhanced monitoring systems to reduce illegal practices. The current maritime safety and emergency response capabilities are at a developing level due to the region's limited infrastructure and the capability to handle maritime emergencies. To bridge the gap from a

developing to the desired advanced level indicates a need for investments in maritime safety infrastructure by deploying more rescue boats and establishing personnel training for emergency response. Lastly, community engagement in lake security is at a developing level as there is low local community involvement in the security initiatives resulting in an increase in criminal activities. To bridge the gap from a developing to the desired advanced level requires the development of community-based security programs that actively involve local communities in monitoring and reporting activities while raising awareness on the importance of lake security.

6.3 Transferability of good blue economy practices to Lake Victoria, Kenya

Lake Victoria has several critical gaps compared to other successful Blue Economy initiatives. To bridge these gaps, adopting good practices from these initiatives like enhancing lake security, trade and market access, sustainability and conservation of the environment, decent employment, and economic opportunities while investing in infrastructure is a way of unlocking the full potential of Lake Victoria's Blue Economy. The matrix below **(see Table 5)** exemplifies the good practices of every policy indicator, which discusses their transferability to the Lake Victoria region and enumerates possible positive effects.

Table 5: Transferability of good practices of blue economy initiatives to Lake Victoria

Policy Indicators	Blue Economy Initiative	Good Practices of Blue Economy	Transferability to Lake Victoria	Positive Impact
Environmental Sustainability and Conservation	Zanzibar's Aquaculture	Community-Based Aquaculture	Due to its resources, community-based aquaculture could be adapted to Lake Victoria, capitalizing the lake's resources to enhance local food production and address food insecurity.	An increase in local fish production reduces the dependence on depletion of wild fish populations. This in turn improves the nutritional intake from locally produced fish. Results to diverse income generation streams for the local communities and consequently better their living standards.

Decent Employment Opportunities	Operation Phakisa (South Africa)	Sustainable Aquaculture Practices	The introduction of sustainable aquaculture practices from Operation Phakisa in the vicinity of Lake Victoria can lead to creations of jobs thus promoting eco-friendliness.	The creation of jobs in aquaculture and the related industries. This in turn would ensure the local communities experience a better economic stability. The adaptation of sustainable practices reduces ecological degradation resulting to environmental benefits.
Trade and Market Access	FAO's Blue Port Initiative	Development of modern fish port facilities	Modernization and upgrading of port facilities surrounding Lake Victoria will increase the effectiveness of trade and open new market possibilities for both fish products and other supplies.	Development of port facilities will increase trade volumes and improve access to the international market. This in turn will enhance competitiveness of products from Lake Victoria resulting in better pay for local producers. Resulting to a strengthened regional economic integration in the area.
Trade and Market Access	Lake Tanganyika's Transport Corridor	Establishment of trade facilitation hubs and streamlined customs and border procedures	Development of trade facilitation hubs to serve as centralized locations for customs clearance, storage and distribution. Additionally, establishment of joint border management systems across countries bordering Lake Victoria and standardize tariffs and documentations.	The trade facilitation hubs will provide traders with easy access to services needed for exporting like inspection, certification and storage making Lake Victoria a more interactive region for trade and market access regionally and globally. The streamlined boarder procedures will improve cross-border trade, lower transaction cost and reduce delays.

Infrastructure Development	FAO's Blue Port Initiative	Development of sustainable and inclusive port operations	Adapting sustainable practices in the port operations like cleaner fuels, energy-efficient technologies and promoting inclusivity for port workers to prioritize environmental conservation and social inclusiveness.	The implementation of the sustainable practices in the port operations will reduce the environmental footprint of the port activities. This helps in the preservation of the lake's ecosystem and the technological advancements makes the port attractive to trade boosting overall economic activity.
Infrastructure Development	Lake Tanganyika's Transport Corridor	Integrated Transport Infrastructure Development	Supporting economic activities and improving connectivity can be achieved through integrated transport infrastructure (ports, roads, and rails) developed around Lake Victoria.	The integrated transport development will lead to reduction of transportation costs along increase in efficiency. This will in turn improve access to trading areas along with amenities in remote areas. Resulting to a stimulated economic growth due to an integrated and upgraded infrastructure system.
Lake Security	Operation Phakisa (South Africa)	Marine Protected Areas (MPAs)	Establishing MPAs around Lake Victoria can keep critical habitat areas secure, reduce IUU fishing practices as well as enhancing the security of various resources required for sustaining the lake's ecosystem.	Establishment of MPAs will lead to conservation of critical ecosystems and the preservation of biological variety. This will in turn reduce IUU fishing practices and promote sustainable resources exploitation. Resulting to Lake Victoria's lasting ecological health for the purpose of sustaining economic activities.

The above table highlights the blue economy initiatives that can be transferred to Lake Victoria and impact the lake positively. However, Ethiopia's GERD initiative serves as a good example of how geopolitical issues due to transboundary water can disrupt regional cooperation and hinder the advancement of blue economy projects. While the project seeks hydropower generation to stimulate Ethiopia's socio-economic growth, it depicts the complex and potential negative outcomes that are interconnected with cross-border water politics and regional security concerns. As an intervening variable, the initiative has altered the governance dynamics of the Nile and curbs the blue economy framework as geopolitical interests overshadow the collaborative efforts and sustainable conservation of common resources. Lastly, for Lake Victoria, an inclusive and collaborative blue economy strategy that prioritizes regional security and mutual benefits will be indispensable to avoid the issues as seen in the GERD case.

In conclusion, this section has provided a gap analysis that identifies the current challenges of the Lake Victoria region in Kenya and later suggests good practices from other blue economy initiatives to mitigate the gaps. The next chapter will provide an overall summary of the study and finalize by highlighting the conclusions found and recommendations for policy practitioners and further academic research.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The present research question is "How can the integration of blue value chains into the Blue Economy framework promote economic growth, enhance food security, and create employment opportunities in the Lake Victoria region of Kenya?" aims to provide an understanding of the blue economy within the Lake Victoria region, Kenya, through the development of an integrated blue economy policy framework. The specific sub-research questions aim to 1) determine the current challenges and opportunities concerning blue economy initiatives in Lake Victoria, Kenya. 2) identify the gaps for implementation of an effective strategy to achieve an integrated blue economy development policy framework in Lake Victoria, Kenya. 3) incorporate the effective initiatives from other African nations that are of good practices to address the specific challenges faced in Lake Victoria, Kenya. The current section begins by providing a summary of the statement problem and the five blue economy case studies; later, the chapter presents conclusions related to the main research question and specific sub- research questions of the thesis; and lastly, the research provides recommendations that emerge from the findings.

7.2 Summary of the statement of problem

This section highlights the reasons for conducting this research on the blue economy potential in Lake Victoria, Kenya, as the many aspects of food security the region struggles with are high variations in fish populations caused by illegal, unreported, and unregulated (IUU) fishing practices, industrial pollution, and environmental sustainability and conservation. The study identifies sustainable, environmentally friendly strategies to ensure long-term food security for local communities dependent on fishing by enforcing strict regulations on IUU fishing practices like increasing patrols within the lake and imposing severe penalties for violations done. Secondly, designate and establish marine protected areas within Lake Victoria, Kenya, to allow the recovery of the fish populations and maintain the health of biodiversity.

Additionally, the study seeks to explore ways on how the blue economy concept could be utilized to stimulate the region's struggle with economic development. First, by promoting sustainable fisheries management and aquaculture to ensure there is long-term food security and economic benefits from the lake's fish production. Secondly, address the barriers faced by SMEs,

like insufficient finance opportunities and poor market linkages. Similarly, seek to support SMEs growth for economic diversification and job opportunities, particularly for women and youth, as unemployment is a significant issue in the region. Thirdly, examine ways to improve critical infrastructure like cold storage facilities, transport networks, and manufacturing and processing industries to enhance the region's competitiveness in the global market. Lastly, enhance trade facilities and border management control to reduce food waste and improve the quality of fish products by investing in cold truck logistics and consistently implementing regulations at border points.

The study's conclusion emphasizes the need for a concerted effort across stakeholders to address the issues facing Lake Victoria's region in Kenya and capitalize on the opportunities to realize its full potential for sustainable development as a blue economy. To address the interconnected challenges of food security, economic growth, environmental sustainability, and job creation, an integrated blue economy policy framework that is in line with regional, national, and worldwide goals can be developed and implemented.

7.3 Summary of the blue economy case study initiatives

The 5 case studies depict the blue economy initiatives that have proved to be of good practice and effective for sustainability in a manner that meets the goals of economic growth, environmental health, and social equity. The blue economy initiatives that have proved to be of good practice and effective for sustainability include South Africa's Operation Phakisa, Zanzibar's Aquaculture, Lake Tanganyika's "Turning Corridors into Sustainable Opportunities" and FAO's Blue Port initiative. These initiatives have been selected as they explicitly have a blue economy policy in place and address on "what is being governed" in line with the infrastructure, ecosystem, and transport corridor in Lake Victoria.

Operation Phakisa's comprehensive strategy focuses on the blue economy sectors like aquaculture, marine protection services, marine transport, and ocean governance. The initiative's developing blue economy outcome addresses (i) economic growth (GDP) and aquaculture development, (ii) job creation through various blue economy sectors, (iii) environmental protection and ocean governance.

Lake Tanganyika's initiative focuses on enhancing maritime transport, trade and market access along Lake Tanganyika, hence improving connectivity between the countries bordering the lake. The outcome of the initiative focuses on leveraging Lake Tanganyika's potential for sustainable economic development by balancing economic development with environmental protection while promoting regional cooperation through trade among the countries sharing the water resource. The Food and Agriculture Organization's (FAO's) Blue Port initiative is a global effort that aims at developing sustainable and efficient port operations worldwide by integrating environmental protection with economic growth in port operations. The project's best practice involves sharing and implementing good practices for sustainable management of port operations across the different regions.

The Blue Nile Mega Dam initiative focuses on contributing significantly to Ethiopia's economic growth by providing a reliable source of electricity both for domestic use and export. The outcome of the initiative highlights the complex nature of large-scale blue economy projects that balance economic development goals with environmental concerns and regional diplomatic challenges because of the geopolitical situation.

7.3.1 Current challenges and opportunities concerning blue economy initiatives in Lake Victoria, Kenya

The poorly developed infrastructure in Lake Victoria, particularly in ports, transportation systems, and cold chain facilities, limits trade capacity and accessibility to markets hence affecting economic integration and growth. This however, contrasts with advanced infrastructure initiatives such as FAO's Blue Ports initiative and Lake Tanganyika's Transport Corridor, which have significantly had a positive impact on economic activities and trade performance within their territories. Additionally, the trade systems of Lake Victoria are underdeveloped as there is insufficient access to markets and inadequate infrastructure to meet the standards of international quality and traceability. This in turn hinders economic growth, thereby limiting the potential income opportunities for the local communities compared to successful initiatives like FAO's Blue Ports and Lake Tanganyika's Transport Corridor.

Lake Victoria's limited conservation enforcement and lack of Marine Protected Areas (MPAs) contribute to the depletion of resources and environmental degradation, hence threatening food security. The persistent environmental threats facing Lake Victoria are because of inadequate

conservation measures and the absence of an integrated Marine Spatial Planning (MSP) framework. This highlights the contrast with better-advanced conservation initiatives that have been able to enlarge MPAs to safeguard marine biodiversity. The lake's environmental sustainability and conservation practices lag behind successful initiatives like Operation Phakisa and Zanzibar's Aquaculture. Additionally, the aquaculture expansion in initiatives like Zanzibar has successfully improved food security through sustainable practices at community levels and therefore, may apply to Lake Victoria to increase local fish production, thereby reducing reliance on wild fish stocks. The job opportunities that have been generated by Lake Victoria's Blue Economy are mainly informal, insecure, and unsustainable. Hence, organized long-term employment options through sustainable aquaculture and port construction have been created by initiatives such as South Africa's Operation Phakisa. The Zanzibar Aquaculture Initiative has significantly empowered women and youth through employment opportunities in sustainable aquaculture practices. Likewise, implementing these strategies at Lake Victoria will create more jobs and promote economic security for the locals.

7.3.2 Gaps to be addressed for implementation of an effective Blue Economy strategy in Lake Victoria, Kenya

The gaps that hinder implementation of an effective blue economy development policy in Lake Victoria, Kenya, need to be addressed and require a combined effort to build stronger governance frameworks, investments in infrastructure, improved environmental management, involvement of local communities, and better regional cooperation. Quite frequently, the Lake Victoria region often lacks a unified and cohesive governance structure that involves all stakeholders. This creates overlapping mandates among multiple institutions and authorities, leading to scattered and ineffective strategy execution and inconsistencies in the enforcement of regulations across the region. Most of the time, the existing policy frameworks are outdated and lack comprehensiveness to address sustainable resource management problems, hence leading to gaps that might hinder proper addressing of overfishing, pollution, and habitat loss issues.

Secondly, critical infrastructure like transport networks, ports, and cold storage facilities is often underdeveloped in the Lake Victora region. This limitation hinders the capacity to support economic activities and trade, thus hampering the implementation of blue economy projects aimed

at boosting regional growth and regional integration. There is often a lack of investment in infrastructure improvements, partly due to the limited financial resources available and lack of proper planning among the key stakeholders, hence hindering the implementation of a comprehensive blue economy strategy.

Thirdly, to effectively implement a blue economy framework, it is essential to have a robust environmental monitoring systems which are often absent in the Lake Victoria region. In the absence of accurate data and monitoring, it is difficult to manage resources sustainably and enforce regulations. The continued deterioration of the environment, like pollution, loss of biodiversity, and the spread of invasive water hyacinth, undermines efforts to implement sustainable practices, as addressing these challenges is crucial for the success of the blue economy strategy. Subsequently, for the efficient enforcement of policies regarding the blue economy, it requires the active participation of local communities. However, in most cases, there are gaps in effectively engaging communities, especially in educating and creating awareness about sustainable practices and involving them in decision-making processes. Adoption of a new labor regime through sustainable fishing or aquaculture has proved difficult due to economic disparities and a high number of people with informal jobs. These changes require economic support and capacity-building so that communities can adjust to them.

Lastly, Kenya, Uganda, and Tanzania share Lake Victoria, which requires strong regional cooperation for its effective management of resources. A disjointed blue economy strategy can arise from differences in national policies, regulatory frameworks, and mechanisms for enforcing them, which can create gaps in implementing a unified blue economy strategy. Coordination among various national institutions in Kenya, local councils, as well as non-state actors is not always robust. This has resulted in redundancies in resource allocation, ineffectiveness of services provided by the institutions, and gaps in policy implementation.

7.3.3 Good practices adapted from successful Blue Economy initiatives to Lake Victoria, Kenya

Community-based aquaculture has been successfully implemented in Zanzibar as it focuses on sustainable farming of seaweed and fish. The good practice can be adapted into Lake Victoria to improve food security and create employment opportunities, as it would involve training of the local communities on sustainable fish farming practices. South Africa's Operation Phakisa's

initiative, which emphasizes marine spatial planning (MSP) to bring balance to economic activities within environmental conservations, can be adapted into Lake Victoria to manage fishing, transportation, and tourism while ensuring the sustainable use of the lake's resources. Lake Tanganyika's transport corridor entails the development of an integrated transport infrastructure around the lake to improve trade and economic integration. Adapting a similar good practice, including the modernization of ports and improving rail and road connections, could improve market access and streamline trade efficiency in the Lake Victoria region. In addition, FAO's Blue Port initiative also focuses on port modernization to facilitate trade specifically for perishable commodities like fish. Hence, modernizing the ports along Lake Victoria and particularly Kisumu port could improve the trade capacity of the region, reduce post-harvest losses, and in turn open up new markets for local products. Lastly, regional cooperation for resource management can effectively be depicted by the Nile Basin initiative, which focuses on transboundary cooperation for sustainable management of the shared water resources. Hence, adapting this good practice by strengthening regional cooperation among Kenya, Uganda, and Tanzania could help address the challenges in managing Lake Victoria's shared resources, improve governance, and ensure sustainable development.

7.4 Limitations of the study

This research is limited to the areas of the Lake Victoria region in Kenya and does not extend to other areas. Such a geographical restriction could restrict the broader applicability of the findings to other contexts. The limitation of data access and availability on Lake Victoria' s blue economy infrastructure, fishing activities, trade, and SMEs in Kenya may restrict the depth of analysis and robustness of the results. Additionally, time and resources for this study were limited, which may have limited extend of data collection, analysis, and interpretation could result in partial exploration of some relevant perspectives. The research faced challenges in reaching decision-makers in government agencies and private sectors, thus limiting the primary information and insights needed for the study. Lastly, the method used for data collection might be influenced by personal opinions and observations coming from the community living along the lake region, as reaching the primary sources was difficult and, as a result, affected the reliability and integrity of the findings.

7.5 Conclusion of the study

On what's next, a policy formulation framework is needed to safeguard economic growth and food security with environmental sustainability. This study examines the gap analysis within Lake Victoria, Kenya, alongside the policy initiatives like Zanzibar's sustainable aquaculture, South Africa's coastal supervision plans, Lake Tanganyika's Transport Corridor, and FAO's Blue Ports that are taking positive shape in the blue economy. By so doing, this will enable the Government of Kenya to adapt some alternative strategies in crafting tailored policy frameworks that are in line with the Lake Victoria region to improve the region's blue economy development goals.

After the implementation of a policy framework, the next step is to assess the gaps and opportunities in Lake Victoria, Kenya, that require some action. This is to come up with a roadmap from the policy indicators like infrastructure development, trade and market access, environmental conservation, decent job opportunities, and lake security. For improved transport connectivity, the policy recommendations should first consider establishing a multi-modal transport system linking rail and road for a seamless movement of goods and people to reduce bottlenecks and improve trade efficiency. This also entails collaborating with the neighboring countries like Uganda and Tanzania in the development and implementation of a regional transport master plan that addresses cross-border connectivity within Lake Victoria and harmonizes transport policies. Secondly, post-harvest losses in Lake Victoria, Kenya, are attributed to the inadequate cold chain logistics, making it difficult to distribute the harvested fish for long distances between the main fishing farms and the end customers while maintaining the fish quality standard. Hence, establish value chain development like cold storage facilities like refrigerated stores and trucks at major fish landing sites for specific business opportunities for traders and logistics companies to reduce post-harvest losses and maintain fish quality for a nutritional food.

An enhanced trade and market access requires the policy recommendations to consider the following: First, develop an integrated regional transport corridor connecting Kisumu port and landing sites in Lake Victoria with major trade hubs in Kenya like Nairobi and Mombasa and neighboring countries. This entails upgrading the dormant rail network, road and the water transportation system to create seamless market access. Secondly, create capital finance schemes for SMEs who are involved in logistics and market connectivity. This entails offering access to

low-interest rates of loans and technical support to the businesses to enable them to invest in logistical solutions and facilitate regional market linkages through expos and trade fairs to enable traders to connect with buyers, investors, and logistics providers to boost their market access and create trade opportunities. Thirdly, collaborate with neighboring countries to harmonize the regional trade standards and regulations for blue economy products like fish and aquaculture products to ensure a uniform standard across the borders and facilitate seamless trade flows. This includes implementing a simplified cross-border customs procedure at key border and lake ports by integrating a digital customs management system to reduce delays, lower the transaction cost, and encourage cross-border trade.

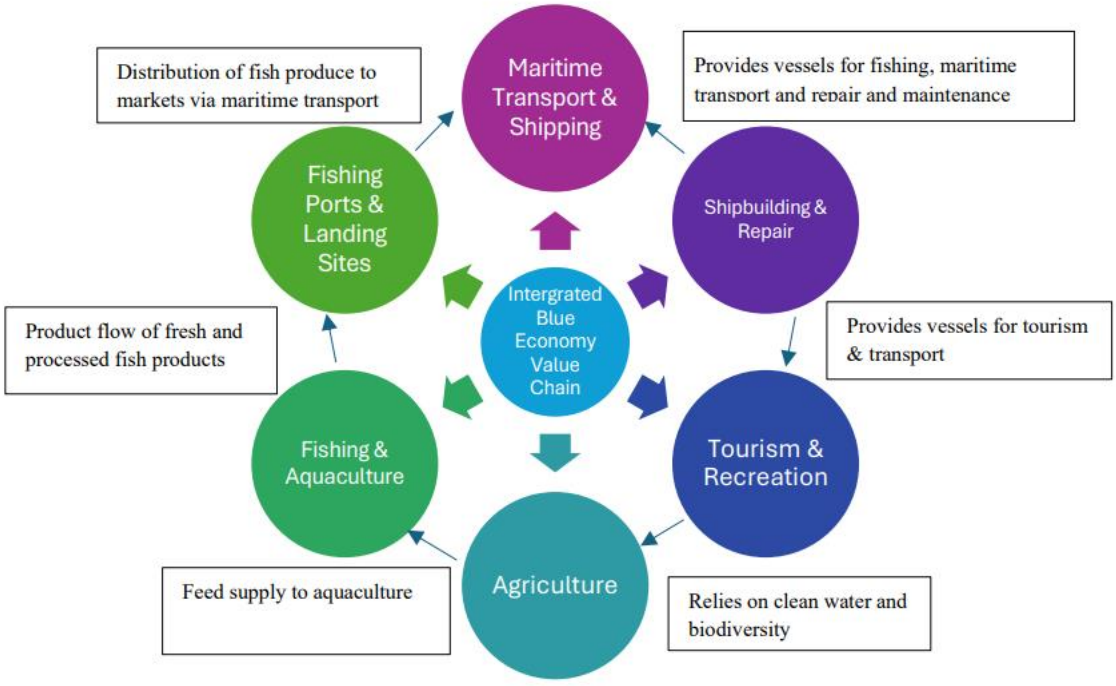
An enhanced environmental sustainability and conservation requires the implementation of policies focusing on pollution control and waste management, fisheries management and sustainable practices, biodiversity conservation and habitat protection. First, develop integrated waste management systems in urban areas surrounding the lake, like proper disposal facilities, recycling and waste segregation, and construct eco-friendly sanitation facilities like bio-latrines, particularly in fishing communities, to prevent untreated sewage and waste from entering the lake. Later, implement strict regulations on pollution control from agricultural, industrial, and domestic discharges into the lake and enforce regular monitoring and impose fines for violators. Additionally, promote the development of waste-to-energy projects that convert organic waste into electricity, as it is beneficial as an alternative source of energy for local communities, hence reducing the reliance on unsustainable energy sources. Secondly, provide incentives to fishermen to encourage the use of eco-friendly fishing gear that is more sustainable and reduces harm to juvenile fish populations. This includes providing training on sustainable fishing and conservation practices to fishermen to foster a culture of responsible use of resources among the local communities. Additionally, support aquaculture like cage farming and integrated fish farming systems that are considered environmentally friendly and economically viable as an alternative source of livelihood to reduce pressure on the wild fish stocks. Thirdly, for biodiversity conservation and habitat protection, establish key protected areas or marine reserves where human activities are restricted to serve as a conservation zone to safeguard vulnerable species and ecosystems. Additionally, encourage the sustainable use of agriculture like organic farming practices in the lake's catchment areas to reduce soil erosion into the lake and implement biological

control measures for the removal of invasive species like water hyacinth as it threatens the lake's biodiversity.

The gap found in the research is that there is less research done on blue economy development in Africa, hence the creation of a gap of unstudied research on blue economy policies in Africa, unlike in Europe and other places in the world where blue economy policies are advancing and can be seen from the European Union. Instead, the inside of the blue economy development in Africa is scattered across each country and is not connected and hence cannot be compared against each other.

In conclusion, **Figure 4** illustrates the interconnection and relationship among fisheries and aquaculture, fishing ports and landing sites, agriculture, tourism and recreation, maritime transport and shipping and shipbuilding and repair to envision the integrated blue economy framework in Lake Victoria, Kenya.

Figure 4: An Envisioned Blue Economy value chain



Source: Author's elaboration of an integrated blue value chain from Blue Economy articles

Fishing ports and landing sites that facilitate offloading, processing, and storing of fish are essential for carrying out fishing and aquaculture activities. To minimize post-harvest losses,

maintain product quality, and increase fishermen's profits, modern ports with cold storage and processing facilities need to be established to enhance food security and improve the communities' livelihoods. Fishing ports are critical links as they connect aquatic products from Lake Victoria into the wider markets. To reduce transit times and costs, efficient maritime transport and shipping services need to be established to facilitate the movement of fish and other goods from landing sites and ports to local and compete in international markets.

Maritime transport supports the movement of goods and has a large impact on the tourism sector by providing passenger services like ferries and water buses in turn enhancing tourism in Lake Victoria and generating revenue. A well-integrated transportation system is needed to link the vital tourist destinations and promote sustainable tourism growth and development in the Lake Region. Hence, promoting eco-tourism like recreational fishing and water sports would increase conservation awareness and support sustainable management of the lake's resources. Agriculture's inputs, like feeds for aquaculture, enhance the development of the fish farming sector. The need of integrating agriculture with aquaculture through integrated fish farming to improve resource efficiency, reduce costs, promote the sustainability of the agricultural sector, and provide value addition to local communities. Hence, the implementation of MPAs and adaptation of sustainable practices reduces ecological degradation, resulting in environmental benefits. Shipbuilding and repair ensure the maritime transport and shipping industry is operational by ensuring the well-maintenance of the vessels to meet safety standards and support the efficient movement of goods and passengers across the lake. There is a need to invest in shipbuilding by modernizing the infrastructure and facilities like the expansion of drydock and repair facilities, implementing green shipbuilding practices, and implementing continuous learning programs for workforce development.

7.6 Recommendation for policy practitioners

The study recommends the development of a comprehensive blue economy policy framework that integrates and aligns with international, national, and regional goals. The framework should incorporate good practices from successful blue economy practices from African nations like Lake Tanganyika, South Africa, and Zanzibar to address the specific challenges and potential opportunities in the Lake Victora region in Kenya.

Afterwards, encourage stakeholder collaboration amongst government agencies, local communities, and non-state actors. Government entities such as the Lake Region Economic Bloc (LREB) should play a role in fostering cooperation and an economic blueprint for the region. Additionally, the government should invest in critical infrastructure development like cold storage facilities and transport logistics to improve food security and reduce food wastage as the modern manufacturing capabilities can boost the region's competitiveness on a global scale.

Similarly, the government should implement management practices on responsible fisheries practices and encourage sustainable aquaculture to guarantee food security in the long run. This would entail enforcing laws against IUU practices and investing in research and training programs for the local communities. Additionally, adapting eco-friendly practices while imposing penalties on overfishing practices to protect the health of the lake's ecosystem. By developing a sustainable port infrastructure, the marine biodiversity is protected, which in turn helps sustain the health of Lake Victoria.

Another key approach that could support the blue economy framework in Lake Victoria, Kenya, is the support offered by the government in the SMEs development to diversify the economy and create job opportunities, especially for youth and women. There are several barriers, like limited access to finance and poor market links, that need to be addressed for the growth of SMEs. Additionally, to cut down on food spillage and increase fish production, the government needs to improve trade facilities and border management control checkpoints. This includes investing in cold truck transport networks as well as taking into consideration standardizing regulations at border control.

7.7 Recommendation for future academic studies

The following study was focused on one region, Lake Victoria, Kenya, and subsequent studies ought to extend beyond the Lake Victoria and encompass other regions and nations that share the lake. This wider perspective can provide a comprehensive understanding of the effects and possibilities of the blue economy in different contexts.

Moreover, another study area is creating dashboards like the European Union blue economy observatory for the comparison of blue economy among countries like Kenya, Uganda, and Tanzania alongside different value chain sectors as they are connected using the same blue

ecosystem. The platform creates maps and displays insights showing economic indicators used for the establishment of blue economy sectors by comparing dashboards and specific analysis for conducting longitudinal studies that helps to observe change over time and determine the long-term effects of blue economy initiatives. This approach can shed light on how sustainable and effective these strategies are once implemented.

Examining the roles that various stakeholders, including local communities, government agencies, and non-state actors, play in the blue economy could be another important field of research. This is because opportunities for improved stakeholder engagement and collaboration can be found in the research

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