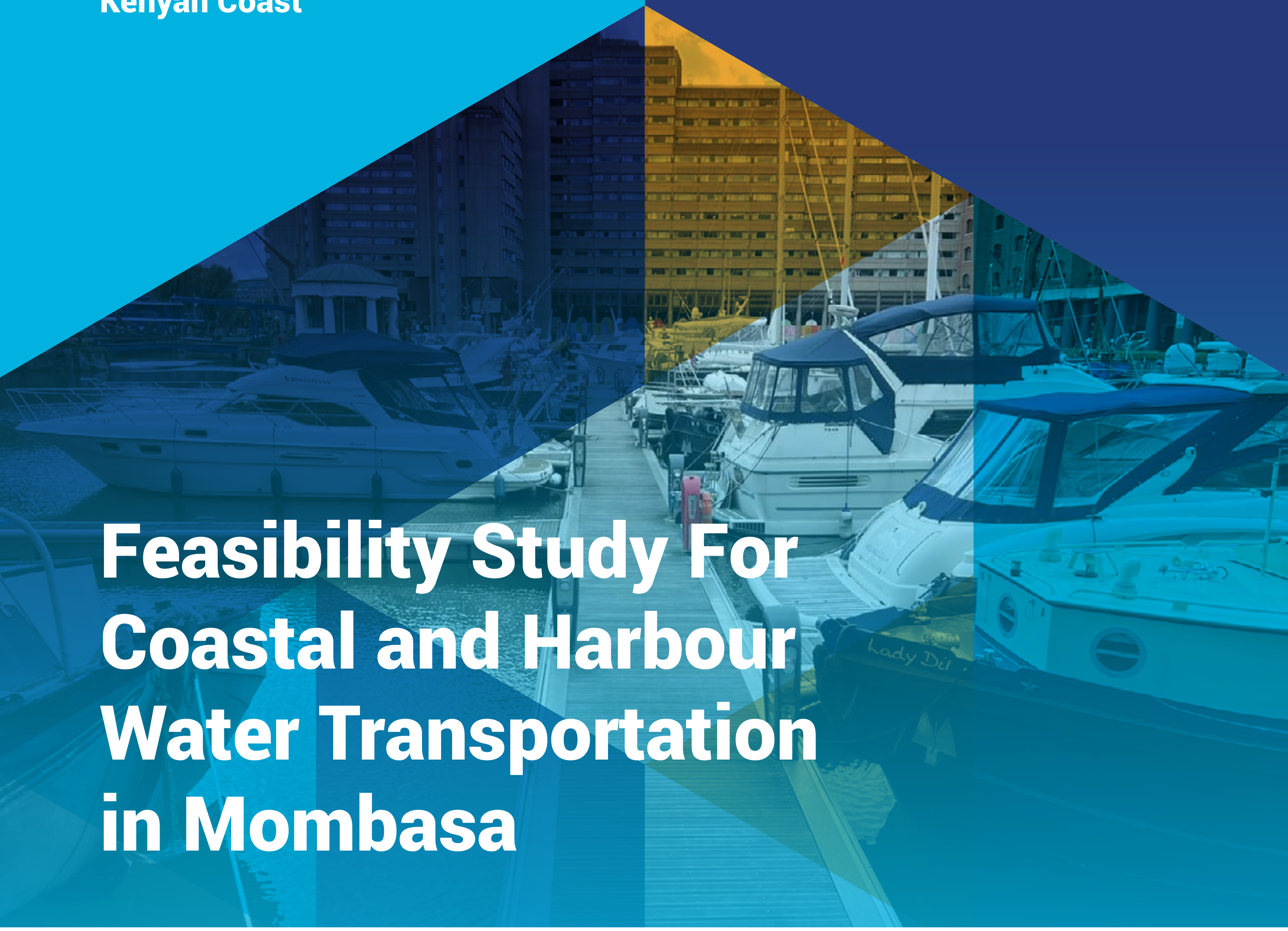
The Go Blue Project Result Area 2 “Connecting People, Cities and the Ocean: Innovative Land-Sea Planning and Management for a Sustainable and Resilient Kenyan Coast”



Feasibility Study For Coastal and Harbour Water Transportation in Mombasa

Funded by the European Union

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United Nations Human Settlements Programme (UN-Habitat)

P.O. Box 30030 00100 Nairobi GPO KENYA

Tel: 254-020-7623120 (Central Office)

www.unhabitat.org

Technical Lead

Eng. Howard A. M'mayi; Innocent Ngao (COMRED)

Contributors

Florian Lux; Jeremiah Ougo (UN-Habitat Go Blue Project) Daniel Manyala; Noah Akala; Basil Angaga (County Government of Mombasa), Titus Jefwa, George Moyale, Pamela Odhiambo, Paul Rabilo, Mwanamkuu Suleiman, Maimuna Mbwana, Steve Ndombi (COMRED)

Design and layout

Boniface Gor, digimatt.co.ke

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For more information

www.goblue.co.ke

For any comments, corrections and suggestions please write to

unhabitat-info@un.org

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Acronyms/Abbreviation

BMU	Beach Management Unit
BRT	Bus Rapid Transport
CBD	Central Business District
CGM	County Government of Mombasa
CORDIO	Coastal Oceans Research and Development in the Indian Ocean
COMRED	Coastal & Marine Resource Development
EIA	Environmental Impact Assessment
FS	Feasibility Study
FGD	Focus Group Discussions
GDP	Gross Domestic Product
KAHC	Kenya Association of Hotelkeepers and Caterers
KeFS	Kenya Fisheries Service
KMA	Kenya Maritime Authority
KMFRI	Kenya Marine & Fisheries Research Institute
KeNHA	Kenya National Highways Authority
KPA	Kenya Ports Authority
KSL	Kenya Shipyard Limited
KERRA	Kenya Rural Roads Authority
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
MBOA	Mombasa Boat Operators Association
MPA	Marine Protected Area
NEMA	National Environmental Management Authority
NMK	National Museums of Kenya
PFS	Pre-feasibility Study
SECO	Southern Engineering Company
SGR	Standard Gauge Railway
TUM	Technical University of Mombasa
UNEP	United Nations Environment Programme
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

Acknowledgements

The Feasibility Study (FS) on Coastal and Harbour Passenger Water Transport for Mombasa is the outcome of a strong collaborative partnership and shared commitment between UN-Habitat, the County Government of Mombasa, and the Coastal and Marine Resources Development (COMRED) in advancing sustainable urban mobility solutions for coastal regions.

We extend our sincere appreciation to the personnel from key institutions who contributed their expertise through key informant interviews, providing invaluable insights and references that enriched the study.

We are equally grateful to the members of the public who generously volunteered their time to participate in surveys, sharing their experiences, perspectives, and aspirations.

Your contributions have been instrumental in shaping recommendations that are firmly grounded in the realities and needs of the communities this initiative seeks to serve.

Executive Summary

Mombasa residents depend on various transportation modes, including matatus, shared bodabodas, tuk-tuks, private cars, and bicycles. According to a JICA report, matatus account for 36% of city trips, while a survey for this study indicates that 54.9% of residents primarily use matatus. Likoni leads in water transport use with 39.8% of users relying on ferry services, followed by Nyali at 13.6%, reflecting its role as a residential and commercial hub with significant tourism activity.

This study utilized a mixed-methods approach, incorporating Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), surveys, and physical site visits to gather robust data and insights. Twenty-two KIIs were conducted with stakeholders from government, the private sector, community groups, NGOs, and academia. A survey of 207 respondents (confidence level of 85%) revealed a strong demand for water transport, with 92.2% expressing interest in its adoption. While willingness to pay varied, most respondents preferred fares between KES 50–100. Traffic congestion and insecurity emerged as the top transportation challenges, cited by 80.5% of respondents.

Mombasa's Comprehensive Development Master Plan outlines ambitious passenger transport projects for 2020, 2030, and 2040, with Coastal and Harbour Water Transport (C&HWT) playing a crucial role in complementing these developments. The integration of water transport into Mombasa's transportation network is essential to achieving last-mile connectivity with key infrastructure, including the Standard Gauge Railway (SGR) station and Mombasa International Airport (MIA). Planned projects like the Kibarani Bus Terminus aim to connect road and water transport systems, enhancing accessibility for the public.

Twenty-two (22) proposed landing jetties were identified and georeferenced within the spatial framework, these are categorized by sub-region: Changamwe (Kitanga Juu, Mkupe, Jomvu, Mikindani, Mteza), Mvita (Old–Port Market, Tudor, Bandari), Kisauni (Mishomoroni, Mkomani, Nyali Msanakani, Bamburi, Utange/Ferry ya Zamani, Marina), Likoni (Mtongwe/Hawai, Timbwani, Likoni, Peleleza), and Mtwapa (Kidongo, Babylon, Moorings, Kwa Chief, Customs).

Comparative analysis of water transport and Bus Rapid Transit (BRT) systems highlights their potential as complementary solutions. A water bus system can transport 695 passengers per hour at an operational cost of $1,042.50, compared to a BRT system that achieves the same capacity at a lower cost of $521.25 per hour. Despite higher costs, water transport is particularly effective in high-congestion areas and along routes better suited for marine travel.

Comprehensive Development Master Plan aims to enhance Mombasa's urban transport network and integrate various modes of transport, including water transport, it will provide seamless mobility from road and rail terminals to the water, thereby linking the wider city area through efficient transport. Water bus offers an alternative with a substantial passenger capacity, but BRT system may be more cost-efficient per passenger. However, water bus can provide a valuable complement to the BRT system, especially where water transport routes are more feasible. Investment in water transport involves significant operational costs, including vessel purchase, fuel, crew salaries, maintenance, insurance, and regulatory compliance. These costs vary depending on vessel specifications. Public-private partnerships (PPPs) will be crucial for financing and developing essential infrastructure, such as jetties and landing sites.

Water transport also has the potential to boost Mombasa's tourism sector by offering convenient sea travel options to and from key beach destinations like Shanzu, Bamburi, and Nyali. Navigation routes and landing ports in these areas would enhance accessibility for both tourists and residents.

To ensure successful implementation, extensive public sensitization and awareness campaigns will be necessary to align expectations and promote stakeholder buy-in. By fostering collaboration among government, private investors, and communities, Mombasa can establish a sustainable and efficient water transport system, addressing congestion, supporting economic growth, and enhancing urban mobility.

Chapter 1

Introduction

1.1 Background Information

Kenya's second-largest city and port city Mombasa is the main gateway city to landlocked countries and a major local and international tourist attraction. Mombasa County contributes 5.2% to the GDP, Kenya's 3rd highest. The population of Mombasa is 1.2 million as per the 2019 census with a rapid population growth of 3.8% annually, which exceeds the national average. However, it is widely believed that Mombasa receives an additional 50% of transient populations during daytime and peak tourism seasons around April, August and from November to January. With the rapid population growth and sprawl, there is a continued rise in private car ownership, and inadequate public transport system, all contributing to congestion and lack of a high-quality public transport system. The county government of Mombasa's response to these challenges has included the development of a County Public Transport Service Plan for a potential Bus Rapid Transport (BRT) network, planning for Non-Motorized Transport infrastructure to encourage active transport modes, and a focus on water as an alternate mode of public transport.

The European Union (EU), together with the United Nations Human Settlements Programme (UN-Habitat) and the United Nations Environment Programme (UNEP) are funding and jointly implementing the Go Blue Project in the six coastal counties of Kilifi, Kwale, Lamu, Mombasa, Taita Taveta and Tana River. The projects' Result Area 2 "Connecting People, Cities and the Ocean: Innovative Land-Sea Planning and Management for a Sustainable and Resilient Kenyan Coast" aims at enhancing land-sea planning and management by addressing key socio-economic and environmental challenges while stimulating benefits from the blue economy. By promoting the economic growth of coastal urban residents and the preservation of coastal and marine resources, the GO Blue project seeks to assist in Kenya's transition to a sustainable blue economy.

Following requests from the County Government of Mombasa, through H.E Governor Abdullswamad Sherrif Nassir, the UN-Habitat is supporting a Feasibility Study (FS) on Coastal and Harbour Passenger Water Transport for Mombasa County under result area 2 of the Go Blue project. The FS conducted in collaboration with Coastal and Marine Resources Development (COMRED) as the implementation partner will enable the county to understand the potential of the Coastal & harbour water transport system in unlocking the existing and projected public transport challenges, enabling the movement of passengers and freight. The FS entailed an analysis of the viability of Coastal and Harbour passenger water transport, providing an in-depth report with accurate estimates (up to 10–20% accuracy) for the investments required, the effectiveness as well as the profitability.

The FS will be the basis of the Coastal and Harbour passenger water transport capital estimates, operating costs and overall economic viability. When implemented, water transport can offer an economical and environmentally friendly competition for road transport. Investing in Coastal and Harbour water transport system is expected to share a large volume of traffic in the coastal belt.

Due to its island nature, Mombasa has limited space for expansion of urban infrastructure and services including road and railway structure. The traffic controls in place are inadequate creating challenges at major intersections, leading to congestion, delays, and reduced road safety.

Figure 1: Transport Situation in Mombasa

Mombasa is currently experiencing significant infrastructure developments aimed at improving road connectivity and reducing congestion. Ongoing Projects include the Dongo Kundu

Bypass, Mombasa–Mariakani Road (through Kwa Jomvu to Mariakani). The Mombasa–Kilifi Regional Projects include the Mombasa–Mtwapa and Mtwapa–Kilifi sections, which are nearing completion. Completed projects are the Makupa Bridge, Airport–Port Reitz Road, Kipevu–Miritini (Port Evacuation Route)–MPARD Package 1, Mwache–Mteza Road–MPARD Package 2, Mteza–Kibundani Road–MPARD Package 3. The Planned Projects include Mombasa Gate Bridge, Likoni–Ukunda–Lungalunga Road, Mombasa Northern Bypass. In addition, several ongoing maintenance and network improvement projects have been done including pedestrian walkways (e.g., near Mama Ngina Waterfront) and a dedicated cycle track from Nyali Centre to Nyali Bridge but these are still inadequate.

Within the coastal and harbour water transport systems, infrastructural developments are much less compared to roads. There exists potential considering Mombasa has 14 gazetted landing sites with basic standards for fishing activities including fishing, offloading, waste management and storage. However, their limited infrastructure requires improvement to handle passenger transport. The informal status of 36 landing sites would prevent their development, limiting them to fishing landing sites. These landing sites lack clear documentation of land ownership.

The County Government of Mombasa commissioned a Pre-Feasibility Study (PFS) on Passenger Water Transport in Mombasa and along the Kenyan Coast in 2014. The early-stage analysis provided basic information, and an overview based on which decision-makers can provide a green light on whether to proceed with or abandon the proposed passenger water transport initiative. The PFS provided a positive base-case scenario and an optimistic rather than a pessimistic start. It noted that: Firstly, on the problem of traffic congestion in Mombasa Island, 1 million people entered and left Mombasa Island daily, majority by passenger cars and reducing this number by providing alternative routes would help address the traffic congestion challenge. Secondly, on the technical financial viability of the passenger water transport around Mombasa Island, specifically the Island Line, water bus services connecting landing sites on North mainland and East of the island are technically and financially viable and additional peripheral infrastructure (access roads and parking areas) are recommended through a detailed study. Finally, large, seaworthy vessels are required for passenger water transport systems between Mombasa and the towns in the South and North Coast, due to the various challenges (including the sea conditions. Additionally, the Southern coastal towns have low population, low (seasonal) tourism, narrow creeks (Kilifi/Mtwapa), coral reefs, marine observation routes (Chale point), open sea and well-connected road transport. Water transport must compete with car travel time and costs.

1.2 TORs for the Feasibility Study (FS)

The Coastal and Harbour Water Transportation study led by UN-Habitat and COMRED, aims to establish a sustainable water transport system to alleviate traffic congestion and enhance mobility in the Mombasa region. This initiative seeks to provide an alternative mode of transport to road-based systems, particularly at critical access points such as the Nyali Bridge, the new Kibarani Bridge, and the Likoni Ferry. By promoting sustainable urban mobility, the project offers an economical and environmentally friendly solution that can complement and reduce pressure on the coastal road network, sharing a significant portion of the traffic volume along the coastal belt.

The FS entailed an analysis of the viability of Coastal and Harbour passenger water transport, providing an in-depth report with accurate estimates for the required investments, effectiveness, and profitability. The FS forms the basis of the Coastal and Harbour passenger water transport capital estimates, operating costs, required effectiveness, as well as the profitability. It also serves as the foundation for the overall economic viability of coastal and harbor passenger water transport.

The Feasibility Study (FS) builds on the foundation of the positive base-case scenario established in the Pre-Feasibility Study (PFS) to explore critical elements, including:

i. Identifying viable routes for passenger transport along the coastline and within harbours.

ii. Proposing innovative engineering measures to mitigate the challenges posed by tidal variations and surges.

iii. Reliable water buses capable of operating efficiently under extreme sea conditions

iv. Enhancing accessibility and attractiveness by introducing affordable, reliable, comfortable, and accessible water transport services while discouraging private car access to the city.

1.3 Objectives of the FS

v. To review existing literature (including reports, publications, thesis materials etc.) and establish main arterial short-distance passenger transport routes and waterways within Mombasa County. This includes preparation of relevant maps, models, designs, and plans for the established transport routes and waterways, together with attendant analytic descriptions.

vi. To provide an outlook of inland navigation in Mombasa including demand assessment, travel patterns, infrastructural gaps, and institutional support analysis. This includes making provision for possible engineering solutions to the tidal surges as well as a comprehensive business and financial plan for consideration by private sector investors.

vii. To provide a comparative analysis of waterways vis a vis other existing or proposed competing inland transportation modes like railway and roads including BRT and the augmenting capacity of such competing modes and, in parallel, the ability to discourage access by personal cars into the city.

viii. To provide an estimated broad cost for the proposed Coastal & Harbour water transport considering environment, technology, operations and space as well as the contribution of the proposed water transport to local economic development and GDP in the tourism, transport, trade, logistics, agriculture and related sectors.

ix. To recommend attractive (affordable, reliable, comfortable, accessible, relatively fast and sustainable) water bus solutions that are also suitable for extreme sea conditions considering passenger movements, environment, and the land-sea nexus, connecting the city to the hinterlands including places of important commercial, agricultural, residential, industrial, and institutional services.

The outputs delivered by this Feasibility Study are twofold:

Output 1: Transport Routes & Waterways and Engineering Solutions

Output 2: Recommended Water Bus Solutions based on comparative analysis, broad estimates, and attractiveness.

Chapter 2

Results by Objectives

2.1 Review of Existing Literature

With increasing urbanization, it is expected that future cities will have a high population density, and 70% of the total population shifting to cities by 2050[1]. Most cities are thus updating and expanding their transport systems to meet the rising demand. Countries with access to waterways and sea routes are considering water transport to complement their existing transport systems and networks. Such steps are in alignment with the New Urban Agenda as clearly outlined in paragraph 114, which emphasizes on the need for development of sustainable, inclusive, integrated, people-centered urban mobility systems including waterways especially for coastal cities and Small Island Developing States (SIDS)[2]. While water transport is mostly used for tourism and leisure purposes in most countries, there is a need to incorporate its use for local passenger transportation to minimize traffic-related concerns. A study by Moss (2021)[3], reveals that in 2019, traffic related issues resulted in an economic loss of ~$305 billion globally. Integration and implementation of passenger water transportation into the main Urban Transport System has aided in reducing traffic flows and congestion in cities such as Auckland, Brisbane and Istanbul[4]. In comparison to other modes of transport, water transport is reported to be environmentally friendly and energy effective[5].

One of the goals outlined in AU's Agenda 2063 is development of a "world class infrastructure that crisscrosses Africa" with a focus on prioritizing communications and infrastructure connectivity. Additionally, modernization and implementation of coastal and marine water transport systems is one of the key areas of intervention towards achievement of the goal of "Blue Economy for accelerated economic growth"[6]. This strategic framework not only puts emphasis on the need to leverage on the existing coastal waterways but also integrate water transport with other transport systems such as road and rail.

2.2 Review of Relevant Legal Instruments

In pursuit of this transformative vision, Kenya has embedded modernization of water transport systems in its long-term development plan (Kenya Vision 2030) through revitalization of inland water transport networks, ports expansion and modernization, as well as advancement of water transport vessels and related infrastructure. However, coastal and harbour water transportation in Kenya is mostly for shipping and leisure with few areas exploited for public transport such as the Likoni ferry. The Integrated National Transport Policy 2024 propagates for public passenger transportation, NMT and interconnectivity amongst various transport modes. Despite the progress that has been made, Kenya is yet to unlock the potential of coastal and harbour water transportation for public usage in its coastal cities to decongest these urban areas.

Mombasa, being one of the coastal cities in Kenya has a great potential to benefit from such advancements given its strategic location and navigable waterways. Being a port city, it has great prospects for economic growth coupled with challenges of rapid urbanization, lack of effective planning as well as weak governance frameworks. Given the numerous existing urban challenges, Mombasa has rethought its planning and restrategized by implementing development blueprints and plans to tackle related challenges such as: Mombasa Vision 2035, Mombasa Gate City Master Plan, County Integrated Plans as depicted in the summary table below.

The legal instruments reviewed were chosen based on recommendations from Key Informants working for various agencies, both governmental and Non-Governmental Organizations.

1 Bibri, SE and Krogstie, J. 2020a. Smart eco-city strategies and solutions for sustainability: The cases of royal seaport. Stockholm, and Western Harbor, Malmö, Sweden. Urban Science, 4(1): 1–42. DOI: https://doi. org/10.3390/urbansci4010011

2 Nations, U. (2017). New urban agenda. In *Habitat III–The United Nations Conference on Housing and Sustainable Urban Development.*

3 Moss, D. The True Cost of Congestion. Available online: https://internationalfleetworld.com/the-true-cost-of-congestion/ (accessed on 10 December 2021).

4 Cheemakurthy, H. (2017). Urban waterborne public transport systems: An overview of existing operations in world cities.

5 Gołębiowski, C. (2016). Inland water transport in Poland. Transportation Research Procedia, 14, 223–232.

6 DeGhetto, K., Gray, J. R., & Kiggundu, M. N. (2016). The African Union's Agenda 2063: Aspirations, challenges, and opportunities for management research. *Africa Journal of Management*, 2(1), 93–116.

Table 1: Summary of relevant Policy and Planning documents

Policy/Plan Document	Related elements
Mombasa Vision 2035	Integrating and improving road, rail, pedestrian, water and air transport Introduction of planned public transport system Navigability of Tudor creek for ferries from the Southern part of Mombasa Island to the Eastern part of Kisauni Unsuitability of ferry services in the Northern part of Kisauni during low tides Target economic hubs in Mombasa: Eco-city (Mwakirunge), Knowledge city (Maunguja), Petro-city (Mtongwe/ Shika adabu) Possibility of dredging a canal from Kisauni to the proposed knowledge city (Maunguja) Two proposed ferry routes in Tudor creek: Changamwe–Buxton–Mama Ngina Drive–Ferry stage Proposed Knowledge City–Buxton–Mama Ngina Road–Ferry Stage **Remarks**: *The three proposed economic hubs in Mombasa are a good target for development of public water transport system to ease commuter transport and trade needs*
Port Master Plan (2018–2047)	Infrastructural development in maritime transport Modernization of ferry services Enhancement of public-private partnerships in maritime transport Establishment of moorings and other passenger facilities Development of navigational aids in creeks using hydrographical surveys **Remarks**: *The strong focus on water transport provides good guidance for any development in water transport including landing sites, jetties*
JICA Mombasa Gate City Master Plan (2014–2030)	Need for a clear, accessible and navigable transport system Possibility of passenger water transportation along Nyali channel. Concerns: Wouldn't help alleviate congestion Wouldn't meet the mass demand Economic gap between Nyali and Old Town is difficult to bridge Discussion between CGM & KFS on possibility of re-opening Mtongwe ferry (passenger-only peak hour service) **Remarks**: *The concerns raised above might be based on false premise given the population density and composition of Nyali includes medium and low-income households that would be good targets for public water transport*

Policy/Plan Document	Related elements
Mombasa's Third County Integrated Development Plan (2023–2027)	Enhance accessibility and connectivity of road infrastructure, including improvements to Non-Motorized Transport (NMT) infrastructure Formulating NMT policies, preparing NMT plans, constructing new NMT networks, and reviewing/updating public transport service plans. Lack of water transport infrastructure Adequate natural resources (Indian Ocean) for water transport Developing Bus Rapid Transit (BRT) phase 1, conducting feasibility studies on water transport, and implementing recommendations from these studies. **Remarks:** *The current CIDP is premised on easing road transport congestion in Mombasa through development of NMT and BRT. This feasibility study responds to this CIDP plan.*
Maritime regulations	Ensure compliance with construction regulations, safety standards, safety navigation rules, and protection of marine environment Licensed maritime providers adhere to the stipulated conditions of the licenses Outlines need for enhanced connectivity of water transport with other transport modes and investment in infrastructural development
Other related documents	1. Pre-feasibility study of water transport in Mombasa 2014 2. Mombasa Marine Park Gazette Notice 1986–KWS[7] 3. Kenya Wildlife Strategic Plan 2024–28–Draft/KWS Conservation fees 2024. (Conservation fees)[8] 4. Mangrove Conservation Gazette Notice 1932–KWS 5. Environmental & Social Safeguards Guidelines 6. Urban Mobility Transport report by ITDP-CGM[9] 7. Fisheries Policy, Marine regulations[10] 8. BMU regulation, Fisheries Management and Development Act 378–KeFS[11] 9. Environmental Management and Coordination Act (EMCA) 1999 Cap 387[12] 10. Environmental Management and Coordination (Amendment) Act, 2015[13]

7 https://www.kws.go.ke/sites/default/files/2019–11/The%20Wildlife%20Conservation%20and%20Management%20Bill%202013_0.pdf

8 https://www.kws.go.ke/sites/default/files/2025-07/THE%20WILDLIFE%20CONSERVATION%20AND%20MANAGEMENT%20%28ACCESS%20AND%20CONSERVATION%29%20%28FEES%29%20REGULATIONS%2C%202025%20DRAFT_1.pdf

9 https://africa.itdp.org/publication/service-plan-for-public-transport-in-mombasa/

10 https://new.kenyalaw.org/akn/ke/act/2016/35/eng@2022-12-31

11 http://kenyalaw.org:8181/exist/rest/db/kenyalex/Kenya/Legislation/English/Acts%20and%20Regulations/F/Fisheries%20Management%20and%20Development%20Act%20-%20No.%2035%20of%202016/docs/FisheriesManagementandDevelopmentAct35of2016.pdf

12 https://pppkenya.go.ke/wp-content/uploads/2020/07/PPP-EMCA-Act.pdf

13 https://kenyalaw.org/kl/fileadmin/pdfdownloads/AmendmentActs/2015/EnvironmentalManagementandCo-ordination_Amendment_Act_2015_No5of2015_.pdf

2.3 Fish Landing Sites

Out of over 50 fish landing sites in Mombasa, a meagre 14 are gazetted, of which 5 have been encroached upon and may not fully be available for landing sites expansion. The rest of the landing sites still awaiting formal recognition and cannot be ideal candidates

Table 2: Gazetted Landing sites in Mombasa

Sub-County	Landing site	Status
Changamwe	Kitanga juu	Available
	Mkupe	Available
	Jomvu	Available
	Mikindani	Available
Mvita	Old-port market	Available
	Tudor	Encroached
Kisauni	Mishomoroni	Encroached
	Mkomani	Encroached
	Nyali Msanakani	Encroached
	Bamburi	Available
	Utange/Ferry ya zamani	Available
Likoni	Mtongwe/Hawai	Available
	Timbwani	Encroached
	Likoni	Available

Source: Haki Yetu Organization, (2015)

The development of water transport in Mombasa will require the development of eighteen proposed landing sites in Mombasa County and four in Mtwapa in Kilifi County making 22. The inclusion of Mtwapa is an acknowledgement of the significant daily traffic movements into Mombasa. Furthermore, it reflects the growing need for regional connectivity and the role that water transport can play in easing congestion, reducing travel times, and promoting sustainable alternatives to road-based transport.

The selection of landing sites to provide water transportation includes three key considerations, i.e., Sites at high traffic movement areas in terms of volume of daily traffic, which presents a clear opportunity for an efficient water transport network; Sites that are strategically located for intermodal connectivity such as proximity to existing or planned infrastructure for buses, taxis, and other forms of transportation ensure accessibility for passengers; Sites at existing landing sites that are undeveloped since they are already currently under active or passive use as landing areas. Areas with potential for infrastructure development to support larger vessels, more passengers, and improved services.

Table 3: Proposed landing sites for passenger water transport in Mombasa

Sub-County	No.	Landing site	Bathymetry	Soil Type	Type of Jetty Required	Approximate length of Jetty from high tide	Approximate Dimensions
Changamwe	1.	Kitanga juu	Gently sloping	Fine silty sand deposits with organic matter	Anchored Floating Jetty	50–100 m	As per vessel
	2.	Mkupe	Gently sloping	Fine silty sand with organic matter	Anchored Floating jetty	50–100 m	As per vessel
	3.	Jomvu	Gently sloping	Fine silty sand with organic matter	Anchored Floating jetty	50–100 m	As per vessel
	4.	Mikindani	Very gentle sloping	Fine silty clay with organic matter	Anchored floating jetty	50–100 m	As per vessel
	5.	Mteza	Steep sloping	Fine silty clays with organic matter	Anchored floating Jetty	30–80 m	As per vessel
Mvita	6.	Old-port market	Drastic dropping	Coral rock with Sandy deposits	Anchored floating jetty	20–60 m	As per vessel
	7.	Tudor	Drastic dropping	Coral rock with Sandy deposits	Anchored floating jetty	30–80 m	As per vessel
	8.	Bandari	Steep sloping	Fine Sand overlaying coral rock	Anchored floating jetty	30–80 m	As per vessel
Kisauni	9.	Mishomoroni	Steep sloping	Very fine silty clay with organic matter	Anchored floating jetty	30–100 m	As per vessel
	10.	Mkomani	Steep sloping	Fine Sand and coral rock	Anchored floating jetty	30–80 m	As per vessel
	11.	Nyali Msanakani	Gently sloping	Fine Sand overlaying coral rock	Fixed jetty with breakwater wall	200–1000 m	At least 200 m breakwater structure
	12.	Bamburi	Gently sloping	Fine Sand overlaying coral rock	Fixed frame jetty with breakwater wall	200–1000 m	At least 200 m breakwater structure
	13.	Utange/Ferry ya zamani	Drastic dropping	Fine Sand and Coral rock	Anchored floating jetty	30–80 m	As per vessel
	14	Marina	Steep sloping	Fine sand and coral rock	Fixed frame jetty with breakwater feature	30–80 m	At least 100 m breakwater feature
Likoni	15.	Mtongwe/ Hawai	Drastic dropping	Fine Sand and coral rock	Anchored floating jetty	30–80 m	As per vessel
	16.	Timbwani	Steep sloping	Fine silt	Anchored floating jetty	30–80 m	As per vessel
	17.	Likoni	Drastic dropping	Fine Sand and coral rock	Anchored floating jetty	20–60 m	As per vessel
	18.	Peleleza	Drastic dropping	Fine Sand	Anchored floating jetty	20–60 m	As per vessel
Mtwapa	19.	Babylon	Steep sloping	Fine silty Clay with organic matter	Anchored floating jetty	30–80 m	As per vessel
	20.	Moorings	Steep sloping	Fine Sand	Anchored floating jetty	30–80 m	As per vessel
	21.	Kwa Chief	Gently sloping	Fine silty clay with organic matter	Anchored floating jetty	50–100 m	As per vessel
	22.	Customs	Gently sloping	Fine silty Sand	Anchored floating jetty	30–80 m	As per vessel

2.4 Proposed Water Transport Routes

1. **Mtwapa Creek–Customs–Moorings**

Within the Mtwapa creek with existing landing sites at customs, moorings, copa cabana are potential for additional landing sites. The creek extends almost 25 kms with varying depths. There is also potential to open up a canal to connect with the Tudor creek

2. **Shanzu–Jomo Kenyatta Public Beach**

Runs from the mouth to Mtwapa creek in a Southerly direction along the coastline of the open sea upto Kenyatta public beach where an offshore landing site with breakwater infrastructure is required. A significant section of this route runs through the marine park currently under the administration of The Kenya Wildlife Services (KWS)

3. **Jomo Kenyatta Public Beach–English Point**

It starts from Kenyatta Beach running in a Southerly direction to the mouth into Tudor creek near The English-point Marina.

4. **Tudor Creek–Nyali**

This extends in a Westerly direction into the Tudor creek with existing semi developed landing sites at Alidina Visram, lights, Tudor Nora–Tudor water sports–KMC Kibarani with additional potential at former Kibarani dumpsite (now proposed to be an integrated transport terminus. The creek extends further in the North westerly direction connecting Rabai and Miritini before protruding towards Mtwapa creek.

5. **English Point–Kilindini Habour**

This section starts at the mouth to Mtwapa creek near Fort Jesus running in a Southerly direction to Kilindini entry point. It covers the stretch running along the East of Mombasa Island (Kizingo area) to Mama Ngina. This section of the route may not support any landing site due to the roughness of the ocean in the open sea and at the mouth to the two respective creeks. It may also require robust and large sized vessels to safely navigate with relative comfort to passengers.

6. **Kilindini Harbor**

This extends in a westerly direction into the port of Mombasa. It has existing landing sites at Likoni, Liwatoni, Mtongwe (North and South), KPA, Mkupe and potential for additional sites into Mwache and mteza areas. The entire area is covered by calm protected waters but with strict security controls due to the sensitive installations.

2.5 Relevant Maps, Models, Designs and Plans for the Established Transport Routes and Waterways

This section outlines the methods used to create relevant maps, models, designs, and plans for Coastal and Harbour Water Transport routes and waterways. The process involves using satellite imagery for land use classification to assess urban density and the current road network. Advanced geospatial tools such as ArcGIS, SNAP, Python, and R are employed to process and analyze spatial data. ArcGIS is used for mapping and network analysis, SNAP is applied for preprocessing satellite images, and Python and R are utilized for advanced data analysis, feature extraction, and visualization.

2.5.1 Mombasa Road Transport System

The Coastal and Harbour Water Transport survey shows the passenger perceptions in Mombasa. Residents primarily rely on various modes of transport, including matatus of different capacities, shared bodabodas or tuk-tuks, private cars, and bicycles. JICA reported that matatus accounted for 36% of trips in the city[14], while this survey indicates that 54.9% of Mombasa residents used matatus as their primary mode of transport. Among these, 14-seater matatus were the most prevalent. Based on the 2020 ITDP service plan for public transport and County Government records from December 2019, there were 4,021 registered matatus in Mombasa. As of the same date, there were 8,027 registered tuk-tuks[15], which provided shared public transport services and door-to-door taxi options.

14 Japan International Cooperation Agency. (2018, Mar). Project for Formulation of Comprehensive Development Master Plan in the Mombasa Gate City in the Republic of Kenya.

15 Institute of Transportation and Development Policy (ITDP). (2020. Oct). Service plan for public transport in Mombasa–ITDP Africa

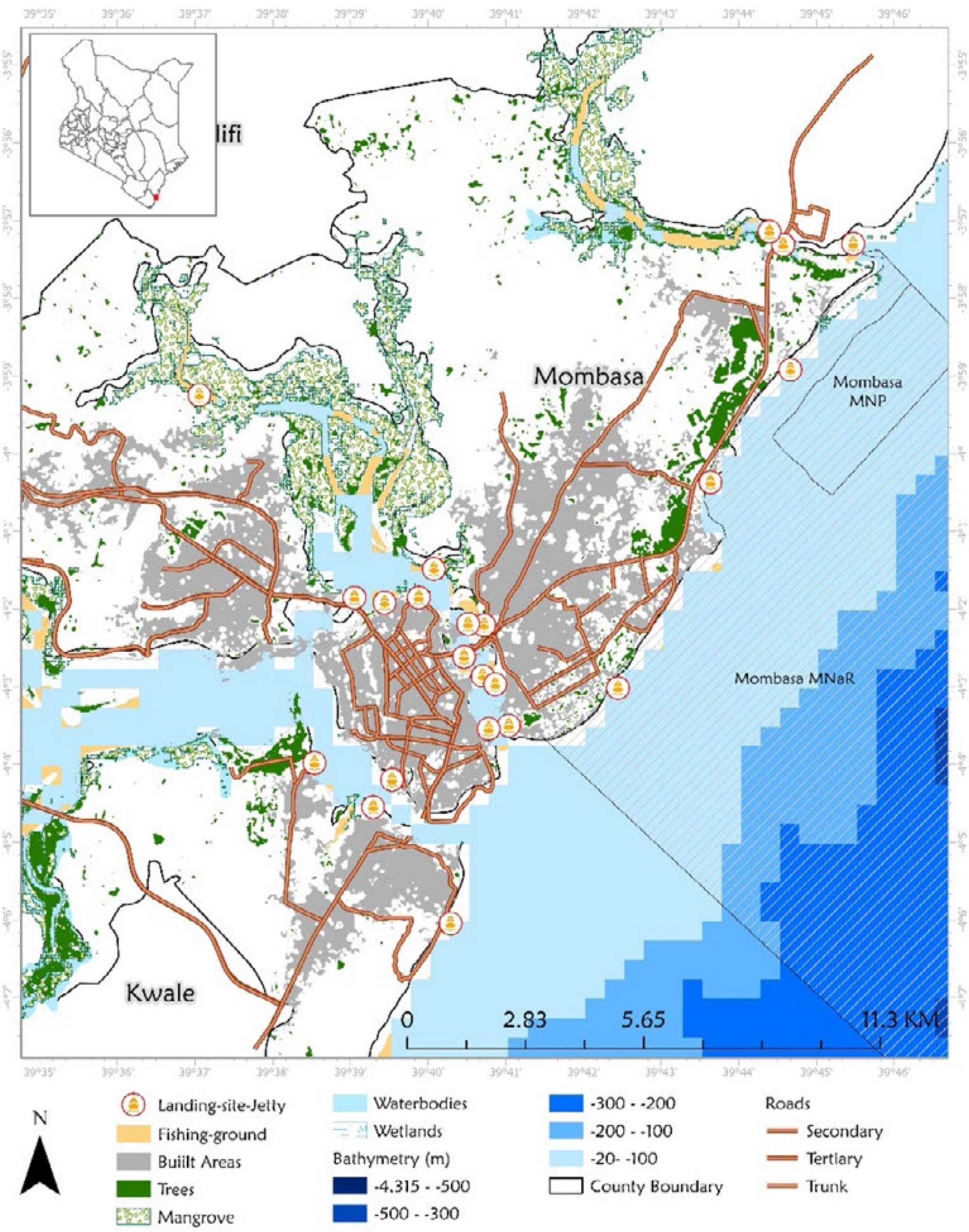


Figure 2: Mombasa Road transport system

2.5.2 Mombasa County Road Network

A spatial representation of Mombasa's current road network, derived from satellite imagery, was created using ArcGIS. The mapping highlighted the main roads connecting various parts of the city and accommodating public transportation routes, distinguishing them from secondary, tertiary, and trunk roads. The road network is structured as a combination of nodes and links: nodes represent specific locations defined by latitude and longitude coordinates where links start, end, or branch, while links serve as pathways enabling vehicles movement between nodes. Each link includes attributes reflecting real-world characteristics, such as length and traffic flow direction (e.g., one-way or two-way traffic).

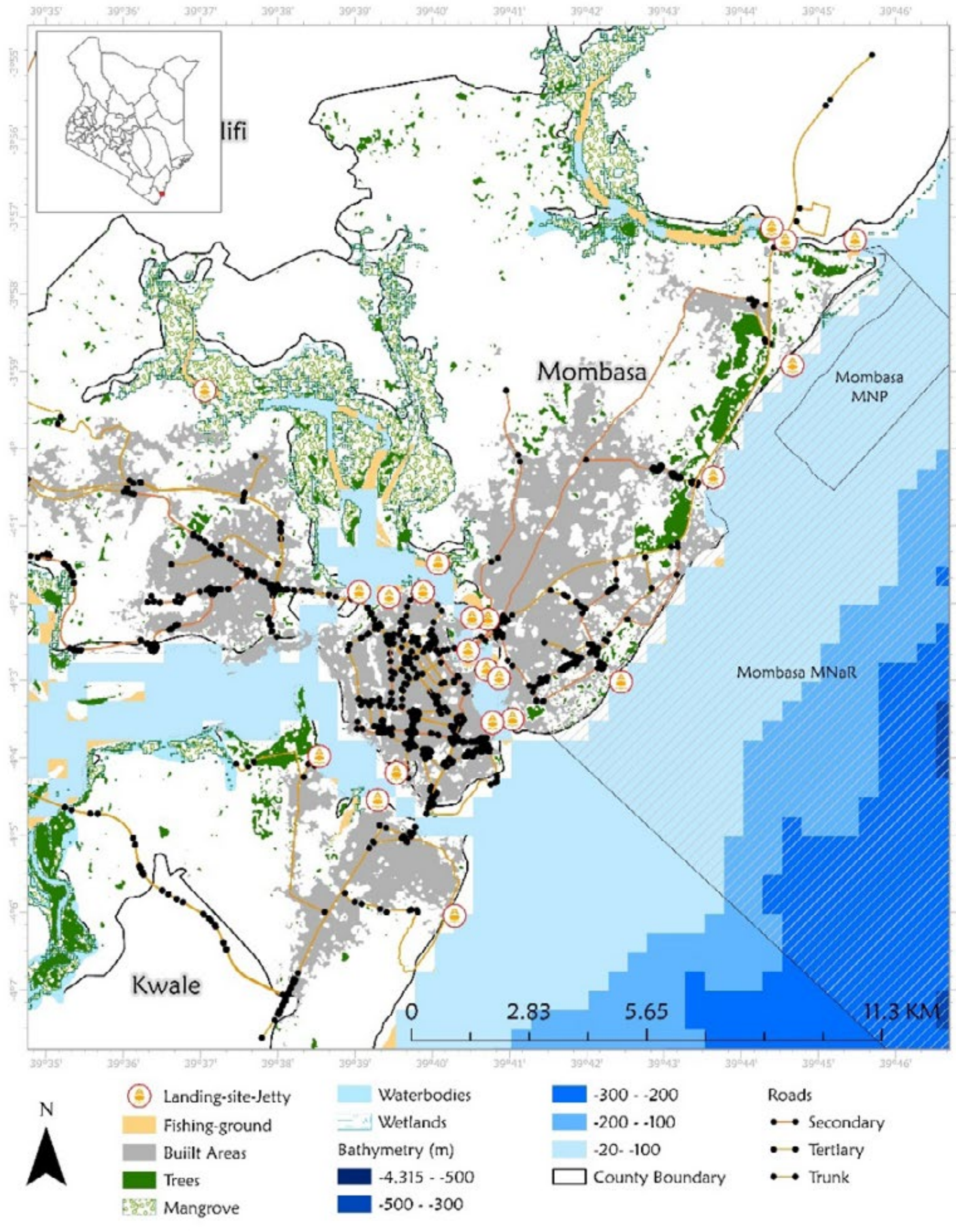


Figure 3: The current road network model is represented as a system of nodes and links

2.5.3 Intensity of Water Transport Use

Mombasa County, located along Kenya's coastline, is administratively divided into six sub-counties: Likoni, Nyali, Mvita, Changamwe, Jomvu, and Kisauni. Each sub-county contributes uniquely to the social and economic dynamics of the county, with varying levels of population density, infrastructure, and access to transportation. The use of water transport varied significantly across these sub-counties, as indicated by the C&HWT survey. Likoni stood out with the highest percentage of water transport users, accounting for 39.8% of the total, reflecting the area's reliance on ferry services and other water-based transport modes to connect to the island and mainland. Nyali, a mainly residential and commercial developments area including tourism, had a slightly lower intensity of water transport use, contributing 13.6% of users, while Mvita had the least users of water transport.

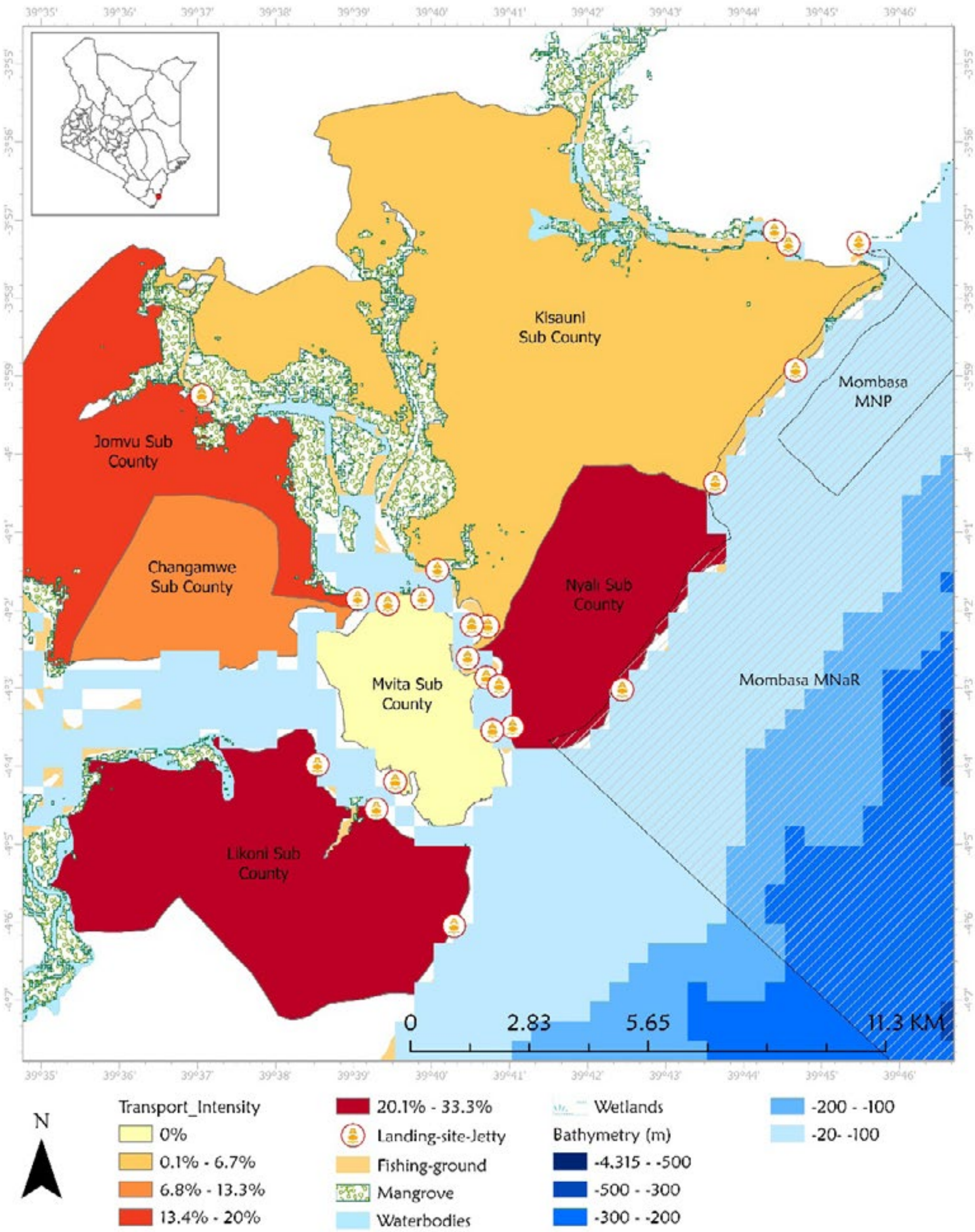


Figure 4: **Intensity of water transport users by place of origin**

2.5.4 Mombasa Coastal & Harbour Waterways

Geographically, Mombasa County located along the coast, at near sea-level is relatively flat with. The hilly terrain is found further inland, with the highest elevation in the county being the Junda/Mwakirunge area at 30 meters to 120 meters elevation. The elevation of Changamwe/ Jomvu is between 30 meters and 90 meters. The county is characterized by numerous creeks and mangroves, which limit the expansion of urban areas in certain regions. Notable creeks include Tudor Creek, which flows through areas such as Mikindani, Kenya Meat Commission (KMC), and Nyali Bridge (Nyali-B), as well as Port Reitz Creek, which passes through Makupa, Mwache Tsunza (Mwache-T), and Mwache-SGR. Kilindini Creek, another significant waterway, also contributes to the region's complex water system.

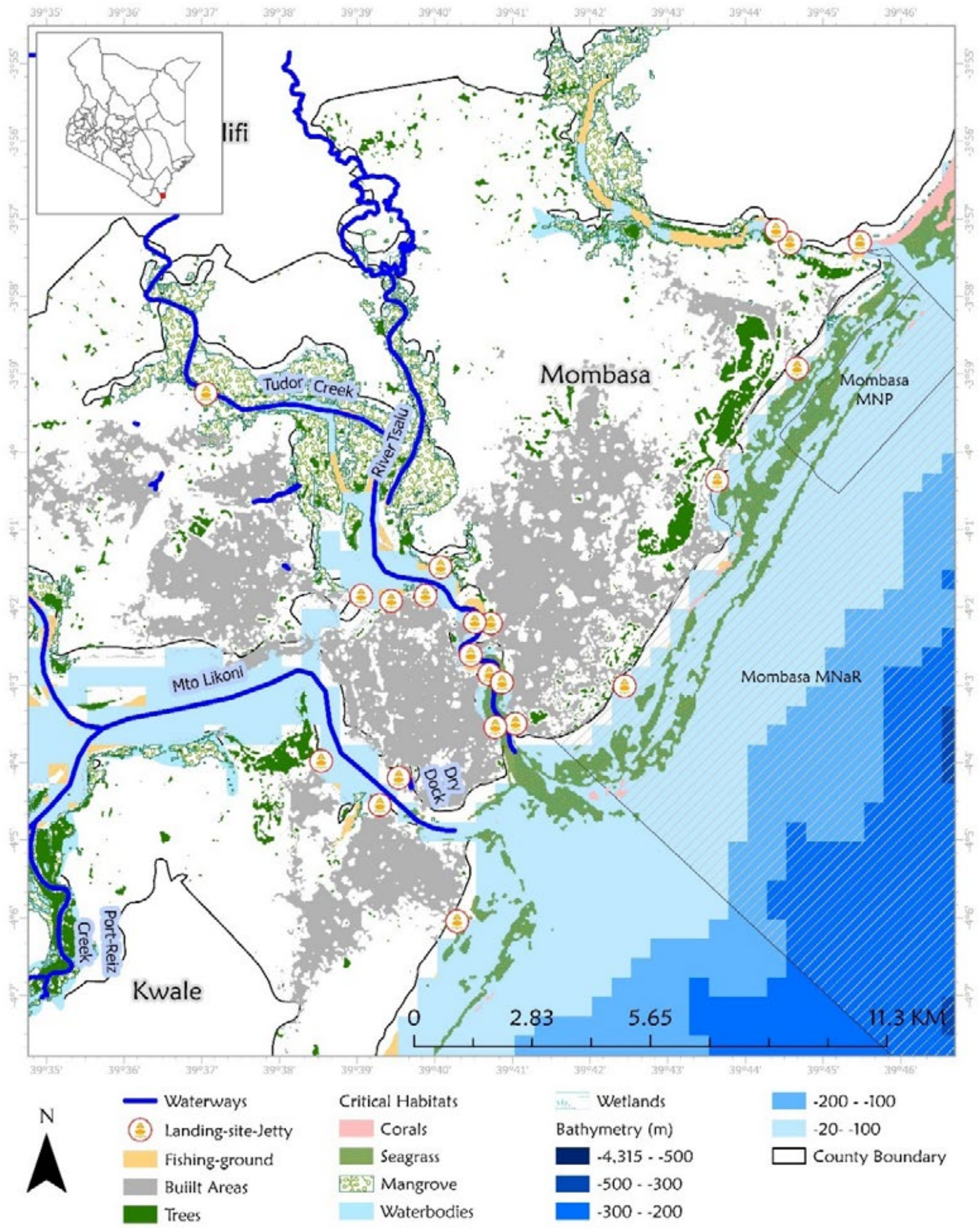


Figure 5: **Mombasa inland waterways**

2.6 Proposed Short-Distance Routes Network

This section presents an assessment of connectivity and accessibility for the proposed landing jetties across Mombasa County and its adjacent areas. The study employed advanced network analysis to evaluate the shortest routes from each jetty to key locations, offering actionable insights for enhancing Coastal and Harbour Water Transport alternatives. A comprehensive transport network, encompassing roads and waterways, was mapped to represent the region's infrastructure. Twenty-two (22) proposed landing jetties were identified and georeferenced within the spatial framework. The analysis categorized the landing site and jetties by sub-region: Changamwe (Kitanga Juu, Mkupe, Jomvu, Mikindani, Mteza), Mvita (Old-Port Market, Tudor, Bandari), Kisauni (Mishomoroni, Mkomani, Nyali Msanakani, Bamburi, Utange/Ferry ya Zamani, Marina), Likoni (Mtongwe/Hawai, Timbwani, Likoni, Peleleza), and Mtwapa (Babylon, Moorings, Kwa Chief, Customs). The results were visualized on a detailed map highlighting the shortest routes, key features of the proposed jetties, and significant waterways.

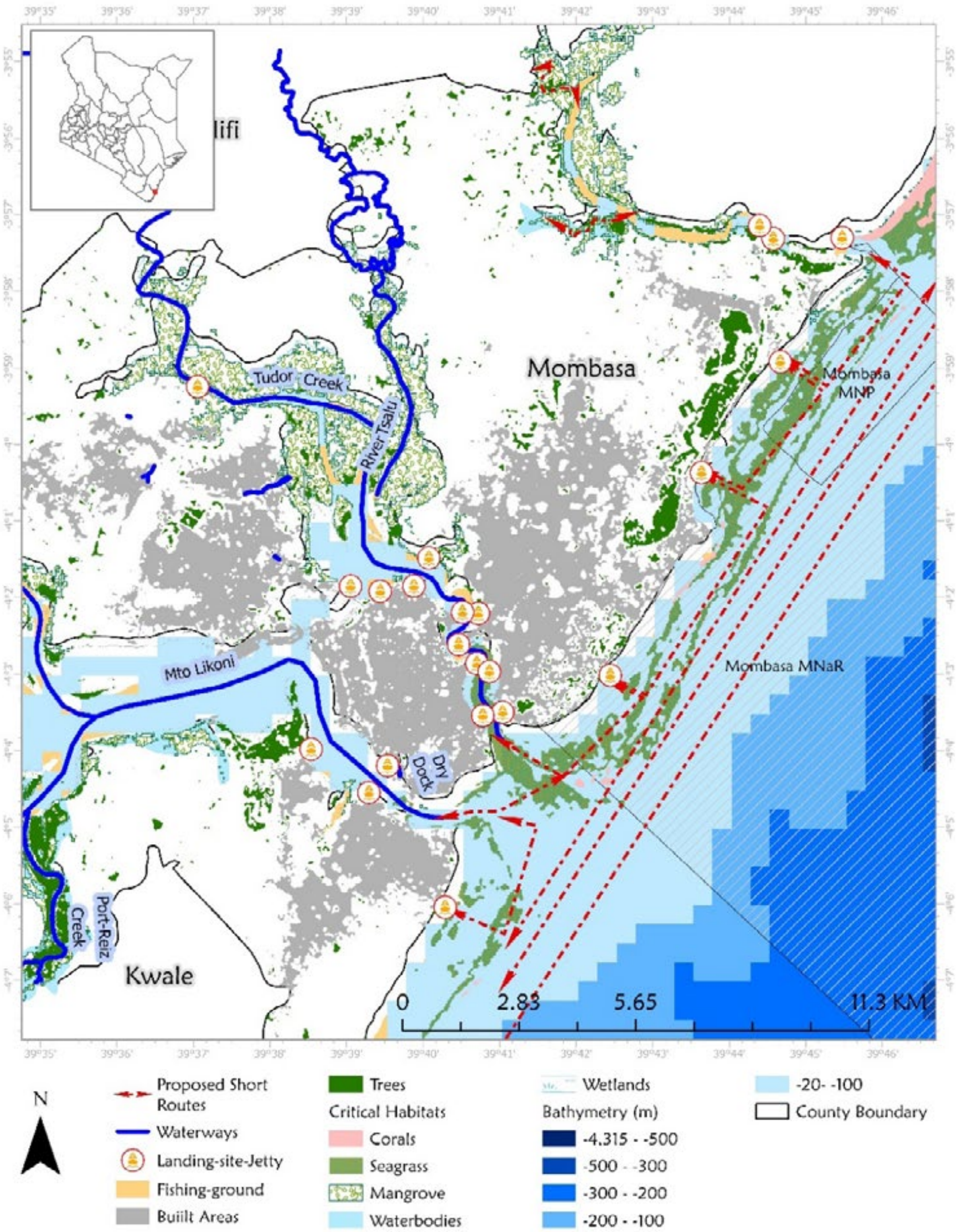


Figure 6: **Proposed short routes**

Chapter 3

Technical Approach

3.1 Study Area

The project location is Mombasa County, along the coastline stretching from Mtwapa Creek in the North, passing through Shanzu, Bamburi Beach, Nyali Beach, Tudor Creek, Kilindini Harbour, and extending to Shelly Beach in the South. Mombasa is a coastal city located in South-Eastern Kenya, along the Indian Ocean. Mombasa Island is separated from the mainland by two creeks: Tudor Creek to the west and Kilindini Harbour to the South. It is connected to the mainland by the Nyali Bridge to the North, the Likoni Ferry to the South, and the Makupa Bridge (formerly Makupa Causeway) to the west, which runs parallel to the Uganda Railway. Figure 4 provides a visual representation of the project location.

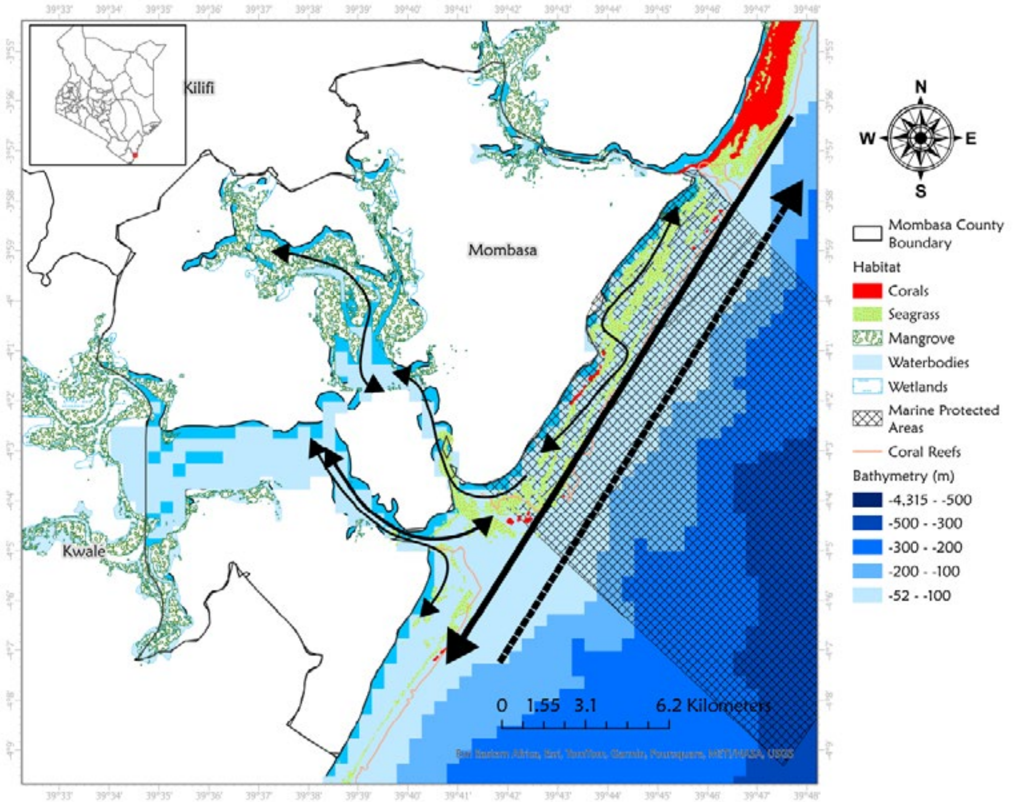


Figure 7: **Map of Project Location**

3.2 Data Sources and Methods

The study adopted a mixed-methods approach to gather comprehensive data and insights, incorporating Review of literature, Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), surveys, and physical site visits. This multifaceted approach allowed for an in-depth exploration of the subject by integrating diverse stakeholder perspectives, understanding community-level dynamics, and validating findings through direct observation.

The Feasibility Study adopted a systematic approach to deliver comprehensive and actionable results. The approach utilized mixed approaches, beginning with initial consultations with the client and the County Government of Mombasa (CGM) to agree on the Terms of Reference (ToRs) and deliverables. This was followed by a thorough desktop review of relevant literature to provide contextual insights into subsequent activities.

Key Informant Interviews (KIIs) were held with key stakeholders including representatives from government, private sector, community, NGOs, and academia to gather expert perspectives. These provided critical information on current initiatives in transport and bottlenecks, concerns, plans and recommendations for water transport. Questionnaire surveys were then administered to the public to assess their current transport habits, perceptions and willingness to pay for water transportation services. In between, two stakeholder engagement workshops were organized first to present the study's findings, and secondly to validate the findings, recommendations, and draft report. Finally, a detailed technical report was developed considering all the above processes.

Key Informant Interviews were conducted with strategically selected participants whose roles and expertise aligned with the study's objectives. These included representatives responsible for oversight in policing and regulation, community members who are direct service users, private sector stakeholders such as manufacturers and service providers, and Civil Society Organizations (CSOs), primarily environmental NGOs, alternative transport providers, water transport and sport service operators, environmental conservationists, marine research institutions, academia, hoteliers, and regulatory authorities.

Two Focus Group Discussions were held with community members providing water transportation services in the tourism sector. The discussions with stakeholders from Mombasa and Mtwapa Beach Management Units, and the Mombasa Boat Operators Association aimed to capture the unique experiences and challenges faced by these groups.

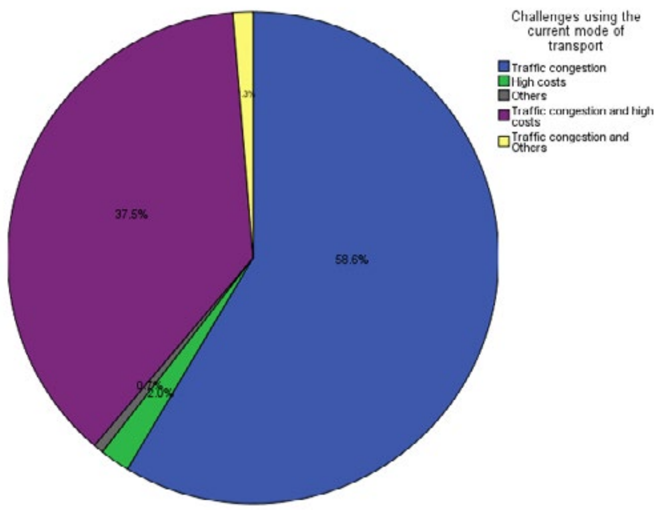
The survey employed scientific method to determine the required sample size. For Mombasa city, with a population of 1.3 million as per the 2019 census, the calculated sample size was approximately 207 respondents using a confidence level of 85%, at margin of error of ±5%. Stratified random sampling was applied to ensure proportional representation, dividing the population into groups based on age, gender, and location. Respondents were randomly selected within each group to minimize bias and enhance the reliability of the findings. The survey gathered feedback from the public on existing demand for alternative water transport, including origin-destination preferences and willingness to pay. The sampling blocks were 7, i.e. areas around Mtwapa, Likoni, Jomvu, Miritini, Nyali, Kisauni (Bamburi) and Mshomoroni (Junda).

Physical site visits were conducted to evaluate potential landing sites across various strategic locations. These included Rabai–Miritini Crossing, Junda, Kenya Meat Commission, Muhoroto, Tudor Water Sports, Tudor Lights, Tudor Nora, Shehena Marina, Tamarind, Alidina Visram, English Point, the Old Port, Mkupe, Mteza, KPA, Bandari, Mtongwe, Liwatoni, Peleleza, Likoni, Customs (Mtwapa), Copa Cabana, and Moorings. Additionally, the team assessed the Uhuru Jetty, Nyali Beach, Bamburi Beach, and Shanzu Beach. During each visit, detailed photographic documentation and geometric referencing were undertaken.

3.3 Outlook of Coastal Water Navigation in Mombasa

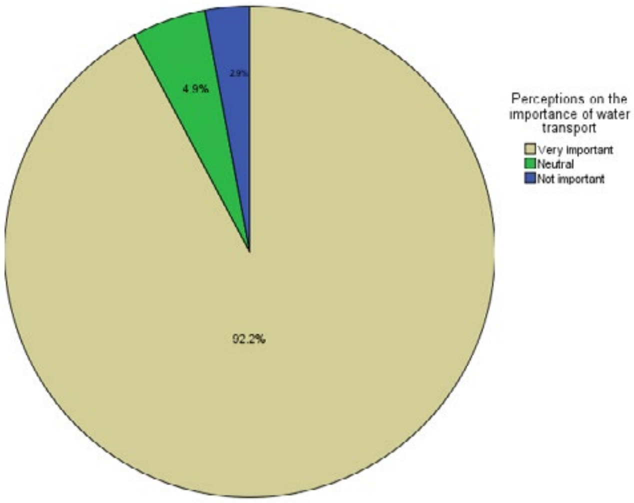
3.3.1 Challenges Faced Using Current Mode of Transport

Traffic congestion was the most pronounced challenge faced in road transport, with 58.6% of people acknowledging it followed by high costs of transport at 37.5%. Addressing these main challenges would alleviate transportation problems in Mombasa. For water transport to serve as a viable option to complement road transport, these two main issues must be part of the solution to the new mode of public transport.



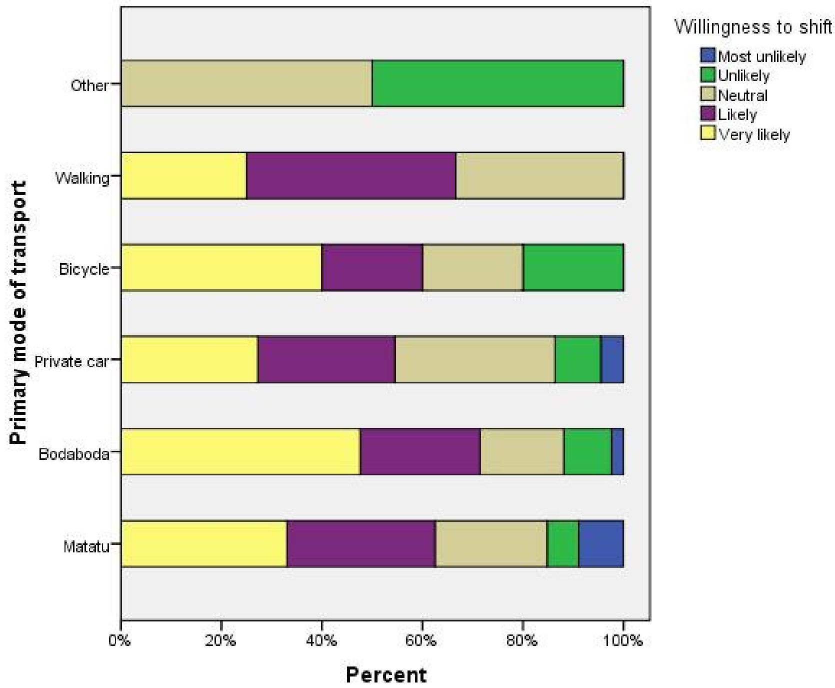
3.3.2 Demand for Public Water Transport

There was a high demand for water transport, with 92.2% of respondents recognizing a need for introducing water transport. The huge margin underscored the potential impact of reducing traffic congestion in Mombasa. Only 2.9% of the respondents felt that water transport lacked significance. At present, public water transport in Mombasa is largely through the use of ferry service at the Likoni channel. Respondents felt a need for more use of public water transportation in other navigable channels and waterways in Mombasa.



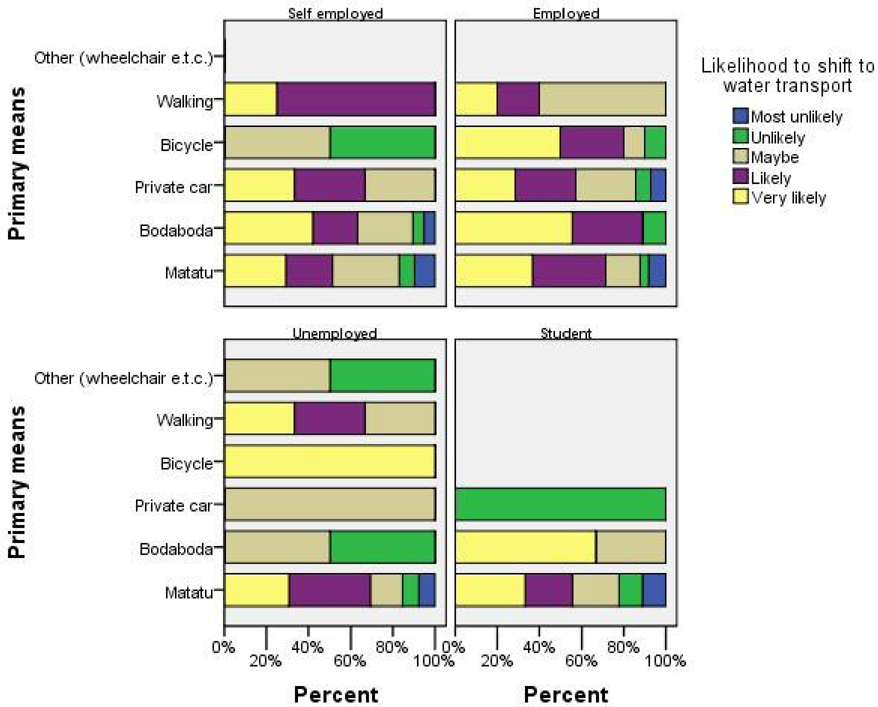
3.3.3 Likelihood to Shift from Primary Modes of Transport to Water Transport

There was a strong interest in shifting to water transport, by respondents who were using boda boda, walking followed by matatu and bicycles. A considerable proportion of respondents would shift to using water transport if it is introduced in Mombasa.



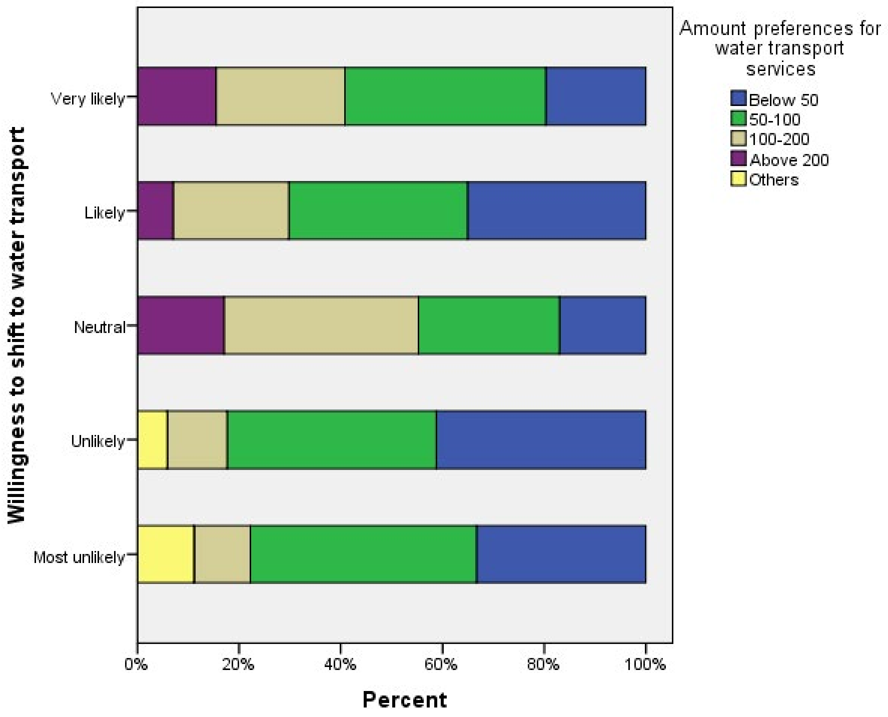
3.3.4 Willingness to Shift to Water Transport Based on Employment Status

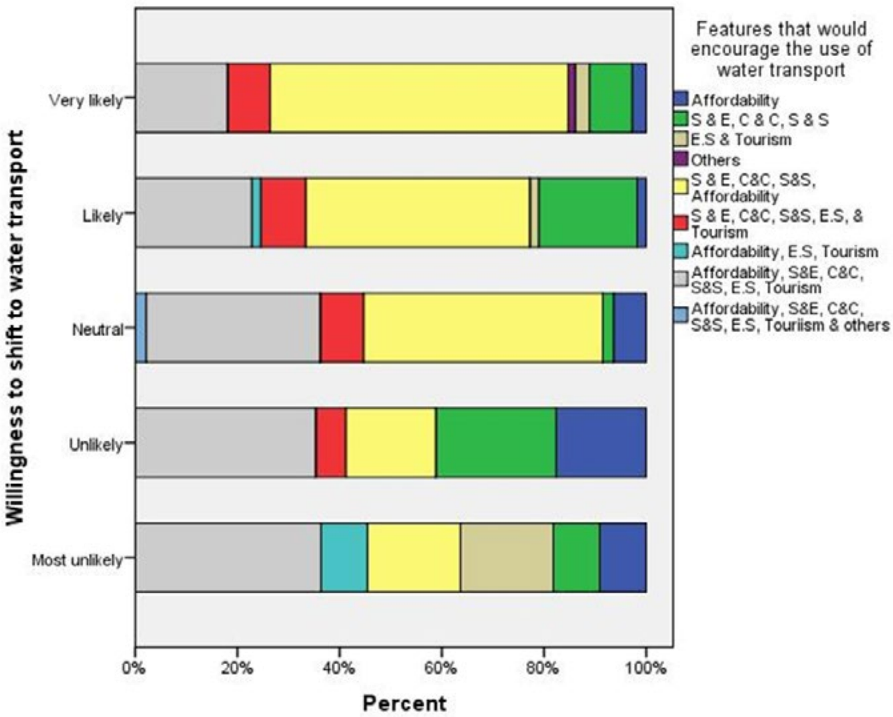
Most of the employed respondents using other transport modes were more inclined towards switching to water transport. On the other hand, those using private cars were not decided on shifting to water transport while 50% of bodaboda users were unlikely. This illustrates their preference to the existing modes of transport. Unemployed bicycle users were very likely to shift to water transport. The willingness to shift varied across occupational groups or the mode of transport used.



3.3.5 Willingness to Pay for Public Water Transport

The willingness to pay for water transport was varied. More than 50% of the respondents willing to shift to water transport would pay KES 50–100 and less than 10% would pay KES 100–200. The average pricing preferred aligns with the current pricing rates charged by inland water transport services in Kisumu, Kenya. Additional premium features would influence the shift to water transport, and the amount paid. These include Environmental sustainability, speed and efficiency, comfort and convenience, safety and security, and affordability. Consideration of these prioritized features can enhance the transition and make water transport appealing and a preferred transport mode for potential users.

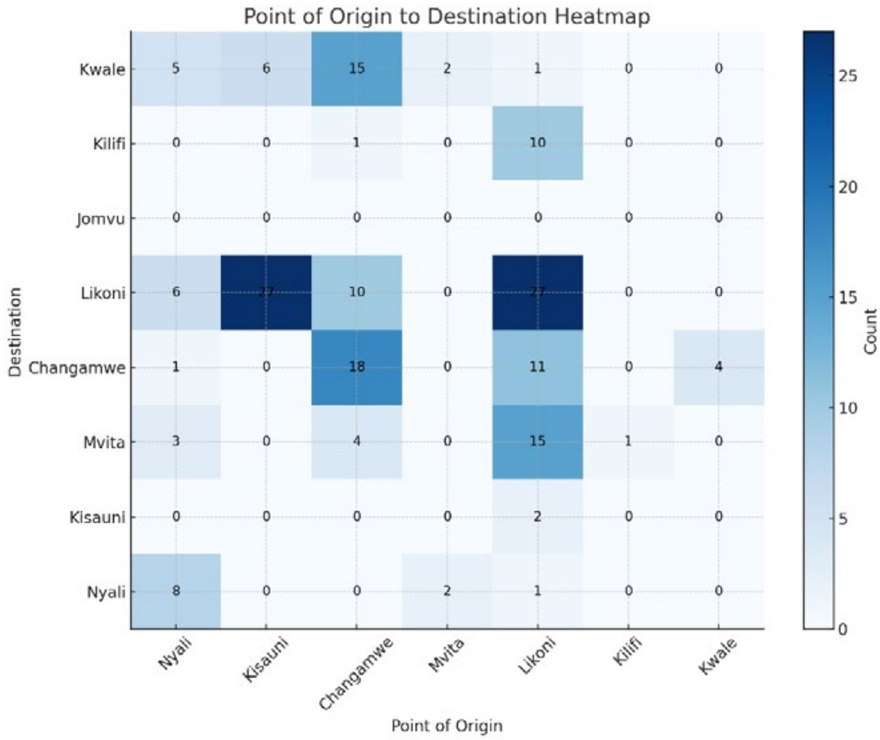




Key	S&S–Safety and security
S&E–Speed and efficiency	E.S–Environmental sustainability
C&C–Comfort and convenience	

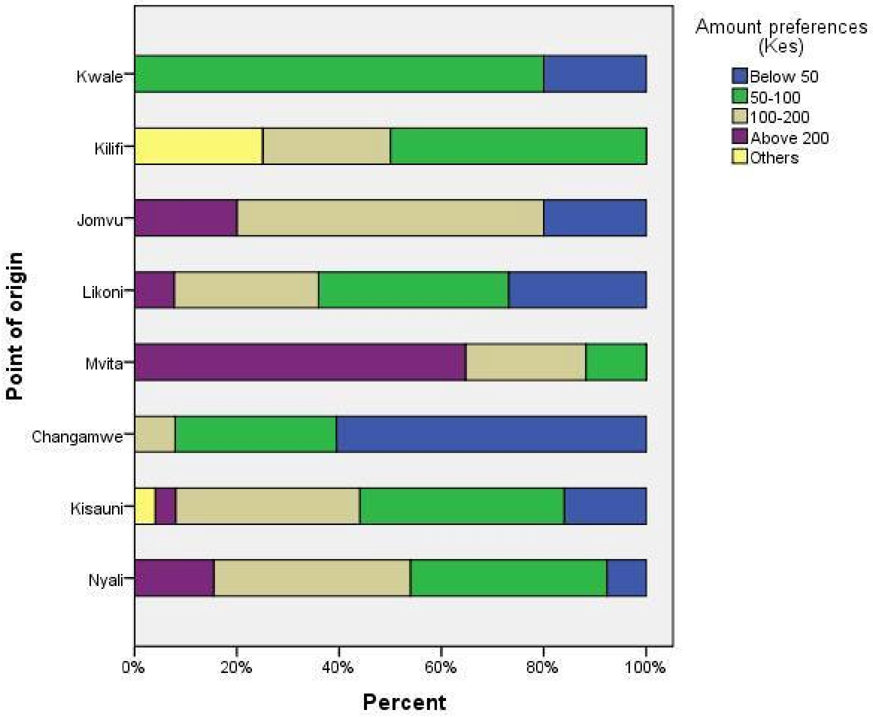
3.3.6 Current Travel Patterns

The origin to destination from Kisauni to Likoni and from Likoni to Likoni route were the most utilized routes as evidenced by highest number of trips (27). Likoni serves as a cross-location destination serving people from within the area and from other areas such as Kisauni, Nyali and Changamwe. Changamwe area was characterized by travel patterns within the area. From Likoni to Mvita and from Changamwe to Kwale (15) show moderate levels of movement. Routes like Kilifi to Changamwe, from Nyali to Kilifi, or Nyali to Jomvu had minimal movement. Localized movement patterns within an area were dominant, with fewer trips to far off areas. Understanding of the travel patterns is key in informing priority areas to target during infrastructural implementation of water transport.



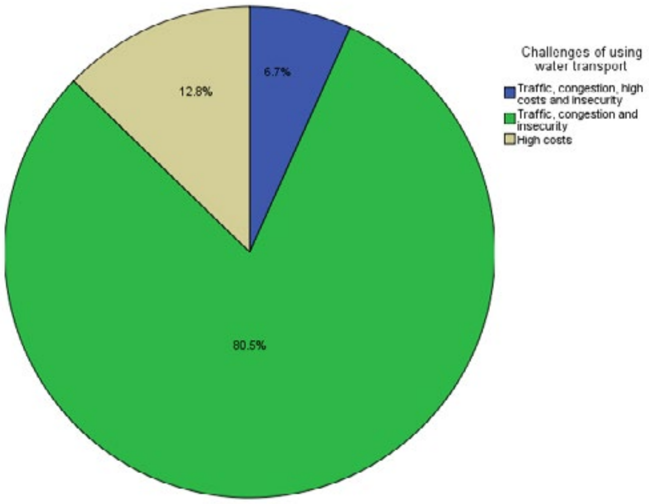
3.3.7 Preferred Water Transport Fares Amount for Travelers from Different Points of Origin

Preferences for water transport fares vary by place of journey origin. Fares between KES 50–100 were preferred across all regions, especially in Kwale and Kilifi. Fares between KES 100–200 also common, especially for Jomvu, Nyali, and Kisauni. Travellers who would pay above Kes 200 were few with Jomvu recording the highest numbers.



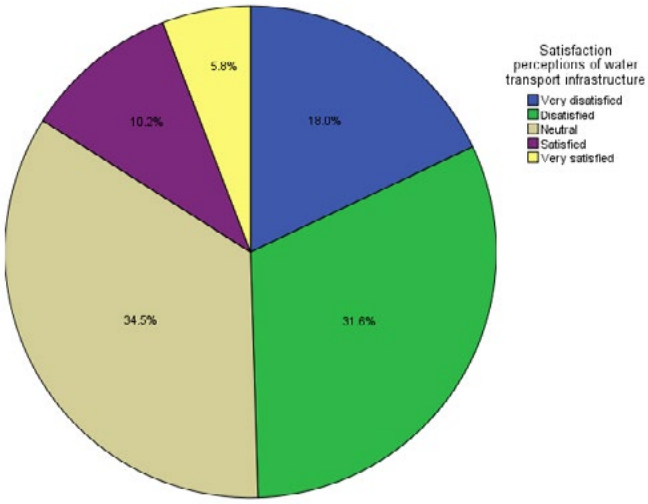
3.3.8 Challenges Experienced Using the Current Water Transport Services

Traffic congestion and insecurity were the main concerns for 80.5% of the respondents, reflecting the experiences of passengers using the ferry for water transportation. The government of Kenya has previously addressed this by procuring additional ferries to accommodate the growing demand and deploying security personnel. This has reduced incidences of petty theft and congestion on the ferry. This is followed by high costs at 12.8% representing those using water transportation for leisure since the existing public water transportation is free.



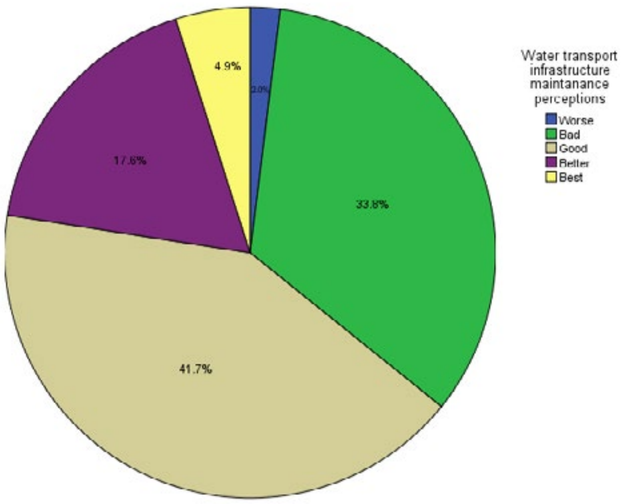
3.3.9 Satisfaction with Current Water Transport Infrastructure

Overall, there was a mix of opinions about satisfaction with current water transport services. The majority of the respondents were either neutral or dissatisfied, i.e., 34.5 at 31.6%, respectively. Those who were satisfied and very satisfied were represented by 10.2% and 18% respectively.



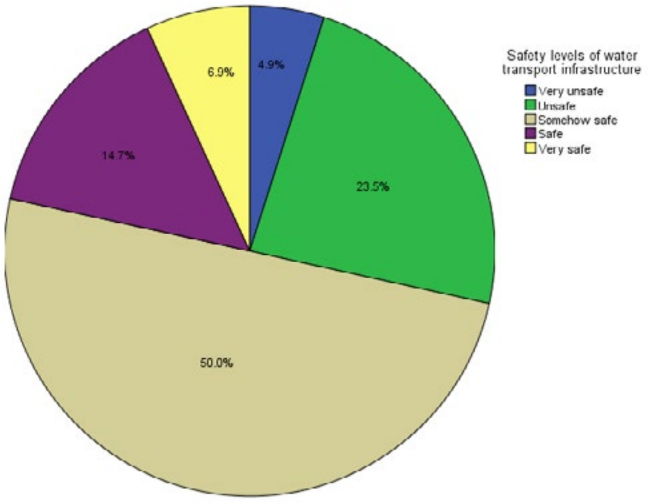
3.3.10 Status of Water Transport Infrastructure Maintenance

The majority, 41.7%, rated maintenance as good, 17.6% considered it better, and 4.9% regarded it as the best. 33.8% of the respondents described the status of maintenance of water transport infrastructure as bad. Although most respondents viewed the maintenance positively, a notable portion showed dissatisfaction, therefore room for improvement to enhance adoption and continued use of water transportation.



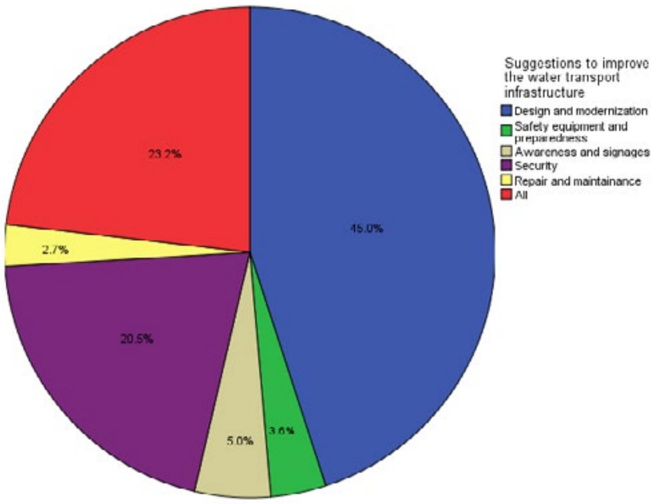
3.3.11 Perception About Safety of Water Transport Infrastructure

A huge proportion of the respondents, 50%, were unsure about safety levels of water transport infrastructure i.e. "somehow safe," another 23.5% perceived unsafe with 4.9% affirming this. These 3 categories together make up 74.2% highlighting a need for safety improvement. The remaining 14.7% felt it was safe, and 6.9% very safe. Safety concerns persist in public water transport given previously reported cases (see Case Study 1 below) hence a need for enhanced safety and security in the water transportation to reduce such occurrences and develop trust amongst the users.



3.3.12 Suggested Improvements to Enhance Safety in Water Transport Infrastructure

To enhance water transport infrastructure effectively, 45% of the respondents recommended innovative design and modernization, 20.5% for improved security measures. Others were below 5% including creating more awareness and signages, safety equipment and preparedness, repair and maintenance. However, 23.2% felt that there is a need for a comprehensive approach that incorporates all essential elements.



3.4 Comparative Analysis of Waterways Visa Vis Other Existing or Proposed Competing Alternatives

According to the Mombasa Comprehensive Development Master Plan, several passenger transport development projects are planned (for 2020 Base Year) by 2030 and projected for 2040. These projects are crucial to the city's transportation infrastructure, with significant implications for Coastal and Harbour Water Transport. Key projects include:

- **P1:** Elevated Mass Rapid Transit (MRT) for the Ferry–Kongowea Line
- **P2:** Miritini BRT (CBD–Changamwe–Miritini)
- **P3:** North–South BRT (Kisauni–Mombasa Gate Bridge–SEZ/Likoni)
- **P7:** Matatu regional regulation and feeder matatu/bus routes
- **P8:** Expansion of the matatu/bus fleet (initial stage)

The developments, particularly the BRT systems, represent a significant shift toward a more integrated and efficient urban mobility network. The competition between the Bus Rapid Transit (BRT) systems and Coastal and Harbour Water Transport is highlighted, as both are critical in reducing congestion and improving accessibility. For example:

- **P1** (Elevated Mass Rapid Transit for the Island Loop Line) and **P2** (Miritini BRT) are key projects that can directly compete with Coastal and Harbour Water Transport by providing alternative, efficient modes of transport across key routes.
- The expansion of the **North–South BRT (P3)** to include more areas, such as the Old Malindi Road in Kisauni, further intensifies this competition, offering better coverage and more reliable alternatives to water transport in the region.

3.5 Alignment of Proposed Plans on Other Modes of Transport to C&HWT

The projects outlined in the Comprehensive Development Master Plan aim to enhance Mombasa's urban transport network and integrate various modes of transport, including water transport. Key initiatives, such as the MRT Ferry–VOK–City Mall Line and the water transport services along Nyali Channel, directly support the development of a multi-modal system that connects ferry terminals with rail, bus, and pedestrian pathways. Below is a table that shows linkages between the proposed plans for development of other public transport systems;

Project	Description	Link to Coastal and Harbour Water Transport Project
MRT Ferry–VOK–City Mall Line & Loop Line (P1)	Development of an exclusive elevated rail structure connecting Ferry, VOK, Bombolulu, and other key urban cores.	The rail line (P1) enhances connectivity around the ferry terminal, which could integrate with water transport services to streamline passenger movement between land and water transport.
MRT CBD–Rail–Airport–Miritini Line (P2)	Connection of the CBD to key locations via meter gauge rail alignment, with BRT and grade separation.	The railway alignment may complement water transport services by connecting the ferry terminal and waterfront areas, improving inter-modal transfers between rail and water transport.
Prioritized Bus Services (P3)	Introduces BRT systems for CBD, Kisauni, and SEZ/Likoni areas, improving regional accessibility.	The BRT services could integrate with water transport to provide seamless mobility from ferry terminals to the wider city area, particularly at the Nyali Channel and Old Town waterfronts.

Project	Description	Link to Coastal and Harbour Water Transport Project
Matatu and Tuktuk Reforms (P7, P8, P9, P10, P11)	Reorganization of matatu routes, higher-capacity vehicles, and tuktuk regulations, improving public transport.	Matatu reforms complement water transport by decentralizing routes, reducing congestion near ferry terminals, and streamlining land-based access to water transport services.
Transit-Oriented Development (P5)	Development of TOD along rail corridors to enhance rail-based traffic.	TOD in waterfront and ferry access areas will promote seamless integration with water transport, providing easy access to terminals and creating a more connected urban environment.
Pedestrian-Oriented Development (P6)	Investment in footpaths and safety measures in pedestrian zones to enhance walkability.	Focuses on enhancing access to waterfront areas for pedestrians, ensuring safe and efficient movement to water transport terminals and surrounding urban spaces.
Water Transport Services (P12)	Niche water transport along the Nyali Channel to enhance city branding.	Directly tied to the Coastal and Harbour Water Transport Project, this would provide ferry services to ease congestion and serve as a complementary mode of transport along the Nyali Channel.
Cruise Ship Terminal Conversion (P13)	Conversion of Mbaraki Terminal to a cruise ship terminal to integrate ferry and mass transit services.	The conversion of Mbaraki Terminal into a cruise terminal could further facilitate water transport integration, linking with other public transport modes like MRT and BRT for a unified system.

3.6 Comparative Analysis of Waterways Visa Vis BRT Systems

To understand how the water bus can compare as an alternative to the BRT system, let us break down the calculation.

1. The speed of water transport vessel is:
   - Speed = 25 knots
   - 1 knot = 1.852 kilometers per hour (km/h)

Therefore, at a speed of 25 knots:

$$25\ knots\ \times 1.852 \frac{km}{h} per\ knot\ = 46.3 km/h$$

So, water transport vessel can travel at **46.3 km/h**.

2. What will be the Distance Covered in 1 Hour since the water bus travels at 46.3 km/h, in 1 hour, it will cover 46.3 kilometers.
3. The maximum capacity of the water bus is **300 passengers per trip**.
4. Mombasa is approximately **20 km** between the major points of the island and mainland (e.g., from Mombasa town to mtwapa or other key locations).
5. Since the water bus can travel 46.3 km per hour, and the distance between major points in Mombasa is 20 km, the water bus can complete:

   46.3*km* ÷ 20*km* per trip =2.315 *trips per hour*

This means the water bus can make 2 **trips per hour** on a 20 km stretch.

6. We then calculate the number of passengers carried in 1 Hour:
   - For each trip, the water bus can carry **300 passengers**.
   - In 1 hour, the total number of passengers carried will be:

   2.315 *trips per hour* ×300 *passengers per trip* =694.5 *passengers*

So, the water bus can carry about 695 passengers in one hour.

3.7 Cost Comparison with BRT

To estimate the cost of the water transport system, let us make some general assumptions:

1. **Cost per Passenger for Water Bus:**
   - Let's assume that the cost of building and operating a water bus system is lower than a BRT system, as it avoids the high infrastructure costs of dedicated roads and terminals.
   - The construction cost for a water bus system is $6 million to $10 million per kilometer for the entire waterway, while the operational cost can vary.

For simplicity, let's assume the operational cost is $1 to $2 per passenger for water transport, depending on factors like fuel, maintenance, and infrastructure.

2. **BRT System Cost:**
   - The construction cost for a BRT system, including dedicated lanes, stations, and buses, could be much higher. On average, BRT systems can cost around $15 million to $30 million per kilometer depending on the design and complexity of the system.
   - Operational costs for BRT can range from $0.50 to $1 per passenger.

Cost Estimate for 695 Passengers:

- **Water Bus** (using an average operational cost of $1.5 per passenger):

  695 *passengers* × 1.5 USD *per passenger* = 1,042.5 USD *per hour*

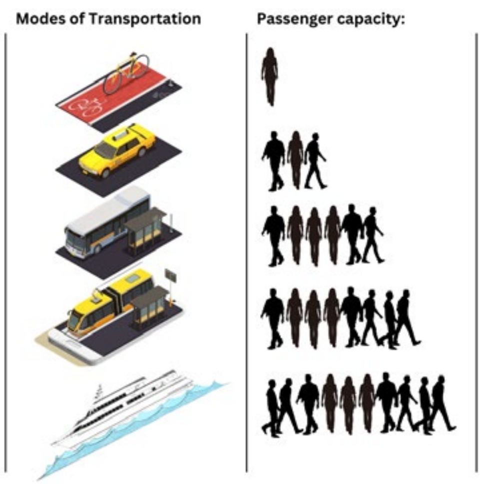
- **BRT** (using an average operational cost of $0.75 per passenger):

  695 *passengers* × 0.75 USD *per passenger* = 521.25 USD *per hour*

This calculation can be concluded that:

- The water bus system can carry about 695 passengers in 1 hour at a cost of $1,042.5 per hour (operational).
- The BRT system, by comparison, can carry the same number of passengers for a lower cost of $521.25 per hour.

While the water bus offers an alternative with a substantial passenger capacity, it is clear that a BRT system may be more cost-efficient per passenger. However, the water bus can still provide a valuable complement to the BRT system, especially in areas where congestion is particularly high, or in regions where water transport routes are more feasible.



3.8 Estimated Broad Cost for the Proposed Coastal & Harbour Water Cost of Vessel Ownership & Operation

This section outlines the vessels specification cost of ownership and operation costs. Below are vessels specification for:

Specification	150 Pax Vessel	300 Pax Vessel
Type	Catamaran	Catamaran
Structure	Aluminium	Aluminium
Length	24m	30m
Beam	8m	10m
Speed	25 knots	25 knots
Seating Capacity	Internal: 120, External: 30	Internal: 220, External: 80
Budget Price	US$ 3–3.5M	US$ 6M
Delivery Time	12 months	15 months

The calculation is based on a 300 Pax Vessel, Catamaran, Aluminium structure, Length: 30m, Beam: 10m, Speed: 25 knots, Internal Seats: 220, External Seats: 80, estimated buying price of: US$6M.

3.8.1 Calculation of Ownership and Passenger Costs

Ownership costs were calculated based on Pure Latitude using a 4-step boat ownership cost calculator that involved use of data based on 1) boat value (6M), boat length (30 meters and boat age (0 year), 2) assuming mooring involves a fully serviced marina and facilities, standard servicing, its use will depreciate at 9% for using 365 days/year. Based on the above, the vessel may attract a 3% annual capital, mooring costs and maintenance costs. Calculation of passenger cost is based on estimated capital and variable costs (see below)

a. Capital costs

Purchase cost: spread over lifespan (depreciation) for a 300-passenger vessel costs an estimated $6 million

b. Insurance costs

Insurance of vessel, passengers, crew, and liabilities costs about $60,000

- Regulatory compliance costs around $10,000 annually
- Docking and mooring fee costs around $55,000 annually

c. Variable costs

- **Fuel costs**

  A diesel-powered vessel of the current specification can consume 600 liters/hour, @$1.5/liter, for 8hours/day, translating to 600 liters/hour x 8 hours x 365 days = $ 1,752, 000 annually.
- **Crew salaries**

  Captain, engineers, support staff etc. salaries are estimated at about $167500 annually, maintenance and repair at $85,000 annually, consumables and supplies (oil, safety equipment, cleaning, etc.) at $20,000 annually and passenger amenities costing about $35,000 translates as below.

3.8.2 Total Annual Operating Costs

Category	Subcategory	Estimated Annual Cost (KES)
Fixed Costs	Capital Costs	6,000,000
	Insurance	60,000
	Docking	55,000
	Compliance	10,000
Variable Costs	Fuel	1,752,000
	Salaries	1,675,000
	Maintenance	85,000
	Consumables	20,000
	Passenger Amenities	35,000
Total Estimated Cost		**8,184,500**

a. Cost per passenger

Below is the formulae to calculate cost per passenger:

$$Cost\ per\ passenger = \frac{\text{Total Annual Operating Cost}}{\text{Annual Passenger Capacity}}$$

Based on annual capacity of 300 passengers x 3 trips/day x 365 days = 328,500 passengers

$$Cost\ per\ passenger = \frac{\$8{,}184{,}500}{\$328{,}500} = \$24.91/passenger$$

Note that the actual passenger cost may vary depending on the time of purchase, insurance and purchasing power parity at the time.

3.8.3 Calculation of Costs to Operate

Operating a marine vessel involves a variety of costs ranging from actual purchase, fuel, crew salaries, maintenance, insurance to port fees and regulatory compliance. Such costs are also dependent on vessel specifications. Calculation of cost is based on specifications A, B and C:

Option	Vessel Type	Capacity	Length	Beam	Speed	Internal Seats	External Seats	Cost
A	Catamaran (Aluminium)	150 Pax	24m	8m	25 knots	120	30	US$ 3–3.5M
B	Catamaran (Aluminium)	300 Pax	30m	10m	25 knots	220	80	US$ 6–6.5M
C	Fiberglass Catamaran	150–300 Pax	70 ft	25 ft	N/A	N/A	N/A	KES 134,657,900

Below is an estimate for A, B and C options.

a. Fuel costs.

Fuel consumption and therefore related cost depends on the engine specification as well as operating speed. For options A, B, and C, fuel consumption can range from 200 to 500 liters/hour. Based on current data, marine diesel prices range from KES 100 to KES 120/ltr. Therefore, if a vessel operating for 8 hours/day, its annual fuel cost estimates are:

$$A = \frac{200lrs}{hr} \times KES\frac{110}{ltr} \times 8\frac{hours}{day} \times 365\ days = \ KES\ 64{,}240{,}000$$

$$B = \frac{500lrs}{hr} \times KES\frac{110}{ltr} \times 8\frac{hours}{day} \times 365\ days = \ KES\ 160{,}600{,}000$$

b. Crew Salaries

A typical crew on a marine vessel includes a captain, officers, engineers, deckhands and hospitality staff. While an average monthly salary for a captain range from KES 300,000-KES 500,000, that of officers and deckhands/staff ranges from between KES 150,000-KES 300,000 to KES 30,000–KES 100,000 respectively. Therefore, assuming a crew of 20 with an average salary of KES 100,000, the annual salaries will be approximately KES 24,000,000.

Annual salaries = KES 100,000 × 20 crew members × 12 months = KES 24,000,000

Role	Monthly Salary Range (KES)	Assumptions	Annual Salary (KES)
Captain	150,000–300,000	1 captain	Included in total average
Officers	100,000–200,000	Part of crew	Included in total average
Deckhands/Staff	30,000–100,000	Part of crew	Included in total average
Total Crew	**Average salary: 100,000**	**Crew of 20**	**24,000,000**

c. Maintenance and Repairs

Typically, routine maintenance is estimated at 5–10% of the vessel's value annually. For a vessel valued at KES 134,657, 900 (option C), maintenance cost at 5% and 10 % will be KES 6,732,895 and KES 13,465,790 respectively (see table 1).

	A	B	C
	150 pax	300 pax	150–300 pax
Cost of Purchase	416,000,000	800,000,000	134,657,900
Cost of Fuel	112,120,000	160,000,000	160,000,000
Crew salaries	249,600,000	249,600,000	249,600,000
Maintenance			
5%	20,800,000	40,000,000	6,732,895
10%	41,600,000	80,000,000	13,465,790
Insurance			
1%	4,160,000	8,000,000	1,346,579
3%	12,480,000	24,000,000	4,039,737
Docking/Berthing Fee	Vary	Vary	Vary
Licensing/Compliance	Vary	Vary	Vary
Total	**856,760,000**	**1,361,600,000**	**569,842,901**

d. Insurance

Insurance coverage includes hull insurance, liability coverage and passenger insurance with annual premiums ranging from 1–3 % of the vessels value.

e. Port and docking fee/charges

Fees vary based on the port and duration of stay. According to Kenya Ports Authority, passenger vessels are charges 80% of the standard rate as berthing fee.

f. Other costs

Various other costs include licensing and registration, and costs associated with mandatory safety and environmental inspection as well as miscellaneous costs (food, beverages, ticketing, promotions and administrative operations.

Considering all these costs, total annual operating costs (including cost of purchase) can range from KES 569,842,901 to KES 1,361,600,000, excluding variable costs and depending on the vessel specifications.

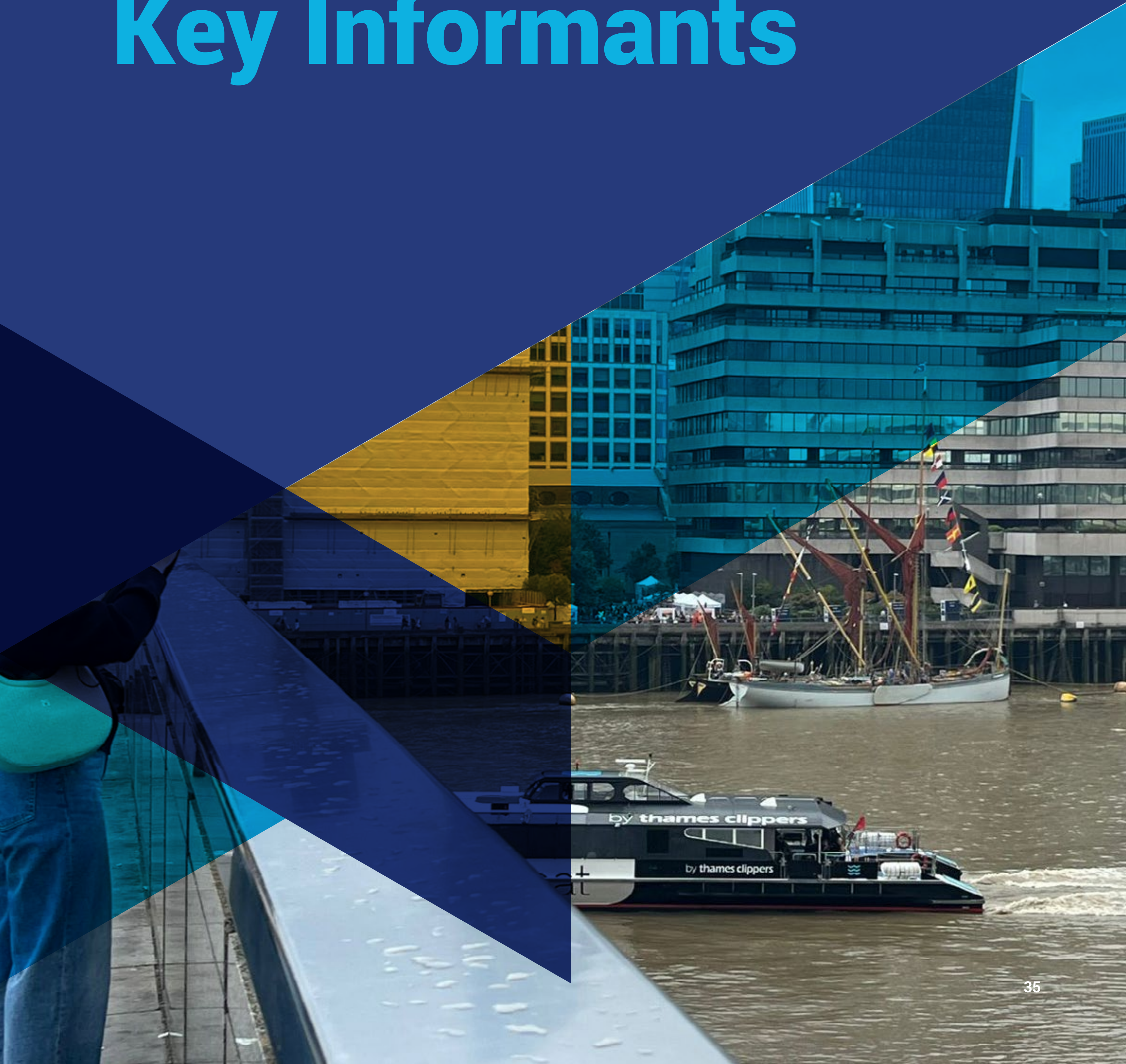
Table 4: Projected Cost of Ownership & Operating a 300 Capacity marine Vessel over 14 years

Item Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cost of Marine vessel	266,475,498	-	-	-	-	-	-	-	-	-	-	-	-	-
Salaries & Wages (Captain, Deckhand, Hostesses)	2,640,000	2,745,600	2,855,424	2,969,641	3,088,427	3,211,964	3,340,442	3,474,060	3,613,022	3,757,543	3,907,845	4,064,159	4,226,725	4,395,794
Fuel Costs	24,967,606	25,866,440	26,797,632	27,762,346	28,761,791	29,797,215	30,869,915	31,981,232	33,132,556	34,325,328	35,561,040	36,841,238	38,167,522	39,541,553
Regular Maintenance	26,647,550	23,982,795	22,303,999	20,742,719	19,290,729	17,940,378	16,684,551	15,516,633	14,430,469	13,420,336	12,480,912	11,607,248	10,794,741	10,039,109
Dry Docking	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Marine Insurance	2,664,755	2,398,279	2,230,400	2,074,272	1,929,073	1,794,038	1,668,455	1,551,663	1,443,047	1,342,034	1,248,091	1,160,725	1,079,474	1,003,911
Berthing Fees	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000	1,825,000
Inspection Fees	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Licensing Fees	9,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
Accounting and Legal Fees	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Advertising Costs	9,000,000	-	-	-		-	-	-	-	-	-	-	-	-
Communication Expenses	260,000	260,000	260,000	260,000	260,000	260,000	260,000	260,000	260,000	260,000	260,000	260,000	260,000	260,000
Contingency Fund (@10%)	33,515,941	5,775,611	5,695,045	5,631,198	5,583,302	5,550,659	5,532,636	5,528,659	5,538,209	5,560,824	5,596,089	5,643,637	5,703,146	5,774,337
		281,075,350	257,007,076	232,052,576	206,395,752	180,212,073	153,669,327	126,928,327	100,143,574	73,463,877	47,032,942	20,989,919		
Total Costs	**368,675,350**	**344,607,076**	**319,652,576**	**293,995,752**	**267,812,073**	**241,269,327**	**214,528,327**	**187,743,574**	**161,063,877**	**134,632,942**	**108,589,919**	**83,069,926**	**62,734,609**	**63,517,704**
Revenues	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**	**87,600,000**
Net Revenues	**(281,075,350)**	**(257,007,076)**	**(232,052,576)**	**(206,395,752)**	**(180,212,073)**	**(153,669,327)**	**(126,928,327)**	**(100,143,574)**	**(73,463,877)**	**(47,032,942)**	**(20,989,919)**	**4,530,074**	**24,865,391**	**24,082,296**

Notes		No.	Unit Cost (KES)	Description
Salaries	Captain	1	150,000–300,000	Per month
	Deckhand	2	30,000–100,000	Per month
	Hostess	2	40,000	Per month
Licensing Fees	Application fee		1,000	One time
	Annual license fee/ annual license fee		8,000	Annually
Inspection Fees	Safety inspection		20,000	Annually
	Sea worthiness inspection		50,000	Annually
Maintenance	10% of Boat value then 7% afterwards			Annually
Insurance	1% of Hull value			Annual premiums
Fuel costs	Catamaran with 700–800HP engine operating at 20 knots	2.78 gallons per nautical mile		
	Assumption 4 round trips between Mtwapa and Mombasa			
	Assumption 12km for one way trip			
	Current cost of diesel	166.84 per litre		
	Inflation rate at 3.6%			
Communication expenses	Satellite phone and internet		260,000	Annually
Advertising fees	Mainsream media		300,000	Prime slot, 30 seconds for 30 days
Berthing fees			5,000	Per day
8 trips a day @100 per passenger, assuming full capacity each trip				

Chapter 4

General Findings From Key Informants



4.1 Key Existing Plans/Projects/ Initiatives Favour Investment in Water Transport

Mombasa has in place plans, strategies, and initiatives that are favourable to investment in public water transport. These are: Mombasa County Plans & Strategies including Annual and County Integrated Development plans (CIDP 2023–27, ADP–2023/24), Urban Mobility Plan (ITDP), Mombasa Gate City Master Plan (JiCA), Vision 2035 (World Bank).

Key infrastructure projects will complement water transport & improve last mile connectivity. These are the Dongo Kundu Bypass, Mombasa–Mariakani Project, Mombasa–Kilifi Project, pedestrian, and cycle tracks in Nyali, road maintenance and improvement projects, proposed Integrated Transport Terminus at Kibarani. Relevant partner Projects on Urban sustainability such as Go-Blue project, KCDP, KEMFSED, and Marine Spatial Planning, GIZ–COMSSA City lab process.

Local capacity exists to produce vessels in Mombasa e.g. SECO, Waterbus or Glopology ltd, Kenya Shipyards Limited (KSL).

4.2 Main Concerns and Challenges

Stakeholders raised concerns and challenges about the development, these are in 5 broad categories:

a. Environmental concerns

- The impacts associated with damage to shipwrecks, archaeological sites, sensitive habitats, marine protected areas, and risk of pollution affecting critical habitats including e.g., coral reefs, seagrass, and mangroves
- Destruction of fish habitats and interference with fishing grounds affecting fishing activities
- Destruction of ecosystems and damage to undersea internet connection cables due to dredging
- Sea Pollution from oil spills and dumping of plastic and other waste at sea
- Noise pollution from vessels causing public nuisance and disturbances to serenity

b. Resources limitation & cost related concerns

- Limited space for development of infrastructure such as road space for the BRT system, and difficulties in relocating industrial activities
- Limited finances for road expansion
- Prohibitive cost of sea transport due to high capital investment in ships and landing facilities, and high operational costs compared to competing options like road transport.
- Prohibitive cost of public water transport if routes include the MPA which charges conservation fees for access
- Short distances for water transport can be uneconomical compared to longer distances e.g., Mombasa–Lamu
- Competition & Conflict between water commute and fishing activities where fishing grounds, and fish habitats are interfered with or destroyed.

c. Public Perception & Convenience

- Operators in public road transport may perceive water transport as competitive and could sabotage water commute
- The willingness of public transport commuters to use water transport will depend on the perceived convenience of travel time, affordability, and safety
- Road transport is perceived to be the most preferred mode of transportation for the public, while water transport is not preferred
- Commuter transport requires scheduled travel unlike leisure travel which is on demand

d. Natural Barriers

- The lowest and highest tidal variation is 3m approx. in Mombasa waters. Mtwapa Creek, which extends 25km, yet only 15km is navigable, and accessible only during high tide. The movement of larger vessels in these zones is restricted
- Tidal Influence affects water Transport so that leisure travel and cruising times are informed by tidal cycles. Commuter transport on the other hand requires a scheduled travel that is informed by timetables as in other transport options, tidal delays in commuter water transport will make it less preferable
- The construction of landing site infrastructure such, as jetties are feasible in calm protected waters for safety reasons, this renders most of Mombasa's North coast unconducive

e. Governance & Institutions

- Weak governance and institutional frameworks will compromise water transport development in Mombasa
- There is significant encroachment and lack of title deeds for fish landing sites in Mombasa
- The sea fronts in Mombasa are inaccessible due to narrow in-roads, and lack of emergency rescue centers nearby or at the sea fronts, posing a threat during emergency cases
- There is insufficient data for investors

4.3 Opportunities & Recommendations

i. Development of integrated transport system in Mombasa. This will network water, road, rail, and air transport by connecting water transport to key locations such as the SGR station, MIA airport

ii. Development of last mile connection linking water transport to by public road transport i.e. matatus, tuk-tuks, boda-bodas, and planned Kibarani bus terminus

iii. Water transport will boost tourism in Mombasa. It will provide tourists in beach hotels along Serena–Mkomani Beach stretch requiring sea travel to moorings, Mtwapa creek and Tudor creek

iv. All creeks are potential ports of landing. Navigation routes & landing ports can be developed along these areas

v. Collaboration with private sector in water transport and entering private-public partnerships. The National government should collaborate with the owners such as in development of landing infrastructure. For instance, the jetties in use currently are privately owned.

vi. Fit marine vessels with silencers to minimize noise pollution.

vii. Conduct public sensitization and awareness prior to implementation of water transport

viii. Inclusivity: The planning, design, and operationalization of water transport in Mombasa should put into consideration PWDs e.g., accessibility of the landing sites and vessels, communication channels at the facilities, signage and sign language

4.4 Required Actions for Development of Water Transport in Mombasa County

a. Legal, Policy & Institutional

- Develop county transport policies and legislation for water transport and development control
- Alignment of the Mombasa County water transport development to existing legal requirements for land acquisition, infrastructure development, and marine protected areas (MPAs).
- Inter-county collaboration for water transport development
- Stakeholder consultation and engagement in the development and operation of water transport, including BMUs to protect traditional fishing sites
- Adherence to Environmental Act (EMCA) of 1999 provisions in the development and operationalization of water transport in Mombasa. The regulations provide guidance on Environmental and Social Impact Assessments (ESIA), and public participation, to address all environmental matters including pollution, critical ecosystems, conservation areas etc.Local enactment of domesticated international frameworks such as Safety of Life at Sea (SOLAS), MARPOL etc
- Decentralizing amenities like housing and support services to decongest the city
- Provision of water ambulances for emergency cases

b. Infrastructural

- Create space for road/rail expansion due to population growth
- Upgrade road networks for integrated water-road transport including the ongoing projects like Mombasa Northern bypass.
- Collaboration between local governments, urban planners, and environmental specialists to address gaps in development control (zoning, setbacks)
- Mark navigation routes and fishing gears to reduce conflict with fisher and other water users

c. Technical Specifications

- Promote investment in larger ships and floating jetties to overcome constraints from rough sea conditions and enhance safety and comfort.

- Promote innovations such as hovercraft to reduce infrastructure needs.
- Technical specifications for marine vessels should promote investment in hybrid/electric water buses and ferries, solar energy systems for water buses.
- Technical specifications for marine vessels should promote investment in fiber boats that are not corrosive on ocean water unlike aluminum boats or wooden boats that are insects infested, and
- Technical specifications for marine vessels should promote boats or ferries designed for vehicles and cargo transport

d. Socioeconomic

- Development of water transport in Mombasa will lead to the growth of local industry. It will result in developing manufacturing industries by creating demand for vessels assembled locally; it will create demand for active tourism such as excursions and tours. Development of these sectors will lead to increased employment opportunities i.e. in transport, tourism, manufacturing etc.
- Recruit and train safety personnel including rescue team and lifeguards for safety purposes during emergencies
- Balance community needs with Vision 2035 by considering low-income communities living along creeks in providing affordable, safe transport services.
- Development of water transport in Mombasa will lead to convenience for commuters. It will deliver timelines for employees arriving at their workplaces, ease transportation of passengers and cargo, promote ease of access to remote and populated areas
- Growth in tourism: Water transport will result in the ease transportation of tourists and clients from the airport to tourist hotels, creating jobs in tourism and transport sectors, creating opportunities for training in cruise tourism
- Conduct public and community sensitization on the environmental and socio-economic impacts of the project.
- Stakeholder engagement to avoid conflicts between resource users or sectors
- Establish compensation roundtable to avoid conflict of interests
- Provide for incentives to local communities and BMUs e.g. dividends to conservation and management bodies and offshore fishery infrastructure

e. Environmental

- Technical specifications for vessels to use alternative energy sources like solar energy to run water buses, and effective waste management to reduce pollution
- Technical specifications for vessels to prioritize on-board sanitation e.g. waste separation dustbins
- Technical specifications for infrastructure that minimize environmental impact like using floating jetties in creeks and inshore areas.
- Avoid/ minimise dredging along important/ critical ecological sites and ensure protection of marine ecosystems and key habitats such as mangroves during development due to negative ecological impacts
- Identify and map important conservation corridors e.g. Mombasa Marine National Park & Reserve
- Safeguarding heritage sites including coastal forests, kayas and archaeological sites like shipwrecks

Annex

Annex: Implementation Roadmap

	Activities	Implementing partners	Status
Phase 0	**Preparatory Actions (2019–2025)**		
	Pre-Feasibility study	Berenschot Groep B.V– Consulting Firm	**Done**
	Feasibility study	Go Blue Project	**Done**
	Stakeholder Engagement and Validation	Go Blue Project County Government of Government COMRED	**Done**
	Incorporation of the comments from the stakeholder validation workshop to the final report	COMRED	**Done**
	Printing and Handover of the final report to the County Government of Mombasa	Go Blue Project COMRED	**Done**
Phase 1	**Inception Activities (2025–2027)**		
	Comprehensive study of sub-components e.g., ESIA (Including land acquisition, resettlement of displaced, and compensation as needed) Baseline surveys of each landing site Verification of land tenure and ownership status of proposed landing sites	Mombasa Investment Corporation (MIC) & County Government of Mombasa	Pending
	Financial modelling and detailed cost-benefit analysis	Mombasa Investment Corporation & County Government of Mombasa	
	Mapping of the proposed landing sites	Mombasa Investment Corporation & County Government of Mombasa	
	Extensive public sensitization and awareness campaigns	Mombasa Investment Corporation & County Government of Mombasa	
Phase 2	**Review of Relevant Legal Instruments (2025–2027)**		
	Transport policies, frameworks & regulations	Mombasa Investment Corporation & County Government of Mombasa	
	Integration of water transport into existing plans, such as Mombasa Vision 2035, Mombasa Gate-city Master Plan, County Integrated Plans	Mombasa Investment Corporation and County Government of Mombasa	
	Approval and Endorsement from the relevant government authorities	County Government of Mombasa	

	Activities	Implementing partners	Status
Phase 3	**Piloting, Design and Construction (2028–2032)**		
	Engineering designs (landing site infrastructure, jetties, terminals)	Kenya Shipyards KPA SECO KMA County Government of Mombasa	
	Construction of the landing infrastructure, jetties, terminals	Kenya Shipyards KPA SECO KMA KeNHA Kenya Railways Corporation Government of Mombasa	
	Establishing smart system ticketing	County Government of Mombasa Investor/Operator	
	Piloting of the intervention with one route e.g., Likoni–Kisauni (Boarding areas, Waiting Bay, Ticketing area/systems, parking areas)	Kenya Shipyards KPA County Government of Mombasa Investor	
	Training on safety measures, management & operations of the landing infrastructure, vessel operation, maintenance, and ticketing systems	Kenya Red Cross Society Kenya Coast Guard COMRED TUM Bandari Maritime Academy	
	Detailed costing of landing site infrastructure	County Government of Mombasa	
	Enhance existing tourism and leisure water transportation by small operators	County Government of Mombasa	
Phase 4	**Procurement of the vessels (2028–2032)**		
	Expression of interest for landing infrastructure	County Government of Mombasa, National Government of Kenya	
	Expression of Interest for vessels	County Government of Mombasa, National Government of Kenya	
	Expression of Interest for the ticketing system	County Government of Mombasa, National Government of Kenya	

	Activities	Implementing partners	Status
Phase 5	**Scale-up (2033)**		
	Strengthen Public-Private Partnership	County Government of Mombasa	
	Monitoring, Evaluation & Research	County Government of Mombasa, KMA, KPA, KMFRI, COMRED, NEMA, KWS, NMK, NLC, TUM	
	Expansion of the landing sites & routes	County Government of Mombasa, NLC	
	Expansion of fleets	Kenya Shipyards, County Government of Mombasa	
	Integrating water transport with other modes of transport	County Government of Mombasa, NEMA, KeNHA, KURA, NLC, COMRED, ITDP	
	Service and Maintenance	County Government of Mombasa, Kenya Shipyards, SECO	

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