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The Economics of Lake Victoria Beaches Urbanization and their Influences on Blue Economy: Towards Sustainable Development in Kenya

⬤ Ong'anya Oriewo Dedan

School of Business and Economics, Department of Economics, Moi University, P. O. Box 3900-30100, Kesses, Kenya

Abstract

This paper investigated the urbanization of Lake Victoria beaches and its influences on the blue economy, specifically focusing on sustainable development in Kenya. Key research questions addressed included the dimensions of urbanization, its impact on the blue economy and local livelihoods, as well as threats and strategic management approaches for sustainable development. The study employed a mixed-methods research design, integrating both primary and secondary data sources. An eight-week field study was conducted in the selected beaches (Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru Bay, and Sori. The data was collected using questionnaires, interview schedules and secondary data. The data was entered into SPSS statistical software for analysis using both descriptive and inferential statistics. The results indicated a significant correlation between urbanisation of Lake Victoria beaches (Employment opportunity creation, infrastructure transformation and quality standards of social amenities) and blue economy ($p<0.005$). The findings suggest that urbanization is key for promoting the blue economy, providing improved access to public services, job opportunities, and enhancing the timely availability of essential services. Factors such as high population, security, strategic location, job and business opportunities, and social services have significantly contributed to the growth and development of the beaches studied. The presence of Lake Victoria and the availability of clean water, health centers, schools and shops also attract migrants, promoting trade and urbanization. However, urbanization also brings challenges such as poor planning, inadequate infrastructure, water and sewerage issues, increased poverty, poor housing conditions, and uncontrolled livelihood activities. In conclusion, sustainable urbanization is a critical model for realizing a sustainable blue economy, necessitating technological advancements, infrastructural transformation, improved transportation and communication, and enhanced social amenities. Recommended strategies include building sustainable and environmentally friendly urban areas,

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providing essential services, creating jobs, establishing special economic zones, diversifying fishery products, and optimizing fish harvesting and post-harvest management.

Correspondence: onganyado@yahoo.com or onganyadedan@gmail.com

Introduction

Globally, the world's oceans, lakes, rivers, and wetlands, particularly Lake Victoria, are recognized as sites of complex socio-economic and environmental processes, challenges, and opportunities. At the 19th Session of the Intergovernmental Committee of Experts (ICE) held in March 2015 in Madagascar, the importance of the Blue Economy in Eastern Africa was highlighted as key for structural transformation, sustainable economic growth, and social development. The Blue Economy is promoted as a key model for the economic development of the Lake Victoria region, directly providing livelihoods and indirectly supporting many others. However, achieving sustainable livelihoods, green and blue job creation, sustainable housing, food security and nutrition, quality education and infrastructure, waste management, ecological protection, and restoration of coastal and waterfront areas remains a significant challenge. The Lake Victoria region has experienced high levels of young migration, but poverty has not decreased as expected. Extreme and urban poverty within the beaches and other regions remains high. The educated middle classes and unskilled youth are unsupported as most fishing activities remain largely subsistence. The urbanization growth along the beaches of Lake Victoria has been unbalanced, with strong growth in fishing activities creating jobs that do not match the rising population along the beaches. Climate change, poor road infrastructure, inadequate water and sewer sanitation services, wetland destruction, poor solid waste management, pollution, and insufficient consideration for environmental and social sustainability are putting Lake Victoria's resources at risk. This hampers efforts to decouple socio-economic development from environmental degradation and hinders the potential of the lake to support current and future generations.

The majority of people who depend on the lake for their livelihood live in developing countries. Lake-based industries such as fisheries, maritime transport, aquaculture, tourism,

shipbuilding and repair, maritime education and training, marine cargo logistics, maritime law, safety and security, marine salvage, international shipping, energy, bio-prospecting, offshore mining, marine biotechnology, blue data, aqua-business, cargo consolidation, marine insurance, bunkering, ship handling, port agency, port-related services, water sports, and marine and maritime governance are critical providers of employment and income. Despite the potential for economic activities, the region experiences poor housing standards, inaccessibility, food insecurity, and inadequate infrastructure.

Urbanization in the Lake Victoria region is unbalanced and unsustainable due to a lack of growth drivers promoting social inclusion, job creation, livelihood improvement, and food production while protecting the lake's environmental health. This has hindered the region's potential to attract investment opportunities, boost food security, and create job opportunities for locals. The inhabitants of the lake region, especially those along the beaches, face numerous challenges including poor standards of living, inadequate infrastructure, and unplanned urbanization.

The growth of urban areas along Lake Victoria beaches places increasing demand on natural resources. Urbanization inherently translates to socio-economic vulnerability, meaning that even Lake Victoria beaches can be transformed into desirable places to live and work, resulting in continued urbanization. The region's population is also vulnerable to natural disasters, and access to basic services such as quality education, specialist healthcare, better employment opportunities, convenient transportation, entertainment, water, and sanitation is limited. The absolute number of poor people has remained broadly unchanged, with many young people unable to find decent employment.

The potential of Lake Victoria and its beaches has not been adequately explored. There is a growing need to promote sustainable economic growth, responsible production and consumption, social inclusion, preservation and improvement of livelihoods, and environmental sustainability through the circular economy. The Lake Victoria Region Economic Block (LVREB), comprising 13 counties in Kenya, is an area that requires urgent exploration of the relationship between Lake Victoria beaches and the Blue Economy. These counties include Trans Nzoia, Bungoma, Busia, Kakamega, Vihiga, Siaya, Kisumu, Kericho, Kisii, Nyamira, Bomet, Homa Bay, and Migori.

The region faces environmental and health hazards due to polluted lake water, poor waste disposal, and inadequate solid waste management. Understanding the linkages between the economy, environment, and society in the Lake Victoria region is key for offering better socio-economic conditions and improving the quality of life for residents. Integrated adaptive management and sustainable development of Lake Victoria beaches are essential.

Urbanization and globalization are symbols of the 21st century, characterized by the confluence of people, economic activity, and the built environment. However, the highly urbanizing beaches of Lake Victoria lack economic activity and built infrastructure. Economic factors, especially spatial inequalities in development, employment opportunities, and wages, drive urban migration. There is a need to shift the traditional model where lake resources are perceived as less useful for extraction and waste dumping. Promoting sustainable use of Lake Victoria

beach resources for economic growth, improved livelihoods, and ecosystem health is critical.

Urbanized cities are focal points for production, exchange, and consumption. Understanding the relationship between the urbanization of Lake Victoria beaches and the Blue Economy is essential. Although African economies are gradually improving, with some nations progressing towards high rankings among emerging economies, Eastern Africa remains the least urbanized but fastest urbanizing sub-region. In Kenya, the Blue Economy has the potential to account for up to 27% of revenue and 33% of exports, but it currently contributes only 2.5% to national GDP, indicating a loss of potential gains.

Lake Victoria, the second-largest freshwater lake in the world, supports over 35 million people in its catchment area and offers opportunities in fisheries, transport, communication, water, energy, tourism, agriculture, and mining. However, the main economic activity, fishing, has declined due to climatic changes and other challenges. The lake's resources are under increasing pressure, requiring more effective management to exploit them sustainably.

There are 844 fish landing beaches in Lake Victoria, facing sustainability challenges such as accessibility, poor infrastructure, inadequate sanitation, wetland destruction, solid waste management issues, presence of water hyacinth, inadequate energy supply, unplanned settlements, and low literacy levels. The communities rely heavily on the lake for their livelihood, exerting pressure on its resources. Overfishing, outdated fishing gear, lack of financial support, and ecological challenges like pollution hinder the realization of the lake's potential.

Despite the opportunities, the region faces negative impacts affecting the residents' economic and social status. Unplanned urbanization and infrastructure development increase vulnerability. The pressures on the lake environment impact the Blue Economy's viability, and some of Lake Victoria's iconic beaches have lost significant biodiversity. The landing beaches, though market places for fish and food products, continue to face problems such as waste management, flooding, accessibility, and poor planning.

There is a need for strategies to improve the potential of Lake Victoria beaches, attract investment in the fishery industry, eco-tourism, regulations, lake monitoring, waste management, and other areas. The Lake Victoria region's cities, associated with ports and waterfront development, are important trade and commerce hubs but fail to attract serious investment. These areas experience rapid population growth and unplanned economic growth, negatively impacting the natural environment. Supporting the vulnerable population becomes increasingly difficult.

For a long time, Lake Victoria has been known for its vibrant fishery but other socio-economic activities remain well documented in books only. However, considering the population growth rate, it is unlikely that fishing activities alone will satisfy the nutritional, income, and employment needs for the region. The significance of this study will be to help identify other areas in which Lake Victoria beaches can be of use; how to help support blue economy so as to improve livelihood status of the highly growing population of the people in these beach landing zones. The paper aims to be useful to the urban planners, developers and policy makers both locally and internationally, environmentalists and the

researchers. It will be a paper whose findings will help in opening up of the lake region for wider activities apart from fishing which is currently overwhelmed by overexploitation. The paper findings also aim to help in understanding that the Lake resources are not freely exploited and once messed is only nature that can restore.

Research questions

This paper investigated the Urbanisation of Lake Victoria Beaches and their Influences on Blue Economy: Threats and Strategic Management for Sustainable Development in Kenya. It evaluated the Urbanisation of Lake Victoria Beaches as a means of improving the blue economy potential of Lake Victoria beaches focusing on Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay Muhuru Bay and Sori. Besides, primary data was strengthened by desktop analysis focused on the benefits, threats and opportunities facing the beaches in terms of blue economy potential to support the growing young population within the beaches. The research questions of this study included:

i) What are the dimensions of urbanisation of Lake Victoria beaches?
ii) What is the influence of urbanisation of Lake Victoria beaches on blue economy and the livelihoods of growing young population in the beaches?
iii) What are the threats and strategic management approaches for sustainable d3evelopment of the Lake Victoria beaches?

Methodology

This study employed a mixed-methods research design, integrating both primary data collection and secondary data analysis. An eight-week field study was conducted in the selected beaches (Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru Bay, and Sori). The study observed and documented the physical and social environment, urban infrastructure, public services and economic activities in the beaches. Also, a semi-structured interviews was conducted with key stakeholders, including local government officials, beach management unit members, local business owners, fishermen, and residents. The questionnaires focused on their perceptions of urbanization, its benefits, and challenges, and potential strategies for sustainable development. The study also performed a comprehensive review of existing literature, reports, and studies related to the urbanization of Lake Victoria beaches, blue economy, and sustainable development. This included academic articles, government reports and documents from international organizations. Several spontaneous and unprepared conversations with people at the site are also made. The consulted persons are for example; officials at the County, UN-habitat and UNEP (United Nations Environmental Programme), CBOs at the site and others with a focus on environmental challenges, landowners of the site and other stakeholders that has an interest in the site. The data was entered into SPSS statistical software for analysis using both descriptive and inferential statistics.

Results and discussion

Demographic characteristic of respondent

Among the respondents in this study, females constituted 58% and males constituted 42%. This demographic imbalance suggests a higher birth rate among females, contributing to the overall population increase in Usenge, Lwanda

Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru Bay, and Sori beaches along Lake Victoria. It also indicates that females likely play a dominant role in both the population dynamics and livelihood activities within these surveyed beach communities.

Income and poverty

The study sought to find out the income and poverty in the Counties of Lake Victoria, the findings are as shown in Table 1.

Table 1: Income and Poverty in the Counties of Lake Victoria

County	(%) Absolute Poverty in 2022	(%) Absolute Poverty in 2023	Monthly Mean Income Kshs.	(%) Food Poverty	(%) of Population with Safe drinking water
Busia	52.90	66.00	3,310	65.1	61.40
Siaya	47.60	59.02	3,043	43.74	41.00
Kisumu	42.50	36.44	6,492	39.00	62.80
Homa Bay	46.90	78.49	3,862	63.00	34.90
Migori	39.08	59.63	3,910	41.14	18.60

Table 1 results indicate that high level of absolute poverty was experienced in Busia (52.9%) followed by Siaya (47.6%), this was followed by Homa Bay (46.9%) then Kisumu as Migori was the least. The findings also indicated a worrying trend where percentage absolute poverty increased in Busia, Siaya, Homa Bay and Migori but decreased in Kisumu, which was also reflected in the monthly mean income of Kisumu, the same trend was reflected in the percentage food poverty and percentage of population with access to safe drinking water.
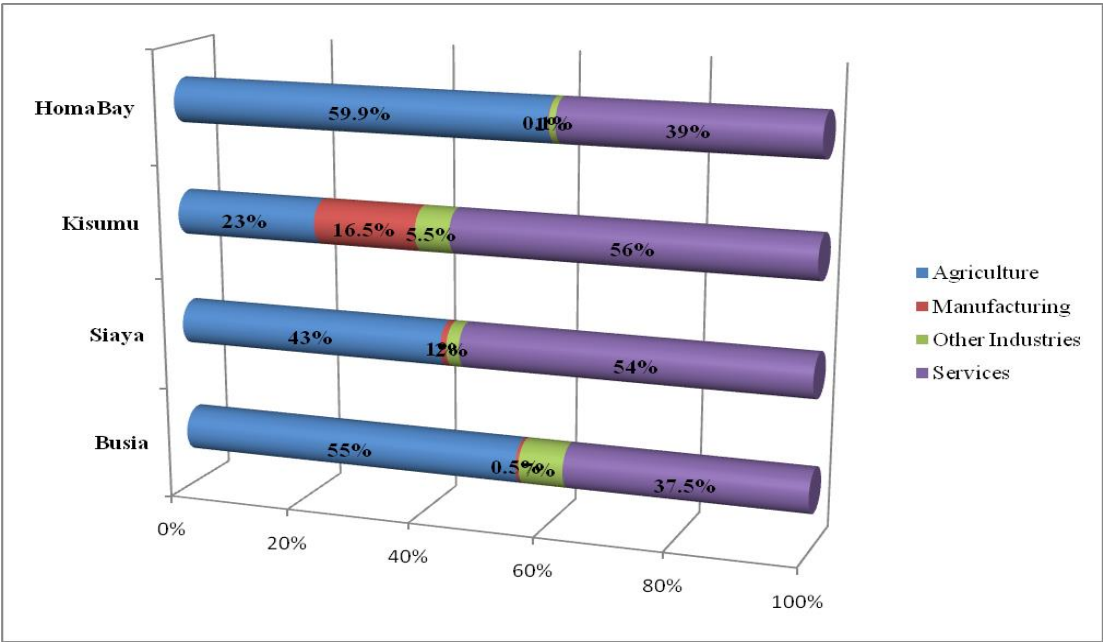

Figure 1: Basic livelihood activities in the studied counties

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Figure 1 shows that Homa Bay is predominantly an agriculture-based county at 59.9%, with manufacturing at 0.1%, other industries at 1%, and services accounting for 39%. In Kisumu, agriculture accounts for 23%, manufacturing 16.5%, other industries 5.5%, and services 56%. Similarly, in Siaya County, agriculture comprises 43%, manufacturing 1%, other industries 2%, and services 54%. In Busia County, agriculture is 55%, manufacturing 0.5%, other industries 7%, and services 37.5%. Notably, only in Kisumu is manufacturing on the rise, which could explain why, as shown in Table 1, the monthly mean income of Kisumu residents is double that of the other counties, with a decreasing absolute poverty rate.

Table 2: Factors for the growth of the beaches

FACTOR	SD	D	A	SA	Mean	Std. Dev.
High population	91	58	203	273	3.57887	1.11392
Security	58	24	242	301	3.7441	1.28900
Strategic location	55	61	218	291	3.7047	1.11556
Job opportunities	59	46	287	233	3.5827	1.25702
Business opportunities	74	61	234	256	3.6772	1.07344
Social services	34	28	225	338	3.6811	1.23065
Presence of Lake Victoria	57	45	241	282	3.6063	1.26465
Capital Flows	54	71	234	266	3.6811	1.15099
Merchandise Trade	58	50	213	304	3.6260	1.28763
Economic Growth	46	47	318	214	3.5709	1.20641
Mean Average Score					**3.645297**	**1.198927**

The results in Table 2 indicate that there are ten factors identified by respondents as contributing to the growth and development of Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru Bay, and Sori beaches. These factors are high population, security, strategic location, job opportunities, business opportunities, social services, the presence of Lake Victoria, capital flows, merchandise trade, and economic growth. Most respondents in these beaches agreed that the presence of Lake Victoria is the main factor driving the development of the beaches. Many respondents clearly reported that without Lake Victoria, these beaches would not exist. According to the respondents, their presence in the area is significantly influenced by the strategic location of the beaches, which include Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru Bay, and Sori, among others, on the shores of Lake Victoria. There is a growing demand for lake products like fish and fish products (such as frames, skin, gut, swim bladder, and fillet), sand, firewood, and charcoal originating from the islands within the lake. None of the respondents disagreed about the contribution of these factors, in addition to Lake Victoria, to the growth and development of the beaches.

In addition to the presence of Lake Victoria and strategic location, many respondents also reported that security in the area and the availability of social services like clean tap water, health centers, schools, and shops have attracted many people to the area, influencing trade and urbanization. The increased population at these beaches has expanded the market for fish, firewood, charcoal, and other agricultural products brought to these beaches for sale. Access, transit, and circulation demand for the beaches have

also increased, though with difficulties. A few respondents disagreed that the growth and development of these beaches were due to the strategic location, increased population, availability of security, and other social services like schools and health centers.

Human activities

The study assesd human activities done at Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru bay and Sori Beaches on Lake Victoria. Figure 2 illustrate the findings.
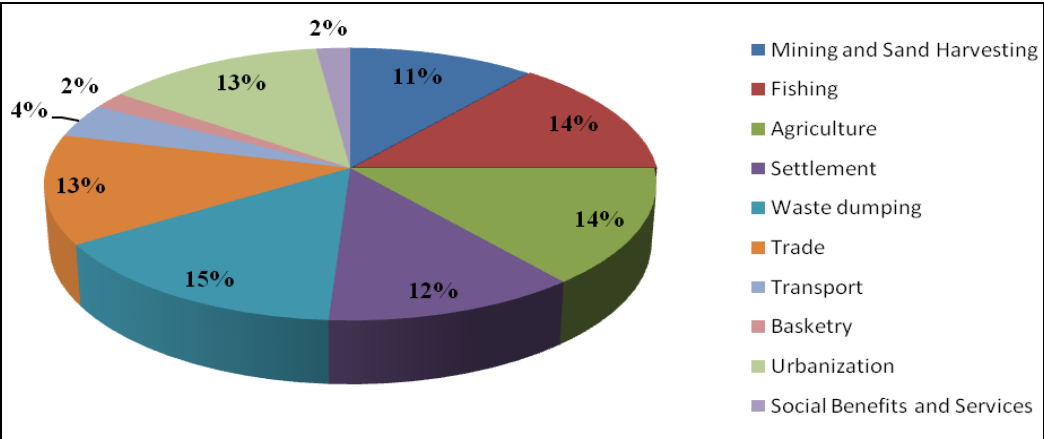

Figure 2: Human Activities Done at Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay Muhuru Bay and Sori Beaches on Lake Victoria

As shown in Figure 2, the primary human activity at Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru Bay, and Sori beaches is waste dumping (15%), followed by fishing (14%), trade (13%), and urbanization (13%). Confident respondents in the study argued that waste dumping around these beaches is inevitable due to the high population, which leads to increased fishing, trade, and urbanization, all of which generate more waste dumped around the water body.

According to Nyaloka (a pseudonym), a fish dealer at Usenge beach, a lot of waste is produced by the business as the caught fish needs to be cleaned, removing the intestinal parts and scales, generating waste. Moreover, fishers buy packed foodstuffs to take with them into the lake; after consuming these items, the waste is thrown into the water.

Lake waves later drive this waste back to the beaches, causing rising pollution. The trade of other commodities, like edible goods, also contributes significantly to waste generation in the area.

The respondents also pointed out other significant human activities at these beaches, including settlement (12%), mining (11%), transport, and social activities like schools and health centers. While these activities have a considerable impact on the growth and development of the studied beaches, they also affect the lake's existence.

The importance of urbanisation of lake victoria beaches to blue economy

The first objective of the study was to establish the importance of Urbanisation of Lake Victoria Beaches to Blue economy and the results were as shown in Table 3.

Table 3: Importance of urbanisation of lake victoria beaches to blue economy

		Frequency	Percent
Valid	Economic Growth	81	13.0
	Merchandise Trade	79	12.6
	Capital Flows	212	33.9
	Labour Markets	209	33.5
	Fiscal and Monetary Performance	44	7.1
	Total	625	100.0

The results in Table 3 identified the importance of Urbanisation of Lake Victoria Beaches to the Blue economy that enhance blue economic development aspects and indicated that economic growth 81 (13.0%), merchandise trade 79 (12.6%), capital flows 212 (33.9%), labour markets 209 (33.5%) while fiscal and monetary performance was 44 (7.1%). This implied that most of the Blue economy activities in this study could depend on the urbanisation of Lake Victoria beaches for different aspects of economic, social and environmental performance. This is a pointer that Urbanisation of Lake Victoria Beaches can be a useful strategic tool model for blue economic value creations that lead to realisation of basic attractive services that people migrate to urban areas in search for. Therefore, the most important areas as identified in the results include capital flows and labour markets as means of optimising blue economy benefits, which includes promote growth, social inclusion, job creation, improvement of livelihoods, and increase food production from the Lake Victoria beaches, while at the same time ensuring the environmental health of the oceans and other water bodies. This is important to the fishing activity which is currently overstretched with declining species of catch and is unable to provide for employment opportunities to the growing population along these beaches.

Measures of blue economy performance

The results in Table 4 show that respondents generally identified five main measures of performing blue economy activities, with composite mean and standard deviation scores of 3.65748 points and 0.99291 points, respectively. The composite mean score indicates that respondents agreed with the statements and were familiar with these identified measures. Specifically, 266 (42.5%) of the respondents agreed that, overall, the blue economy has seen a steady increase over the last 12 months. Similarly, 239 (38.2%) were neutral about the overall growth of blue economy activities—maritime transport, fishing, aquaculture, tourism, shipbuilding and repair, maritime education and training, marine cargo logistics, maritime law, safety and security, marine salvage, international shipping, transport, energy, bio-prospecting, offshore mining, marine biotechnology, blue data, aqua-business, cargo consolidation, marine insurance, bunkering, ship handling, port agency, port-related services, water sports, as well as marine and maritime governance—over the last five years. Additionally, 189 (30.3%) were neutral on the measure that trade and general merchandise activity volumes have been increasing, while 266 (36.2%) of the respondents were neutral on the measure that accessibility, transit, and circulation volumes have improved.

Finally, 364 (58.3%) respondents were   uncertain about the measure.

Table 4: Measures of Blue Economy Performance

	1	2	3	4	5	Mean	Std. Dev.
Overall, blue economy has been steady increase over the last 12 months	34 (5.5%)	34 (5.5%)	140(22.4%)	266(42.5%)	150(24.0%)	3.7402	1.05735
Overall, blue economy and its activities-maritime transport, fishing, aquaculture, tourism, shipbuilding and repair, maritime education and training, marine cargo logistics, maritime law, safety and security, marine salvage, international shipping, transport, energy, bio-prospecting, offshore mining, marine biotechnology, blue data, aqua-business, cargo consolidation, marine insurance, bunkering, ship handling, port agency, port related services, water sports, as well as marine and maritime governance has been growing for the last 5 years	47(7.5%)	84(13.4%)	239(38.2%)	197(31.5%)	59(9.4%)	3.2205	1.04002
Trade and general merchandise activity volumes has been increasing	0(0.0%)	128(20.5%)	189(30.3%)	155(24.8%)	153(24.4%)	3.5315	1.07293
Accessibility, Transit and Circulation Volumes has improved	47(7.5%)	150(24.0%)	266(36.2%)	184(29.5%)	18(2.8%)	2.9606	.97317
Cost saving from automation and modernization has increased blue economy benefits	0(0.0%)	64(10.2%)	364(58.3%)	121(19.3%)	76(12.2%)	3.3346	.82105
Composite Score						**3.65748**	**0.99291**

NB: 1=Strongly   Disagree,   2=Disagree,   3=Not   Sure,   4=Agree,   5=Strongly   Agree

The inability of the majority of respondents to agree or disagree with the measures of the blue economy demonstrates a poor understanding among the respondents in the surveyed Lake Victoria beaches. This could imply underutilization of the blue economy in the area and overreliance on fishing as the main livelihood activity, which is the case for all beaches along Lake Victoria. It also suggests difficulty in effectively measuring blue economy activities and tracking the anticipated benefits with certainty. Consequently, to achieve steady improvement and attain double-digit growth in the blue economy, the studied beaches should embrace and implement suitable urbanization approaches for Lake Victoria Beaches, as established in the earlier findings.
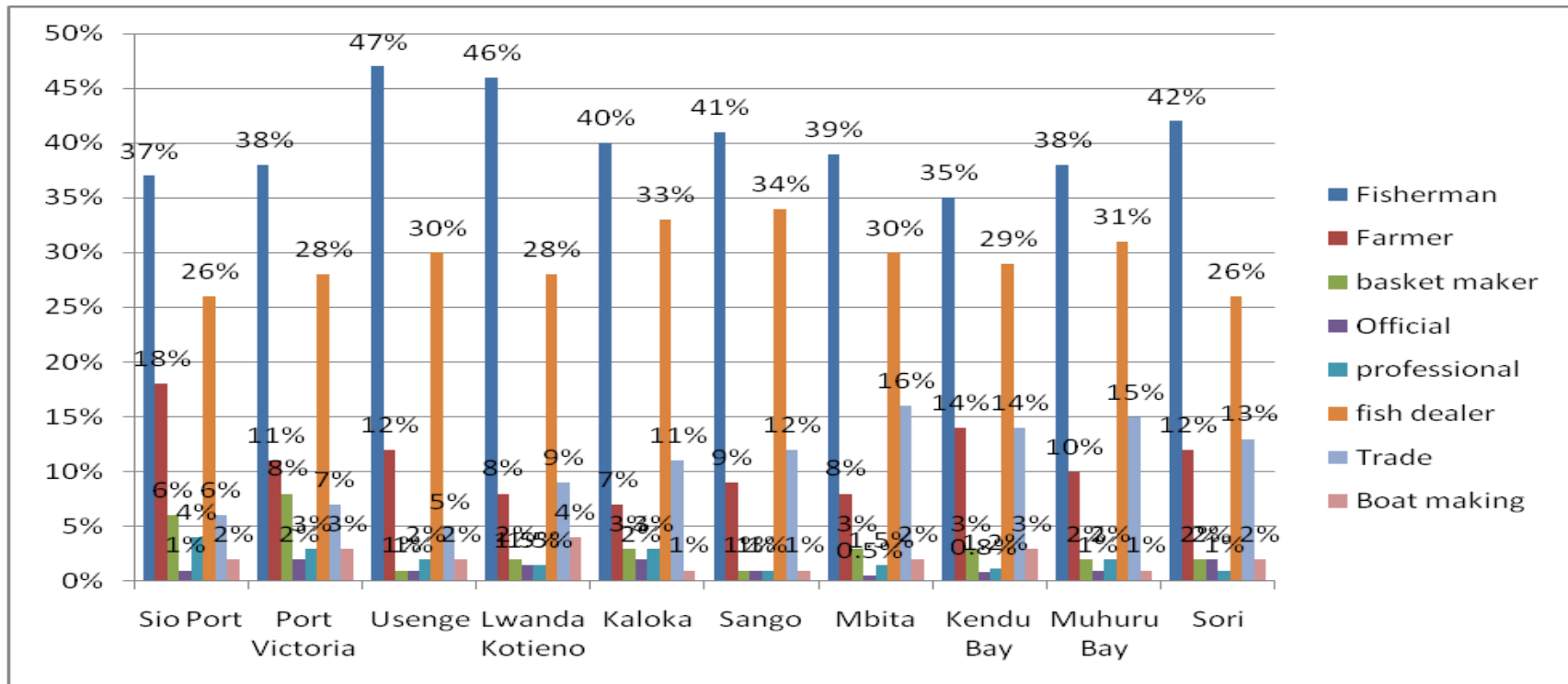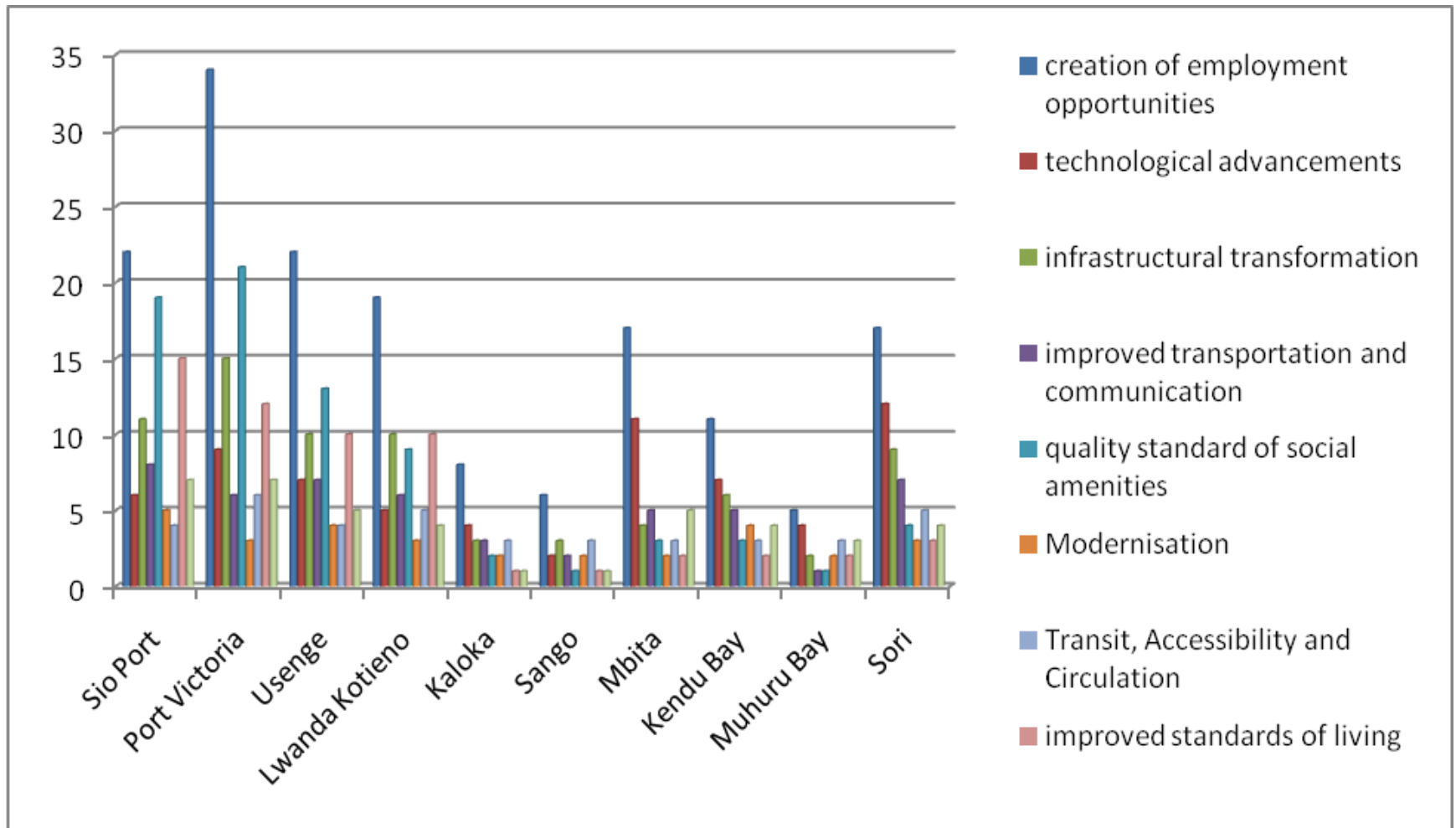
Figure 3: Occupation of respondents

Figure 4: Urbanization of Lake Victoria Beache

Most of the people living in the surveyed beaches are fishermen (40.3%) and fish dealers (29.5%) on average across all the ten beaches, the least number of respondent were boat makers (2.1%) official (1.3%), and professional workers like teachers and nurses (2.0%) indicating that most of the respondents in the studied beaches largely depend on Lake Victoria as a resource for livelihood and therefore the effect can be evident in the areas due to increased population of different Lake products and fish products growing at a high rate, that the Lake cannot support.

Urbanization of Lake Victoria Beaches

The study sought to established possible outcomes of urbanisation of Lake Victoria beaches. The respondents were given major areas to choose from. The results are in Figure 4. It was established that the respondents believed that the realization of urbanisation in the surveyed beaches can help in the creation of employment opportunities, technological advancements, infrastructural transformation, improved transportation and communication, quality standard of social amenities, modernisation, transit, accessibility and circulation, improved standards of living, improved mobility solutions and automation improvements in public transportation. These are considered key top urbanisation and must be available to consider a place as urbanized, which often pull migrants from rural areas to urbanized areas.

On average across all the counties, creation of employment opportunities was considered high at 161 (25.8%); quality standards and social amenities were 76 (12.2%); infrastructure transformation was 73 (11.7%) while the least reported was modernization 30 (4.8%) and automation improvements in public transportation at 31 (4.96%). This was an indication that the most prioritised area was creation of employment opportunities, infrastructural transformation and quality standards of social amenities. This also indicates the critical areas that need urgent solution in the surveyed beaches.

Urbanization of Lake Victoria Beaches influence on Blue economy

It was also useful in seeking to establish the influence of modernization of Lake Victoria beaches on the blue economy. The results are as shown in Table 5. The results show that 75.31% agreed with the statement that urbanisation of the beaches can improve proximity to public services. 54.8% agreed that urbanisation of the beaches can also enhance timely availability and access to services, 65.7% agreed that in order for urbanisation to sustainably support blue economy as expected, there are several structures that need to be set up including the beach management units (BMUs), proper urban planning, land use/cover change, beach guards, 56.0% agreed that urbanisation can help build or strengthen independent units or tiers of sustainable beach governance, 70.5% agreed that urbanisation of the beaches enhances transfer of authority for decision making of Lake resources from free gifts to revenue resources that must be properly managed for optimum benefits for all, 69.3% agreed that urbanisation of the beaches need to be given autonomy and independence without direct control of national government, 60.8% strongly agreed that Decentralised unit need to be given autonomy and independence without direct control of centre government, 69.9% agreed that the local level units must have clear and legally recognized geographical boundaries to exercise authority and perform public functions, 63.9% agreed that urbanisation of the beaches should act on its own, not under

hierarchical supervision of the central government while 58.4% agreed that Urbanized beaches can permit to establish and manage their own budgetary, evaluation system and monitoring.

Table 5: Descriptive Statistics on Influence of Urbanisation of Lake Victoria beaches on Blue Economy

Statements	SD	D	N	A	SA	Mean	Std. Dev
Urbanisation of the beaches can improve proximity to public services	3.62%	3.04%	7.81%	75.31%	10.22%	3.87	0.79
Urbanisation of the beaches have enhanced Timely availability and access to services and job opportunities	1.83%	16.32%	17.5%	54.8%	9.6%	3.54	0.94
In order for urbanisation to sustainably support blue economy as expected, there are several structures that need to be set up including the Beach management units (BMUs), proper urban planning, land use/cover change, Beach Guards	3.04%	3.04%	7.81%	65.7%	20.5%	3.98	0.82
Urbanisation can help build or strengthen independent units or tiers of beach governance	9.6%	15.1%	4.8%	56.0%	14.5%	3.51	1.20
Urbanisation of the beaches enhances transfer of authority for decision making of Lake resources from free gifts to revenue resources that must be properly managed for optimum benefits for all	0.0%	0.0%	9.6%	70.5%	19.9%	4.10	0.54
Urbanisation illustrates inter-organizational pattern of power relationship	2.4%	1.83%	1.2%	69.3%	25.3%	4.13	0.74
Urbanisation of the beaches need to be given autonomy and independence without direct control of centre government	0.0%	0.0%	0.0%	39.2%	60.8%	4.61	0.49
The local level units must have clear and legally recognized geographical boundaries to exercise authority and perform public functions	0.0%	0.0%	0.0%	69.9%	30.1%	4.30	0.46
The urbanisation of the beaches should act on its own, not under hierarchical supervision of the Central Government	0.0%	0.0%	0.0%	36.1%	63.9%	4.64	0.48
Devolved entities permit to establish and manage their own budgetary, evaluation system and monitoring	1.83%	1.83%	6.0%	31.9%	58.4%	4.43	0.83
Grand Mean Score						4.11	0.73

The overall mean of the responses was 4.11 which indicates that majority of the respondents agreed with urbanization of surveyed beaches as measures of blue economy. The standard deviation of 0.73 indicates that the responses were closely varied.

Urbanization of Lake Victoria beaches and its Influence on Blue Economy

Finally, it was to establish the composite influence of urbanization of Lake Victoria beaches on blue economy. The results are as shown in Table 6.

Table 6: Correlation between Urbanisation of Lake Victoria beaches and Blue Economy

		Blue Economy	Urbanisation of Lake Victoria beaches
Blue Economy	Pearson Correlation	1	
	Sig. (2-tailed)		
Urbanisation of Lake Victoria beaches	Pearson Correlation	.694**	1
	Sig. (2-tailed)	0.000	

*** Correlation is significant at the 0.01 level (2-tailed).*

Fitness of Model

The fitness of model explains the relationship between urbanisation of Lake Victoria beaches and Blue Economy. Urbanisation of Lake Victoria beaches was found to be satisfactory variable in determining blue economy. This was supported by the coefficient of determination also known as the R-square of 0.482, ρ=0.000. This means that urbanisation of Lake Victoria beaches explains 48.2% of the variations in the blue economy. These results further mean that the model used to link the relationship between urbanisation of Lake Victoria beaches and blue economy was satisfactory.

Table 7: Model Fitness

Model	Coefficient
R	.694[a]
R Square	.482
Adjusted R Square	.480
Std. Error of the Estimate	.643525

The ANOVA results indicate $F_{(1, 212)}=142.020$, which implied that the model was statistically significant. Further, the results further indicate that the independent variable, urbanisation of Lake Victoria beaches was a good predictor of blue economy. This was also supported by the reported p=0.00 which was less than the conventional probability of 0.05 significance level. Table 8 results revealed a positive relationship between urbanisation of Lake Victoria beaches and blue economy (β =0.240). The relationship was also significant at 5% level of significance (P-value=0.000). This finding implied that an improvement in urbanisation of Lake Victoria beaches by one unit led to a 0.539-unit improvement in blue economy.

Table 8: Analysis of Variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	61.238	1	61.238	142.020	.000
Residual	106.504	212	.431		
Total	167.742	213			

Table 9: Regression Coefficient

	ß	Std. Error	beta	t	Sig
(Constant)	1.593	0.169		9.429	0.000
Urbanisation of Lake Victoria beaches	0.539	0.045	0.694	11.917	0.000

[a]. *Dependent Variable: Blue Economy*

The specific model is; Blue Economy= $1.593 + 0.539X_1$
Where; X_1 = urbanisation of Lake Victoria beaches

Connection of each Urbanisation of Lake Victoria beaches with Blue Economy

After describing the general connection between Urbanisation of Lake Victoria beaches adopted by county governments of the studied beaches and their blue economy, the study sought to find out the relationship between the urbanisation of Lake Victoria beaches approaches adopted and the blue economy. Regression analysis was applied to determine the predictive power of the influence of the Urbanisation of Lake Victoria beaches on blue economy of the beaches of the five counties.

Besides, multiple linear regression analysis between the urbanisation of Lake Victoria beaches components, the independent variables, and blue economy, the dependent variable was conducted and the results were as presented below. The results of the model summary of the regression analysis are presented in Table 10.

Table 10: Model summary of regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.694[a]	.482	.480	.59597	.482	113.137	2	210	.000

[a]. *Predictors: (Constant), distribution, Infrastructure Transformation and Quality Standards of Social Amenities*

The results in Table 10 indicate that the three constructs of urbanisation of Lake Victoria beaches that were investigated in this study explain only 48.2% (Adjusted R^2=0.480; ρ=0.000) influence on the dependent variable (Blue Economy). Therefore, it posits that other factors are contributing to 51.8%, out of the scope of this study, which are controlling blue economy at the surveyed beaches of the five counties.

ANOVA results

Further, the ANOVA Statistics test for the overall model as summarised in Table 11 was valid. ANOVA cross- tabulated results

were obtained based on the mean values on the respondents' views and opinions on the measurement indicators of blue economy in the surveyed beaches of the five counties.

Table 11: Model Summary of the Regression Analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	85.418	6	14.236	42.640	.000[a]
	Residual	82.467	211	.334		
	Total	**167.885**	**217**			

a. Predictors: (Constant), *distribution, Infrastructure Transformation and Quality Standards of Social Amenities*
b. *Dependent Variable: Blue Economy*

The significance value (p) for the relationship between Urbanisation of Lake Victoria beaches (Employment Opportunity Creation, Infrastructure Transformation and Quality Standards of Social Amenities) and Blue Economy at the surveyed beaches of the five counties was (p=0.000 < 0.05) and indicated that the relationship between Urbanisation of Lake Victoria beaches and Blue Economy was statistically significant, therefore, the linear regression model was valid predictor.

Correlation analysis of employment opportunity creation and blue economy

The correlation analysis findings are presented in Table 12.

Table 12: Correlation Analysis of Employment Opportunity Creation and Blue Economy

		Blue Economy	Employment Opportunity Creation	Infrastructure Transformation	Quality Standards of Social Amenities
Blue Economy	Pearson Correlation	.000			
	Sig. (2-tailed)				
Employment Opportunity Creation	Pearson Correlation	.787**	.000		
	Sig. (2- tailed)	0.000			
Infrastructure Transformation	Pearson Correlation	.698**	.464**	.000	
	Sig. (2- tailed)	0.000	0.000		
Quality Standards of Social Amenities	Pearson Correlation	.721**	.198*	.212**	.000
	Sig. (2- tailed)	0.000	0.011	0.006	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

The Pearson's r correlation between employment opportunity creation and blue economy is 0.787. This means that there is a strong relationship

between employment opportunity creation and blue economy since equitably distributed resources enables equitable blue economy. It means the changes in one variable are strongly correlated to change in the second. Given that 0.787 is also positive, therefore, a unit value increase in employment opportunity creation leads to increase in blue economy. There is a statistical significance between employment opportunity creation and blue economy (p=0.000).

The fitness of model explains the relationship between employment opportunity creation and blue economy. Employment opportunity creation was found to be satisfactory variable in predicting blue economy. This was supported by the coefficient of determination also known as the R-square of 0.6194. As a result, employment opportunity creation explains 61.94% of the variations in blue economy. Equally, infrastructure transformation had a Pearson's r correlation of r=0.698, p value =0.000 indicating a strong positive relationship between infrastructure transformation and blue economy. With a coefficient of determination, R-square of 0.487204, it means that infrastructure

transformation explains 48.72% of the variations in Blue Economy.

The findings revealed that the Pearson's r correlation between quality standards of social amenities and blue economy was .721 at p value =0.000 showing a strong positive relationship between quality standards of social amenities and blue economy. With a coefficient of determination, R-square of 0.519841, it means that quality standards of social amenities predict 51.99% of the variations in blue economy. These results further mean that the model applied to link the relationship between devolution system of governance (all the three components- employment opportunity creation, infrastructure transformation and quality standards of social amenities) and blue economy was satisfactory.

Coefficient of correlation

The coefficient of correlation was tested between urbanisation of Lake Victoria beaches (Employment Opportunity Creation, Infrastructure Transformation and Quality Standards of Social Amenities) on blue economy in Surveyed beaches of the five counties in Kenya. The regression statistical results were as presented Table 13.

Table 13: Coefficient of Correlation: Urbanisation of Lake Victoria beaches and Blue Economy

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.513	.169		8.951	.000
	Employment Opportunity Creation	.212	.053	.296	4.023	.000
	Infrastructure Transformation	.020	.053	.028	.375	.004
	Quality Standards of Social Amenities	.020	.009	.107	2.071	.003

a. Dependent Variable: Blue Economy

The results indicated the coefficient of correlation test and the established that when the three urbanisation of Lake Victoria beaches components are considered and made constant at zero, then blue economy will be effective at 1.513. From these findings, it can be concluded that, urbanisation of Lake Victoria beaches has a significant effect on blue economy.

Further, at 5% level of significance and 95% level of confidence, the relationships between all the three urbanisation of Lake Victoria beaches and the blue economy were all significant. This is because the statistically significant value (p) of each urbanisation of Lake Victoria beaches component was less than 0.05, meaning that the relationship between each component of urbanisation of Lake Victoria beaches and blue economy was statistically significant.

Threats and strategic management for sustainable development in Kenya

The promise of well paying jobs and prosperity, among other factors, pull migrants to areas considered more urban from rural areas. Already, half of the global population lives in urban. But in cities two of the most pressing problems facing the world today also come together: poverty and environmental degradation.

Poor air and water quality, insufficient water availability, waste-disposal problems, and high energy consumption are exacerbated by the increasing population density and demands of urban environments. Strong urban planning, land use and land cover change will be essential in managing these and other difficulties.

Accessibility, transit and circulation

The current movements along the surveyed beaches of Lake Victoria are of different types, with cars (*olwenda*), trucks, tuk tuk, boda boda, bicycles and walking. However, there are many physical barriers that limit accessibility, transit and circulation, especially to the Lake, with interrupted pathways and blocked boda boda paths. There is a lack of a coherent network that restricts and guides motor vehicle movement to the beach areas where it is not disturbing. Furthermore, motor vehicles limit access for sustainable modes of travel, such as pedestrians and cyclists. Yet Lake Victoria is an important channel for the corridor that covers Kisumu, Port bell, Jinja in Uganda, Mwanza, Bukoba and Musoma in Tanzania. It means that the 450ikm Lake Victoria ring road which will cover the entire shoreline of Lake Victoria can be useful in providing transport connections between Kenya, Uganda and Tanzania. In Kenya, the road starts from Busia County in Bumala, through Sio port and Port Victoria then through to Siaya, Kisumu, Homa Bay and Migori counties.

It means that accessibility; transit and circulation volume in the surveyed beaches is very poor and cannot attract serious investment to bring desired change to the blue economy. Lack of this accessibility, transit and circulation imply lack of access to quality standards of social amenities such as affordable quality housing, sewer and waste disposal, for example in Usenge beach with over 8,000 inhabitants, one toilet serves over 1,000 people. In Muhuru bay, education of a girl child is under threat.

"*Many girls in Muhuru Bay, with a population of about 25,000, have a slim chance of a secondary education as only four public schools in the area admit both genders. The few private schools are out of reach for many poor parents*"

This could also explain the reason why the school dropout rate for girls was high, as the education officer for Muhuru

Bay says, mostly due to early marriage, teenage pregnancy, children being orphaned by HIV/Aids and others being lured into fishing activities. In Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay and Sori, the story is the same.

Poor urban planning at the beaches

This is another threat that the surveyed beaches experience. The county governments of the surveyed beaches are the main planning institution for beach development and are faced with several challenges in its attempt to bring order in the development activities of the beaches. One challenge is associated with the extension of the beach boundaries to include an 80% land area that is predominantly rural in character and thus demanding a unique set of planning responses.

The land ownership type in this area is mainly freehold, putting direct conflict and influence on pattern of development on the individual owners' docket. With the rising demand for housing against a backdrop of limited space within the core urban centre, in these beaches, private developers continue to acquire private land for housing (residential and commercial) and related development within these areas often with little consideration of statutory planning requirements. Some conflicts are emerging from this practice, for example, settlers at the bottom of the slopes have to contend with increased surface run-off and flooding from uncoordinated developments on the higher slopes.

Most poor beach dwellers, constituting 65% of the population that resides in the informal settlements in the surveyed beaches with limited access to basic services, and are forced to eke a living from petty trades, snatching of people's things, putting up with single women with the aim of surviving while looking for a job. Such practices are common in all the surveyed beachews of Lake Victoria and are due to unplanned for such occupation pitting them against the law enforcement. It is no wonder that a significant section of the urban population complains of harassment by law enforcement agencies as a key issue.

Proliferation of informal settlement is another challenge associated with rapid informal expansion. They are characterized by congestion and lack of basic service extensions. Residents of these beaches feel neglected by the planning authorities, who in turn postulate that the very temporary nature of tenure conditions of their beach residency provides little justification for substantial investment. Indeed, most residents of Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay and Sori beaches perceive the planning responses from respective county government as 'reactive' as opposed to being 'pro-active'.

Inadequate infrastructure and services

Residents in most of the beaches in Lake Victoria continue to reel under poor road conditions, often resulting into non-competitive pricing of the fish resource further impoverishing the fisher folk community. The progressive decline in shipping services has increased the cost of trading limiting it to only local goods, as road transport is relatively expensive. Migrants of the beaches fondly recall the days when goods would be ferried to and from areas as far as Musoma, Mwanza and Bukoba in Tanzania and Jinja, Kampala and Entebbe in Uganda using Lake Victoria waters, bearing great economic benefit. This collapse has helped enhance the emergence of a large influx of 'boda boda'. Since such a development was not anticipated, no commensurate provisions

were made for cyclists, for example, bicycle tracks, with a resultant increase in accidents and congestion on the roads leading to the beaches. The 'boda boda' trade has grown to be a significant income earner for the poor youth who can't find formal employment with an estimated 2,000 bicycle taxis servicing various routes in major beaches. The challenge remains on how to integrate this economic activity into the urban transport system, while reducing user conflict and ensuring safety. Alongside this challenge is the begging opportunity to make public transport safer through provision of designated passenger stops on the various routes. Given that the surveyed beaches that are entirely walking ones due to their small size, a lot of potential for job creation lies in building urban roads that provides for bicycles and pedestrians use.

Water and sewerage

The water situation in all the beaches of Lake Victoria surveyed in this paper presents both unique challenges and opportunities. The current water supply network and sewerage system across all the beaches commands 20% and 5% coverage respectively, mainly concentrated within the built up beach zones. For instance, the combined water supply capacity from the two water treatment systems amounts to 20,000 m3/day against a projected demand of 50,000 m3/day. Most residents in these beaches are subjected to buying water at higher costs due to its unavailability as others use dirty Lake Water, where they wash, bathe and later carry home for domestic uses and with poorly build pit latrines within the proximity of the Lake, increasing the chances of cross contamination is high.

Piped water is supplied to these areas via handcart vendors who charge 50% higher than the cost of receiving the water directly through the supply meter. As a consequence, this population feels the bigger burden of disease as it has to contend with frequent exposure from use poorly build pit latrines within the proximity of the Lake, depriving them of much needed income for other household needs. In some of the beaches such as Sio Port and Port Victoria, construction of pit latrines is further inhibited by the high ground water table, surface run-offs and the flash floods intrinsic in these beaches. The major challenge therefore is in finding alternative technologies for affordable water supply and sanitation systems to the residents of such beaches to urgently reduce the disease burden amongst the Sio Port and Port Victoria residents.

It means that the residents normally draw water from the polluted Lake water with no reliable source of clean. The restaurants operating at the beaches have no alternative but use the contaminated water for services to their customers. Waste disposal at the beach is indiscriminate with human waste carried by surface run-offs into the Lake.

The paper found out that all the beaches have no proper initiatives for solid waste management. With no waste collection and recycling facilities, all the solid waste wastes find their way into the Lake through surface run-offs as well as indiscriminate waste disposal into the Lake. The rest are burnt.

Increased poverty at the beaches

The majority of people residing on the shores of Lake Victoria are poor. While urban poverty has been decreasing according to some measures, statistics indicate that the proportion of the urban population experiencing extreme poverty (food poverty, lack of access to social services including clean water) has been on the rise. Poverty in these beaches is

exemplified by a lack of food security, poor housing conditions, mushrooming slums and squatter settlements, increased insecurity, declining health standards, high under-5 mortality rates, low life expectancy, high prevalence of HIV/AIDS, and inequitable resource distribution.

The lack of other economic activities to support fishing in the surveyed beaches mainly contributes to the general decline in the livelihoods of the inhabitants. This, coupled with government restrictive fishing laws and frequent arrests of law violators, has resulted in a high level of unsustainable fishing, leading to growing rates of poverty at the beaches. Some of the arrested boats require fine payments that the owners cannot afford, effectively stopping the fishing activity and rendering individuals jobless. Many surveyed beach inhabitants were previously engaged in other activities such as farming, basket making, official duties, professional services, fish dealing, trade, and boat making. However, these activities remain secondary and are not the main focus, and therefore may not support the growing population of the beach inhabitants.

A reported decline in fish catch, accompanied by a slump in the sugar industry in the hinterland, has greatly affected the local beach economies, effectively reducing the purchasing power of households in the surveyed beaches. Their plight is worsened by the lack of decent and affordable housing, noting that public investment in the provision of low-cost decent housing has stagnated since the early 80s, with an annual housing deficit of over 150,000 units in the entire country. Subsistence farming, along with some small-scale trade, has emerged as a widely practiced option for household livelihood support, especially in Kendu Bay, Muhuru Bay, Lwanda Kotieno, Kaloka, and Sango, often with higher

female engagement. These beaches have experienced declining fishing activities due to stalled fish processing plants, pollution, and water hyacinth infestation.

Overcrowding is a form of congestion found in the surveyed beaches and is consistent because of overpopulation. It is an aspect that increases day by day as more people and immigrants move into the beaches in search of a better life. Most people from rural or undeveloped areas have the urge to migrate to these beaches, which normally leads to the congestion of people within a small area.

Poor housing conditions

Urban housing delivery involves providing housing that meets affordability and sustainability standards to urban dwellers within a given urban space. However, there is a mismatch between housing development and community facilities relative to the population.

Urbanization attracts people to urban areas, leading to a high increase in population. With more people living in urban centers, there continues to be a scarcity of housing. This scarcity is driven by insufficient expansion space for housing and public utilities, poverty, unemployment, and costly building materials that only a few individuals can afford. Many residents of the surveyed beaches live in substandard dwellings and settlements, largely due to informal settlements that remain largely unregulated in the area. Moreover, most beach sites lack hotels, guest houses, or resting places that visitors from outside can use, hindering the development and accessibility of these areas.

Unemployment and under-employment

A decline in employment opportunities is slowly creeping into the beaches of Lake Victoria Fishing, which has

traditionally been the main economic activity practiced, is fast dwindling due to various factors such as the over-exploitation of fish in Lake Victoria due to increased population; water pollution in the lake; introduced fish caging, and the resultant water hyacinth menace that has rendered most boating lanes inaccessible; falling water levels in the lake; and the receding shorelines.

Moreover, the shipping route is also endangered. The large government ferries that plied the shipping route to the City of Kisumu have since been recalled because of increased difficulties in berthing due to the declining water levels and the problems resulting from the water hyacinth. This has contributed to the reduction of employment opportunities and increased underemployment.

Uncontrolled livelihood activities in the lake

There are a number of livelihood activities carried within the shores and inside the Lake. This is after the declining fish catch. These activities include sand harvesting in the beaches and inside the Lake, Use of detergents in Lake Victoria and Washing of heavy petroleum vehicle in Lake Victoria

Strategic Management for Sustainable Development

1. Building Sustainable and Environmentally-friendly urban areas

Governments should pass laws that plan and provide environmentally sound beaches and smart growth techniques, considering that people should not reside in unsafe and polluted areas. The objective here is to build sustainable beaches that embrace improved environmental conditions and safe habitats for all urban populations. This is essential especially where there are

efforts to dredge Lake Victoria of its hyacinth menace, expanding water transport supported by ship building institute in Kisumu, the beaches of Lake Victoria can enhance Lake Resource exploitation to improve on the economic and livelihood activities of the people of the Lake region.

The County Governments concerned should also encourage sustainable use of urban resources and support an economy based on the sustainable environments such as investment in green infrastructure, sustainable industries, recycling and environmental campaigns, pollution management, renewable energy, green public transportation, and water recycling and reclamation. People need to be trained on Lake Resource utilisation and the notion that it is freely given so its free use must stop and only sustainable use of the Lake resources be allowed.

2. Provision of essential services

Urban stakeholders of Lake Victoria beaches must ensure all populations within these areas have access to adequate essential social services namely education, health, sanitation and clean water, technology, electricity, and food. The objective here is to provide and implement employment opportunities and wealth creation activities so that people can earn a living to pay for the maintenance of the services. Subsidies can also be availed by the government to lower the costs of basic healthcare, basic education, energy, education, public transportation, communication systems and technology.

3. Creation of more jobs

To lessen the negative effects of rapid urbanization while at the same time conserving natural ecosystems, private investments should be encouraged so as

to utilize natural resources and create more job opportunities. Tourism promotion and the sustainable exploitation of natural resources can create more jobs for urban populations. Subsidies and grants may as well be provided to foreign and private investment in environmentally friendly development projects that encourage job creation.

4. *Creation of special economic zones within the beaches*

In Mombasa, dry ports, and Dongo Kundu are emerging as new economic zones to support the already congested Mombasa town and its infrastructure. The beaches of Lake Victoria can as well become developed into economic zones to help in production of fish stocks to help restock controlled areas of the Lake. This can be done by dredging of beach areas, creating manmade Lake attached to the main Lake to have a control of fish movement. This will call for restocking of fish annually with the desired number. As a result, it can help projections that fishing activity annually produces specific revenue and the number of people to support. This together with supporting industries such as fish processing plants, fish products processing plants, and other product making plants will help improve the activities around the Lake, which in the end will attract more investment tapping in large foreign direct income and eco-tourism development.

5. *Diversification of fish and fishery products*

The findings of landings and fishing effort patterns reveal that tilapia and Nile perch in Lake Victoria are currently overfished across all the surveyed beaches, with no chance of increasing landings unless harvesting pressure is reduced in the short-term to allow stock recovery and achieve maximum sustainable yield (MSY) in the long term. That notwithstanding, more value can be derived from Nile perch and tilapia by diversifying the products. Fillet accounts for 37–40% of the total Nile perch and tilapia the remaining 60–63% are byproducts. Frames or skeletons with adhering flesh account for 40–43% of the byproducts' weight, followed by skin (8%), gut (5.7%), and swim bladder or fish maw (2.3%). The potential earnings from Nile perch and tilapia byproducts could be two times more than those from the fillet.

It also requires proper use of appropriate technology and investment to convert wastes into premium products to attract high-end consumers. For instance, when handled properly, fish skin can produce high quality leather. Various studies have shown that viable quantities of oil can be extracted and refined from Nile perch viscera, belly flaps, and heads. The resulting oils are rich in Omega 3 fatty acids, which are in great demand globally. It means that leather and oil processing plants are critical for diversification of fish and fishery products in these beaches.

The unconfirmed sources indicate that Nile perch swim bladder (maw) is among the precious aquatic products. This is because of the demand for fish bladder in China and Hong Kong. Currently fish maws on an average attract a retail value of USD 127 to 287 per kilogram. Although this trade has been going on in Lake Victoria since the 1990s, it is restricted to a few traders. If this value chain is formalized and optimized, it could give the lake edge communities an additional income. This means that a properly planned fishing in Lake Victoria beaches is key for the improved revenue generation both to the fishers and to the government.

6. *Optimization of fish harvesting and postharvest management*

The catch per unit effort (CPUE) for Nile perch in Sio Port, Port Victoria, Usenge, Lwanda Kotieno, Mbita, has progressively dropped since effort has increased. This is also the case with the *Omena*. The lowest annual landings of Nile perch in the previous two decades were 165,083.4 tonnes in 2015, significantly below the predicted maximum sustainable yield (MSY) of roughly 212,000–323,000 tonnes. A gradual increase in fishing effort in a fishery will increase the fish output until a maximum is achieved (MSY level). If fishing effort is increased further, including restocking of fish in controlled areas, the overall fish output will plateau beyond the MSY level and will always depend on the annual restocking of fish.

On the other hand, the catch of Dagaa, which accounts for most of the landings in the beaches such as Usenge, Lwanda Kotieno, Sori, Mbita, Sio Port, Muhuiru Bay and Kendu Bay, is lower than the MSY. The findings show that Dagaa and haplochromines are underexploited, having exploitation rates of less than 15%. Nonetheless, haplochromines are considered as low-value fish. Their true worth is found in their ecological function. Indeed, simulations using the Atlantis ecosystem model have revealed that minimizing haplochromine harvesting results in optimum ecosystem function, improved yield of economically significant species, and probably the least "socioeconomic" cost implications. Given these findings, there is an opportunity to increase landings from Usenge, Lwanda Kotieno, Sori, Mbita, Sio Port, Muhuiru Bay and Kendu Bay that currently produces about 8% overall total inland capture landings global.

7. *Other areas of potential investment*

In the last 10 years, landings of the main commercial species in the major beaches surveyed in this paper have either declined or stagnated. The stagnation of production from the captured fisheries presents an opportunity for entrepreneurs to bridge the large gap between the number of fish consumed and that recommended by the World Health Organization. The growing number of fish in cages in Lake Victoria could be a response to fill the deficit in fish production (Hamilton et al., 2019). However, caging is not a Lake Victoria sustainable likelihood activity. It is one of the major pollutants that spoils for oxygen concentration due to frequent movement of unwanted containers some that corrode and produce metal particles in water, some security houses of these nature are also not to the standard. Therefore, a controlled and appropriately accepted cage and caging materials must be allowed into the Lake.

Sustainable cage-fish farming offers an opportunity for investment in the venture's value chain. Presently, cage-building materials are sourced from Far East and Europe, an undertaking that is quite costly. Potential entrepreneurs can take on producing these materials locally and cheaply. Other potential investment areas in the cage culture value chain include fish seed and feed production, cold storage, value addition, consultancy, and marketing.

Conclusion

The paper concludes that, at face value, urbanization of the beaches is a critical approach to boosting the blue economy in the Lake Victoria region. It has been demonstrated to yield several beneficial outcomes for the blue economy, including improved proximity to public services, enhanced access to job opportunities, and

the establishment of necessary structures such as Beach Management Units (BMUs), proper urban planning, land use/cover changes, and beach guards, all of which support the thriving of the blue economy. Factors such as high population, security, strategic location, job opportunities, business prospects, social services, and the presence of Lake Victoria were identified as contributors to the growth and development of beaches like Usenge, Lwanda Kotieno, Sio Port, Port Victoria, Kaloka, Sango, Mbita, Kendu Bay, Muhuru Bay, and Sori. The presence of Lake Victoria, strategic location, and availability of essential services like clean water, health centers, and schools were noted to attract migrants to these beaches, influencing trade and urbanization. The growing population at these beaches has expanded the market for fish, firewood, charcoal, and other agricultural products, which are brought to these areas for sale. However, respondents highlighted challenges with access, transit, circulation, and the difficulties associated with managing increased demands at these beaches.

Additionally, it was concluded that while urbanization brings positive influences, it also poses threats. These include issues with accessibility, transit, and circulation, poor urban planning, inadequate infrastructure and services (particularly water and sewerage), increased poverty, substandard housing conditions, unregulated livelihood activities around the lake, and high rates of unemployment and underemployment. This suggests that urbanization, without proper control and planning, may lead to unforeseen and potentially negative consequences.

The paper also identifies strategic management strategies to mitigate these threats. These strategies include developing sustainable and environmentally friendly urban areas, providing essential services, creating more job opportunities, establishing special economic zones within the beaches, diversifying fish and fishery products, optimizing fish harvesting and post-harvest management, and exploring other areas for potential investment.

Recommendations

Urbanisation is a significant model that when applied sustainably, will help realise a sustainable blue economy. Therefore, areas such as creation of employment opportunities, technological advancements, infrastructural transformation, improved transportation and communication, quality standard of social amenities, modernisation, transit, accessibility and circulation, improved standards of living, improved mobility solutions and automation improvements in public transportation.

Acknowledgements

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