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FINAL ASSESSMENT REPORT

Private Sector Participation in an Integrated Transport System in Lagos, Nigeria – Lagos State Water Transport Program

Prepared for:

World Bank

Prepared by:

CPCS

In association with:

Benchmac & Ince

Osot Associates

Solutions for growing economies

CPCS 17447

December 28, 2018

Quality Assurance

Private Sector Participation in an Integrated Transport System in Lagos, Nigeria.

CPCS Ref: 17447

Draft Assessment Report

Version	Date	Responsible	Approval
1.0	November 15, 2018	Vidhi Mohan	Jean-Francois Arsenault
2.0	December 28, 2018	Vidhi Mohan	Jean-Francois Arsenault

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December 28, 2018 CPCS Ref: 17447

To:
The World Bank Group
1818 H Street, NW
Washington, DC 20433 USA

Dear Sir/Madam,

Re: Private Sector Participation in an Integrated Transport System in Lagos, Nigeria
Lagos State Water Transport Program - Submission of Final Assessment Report

We are pleased to submit the finalized assessment report for the above-referenced Project following comments from the World Bank Group.

We would be pleased to address any remaining comments or questions the World Bank may have following the Bank's Decision Meeting in February 2019.

Yours very truly,

CPCS Transcom Limited

Vidhi Mohan
Project Manager

Acknowledgements

CPCS would like to acknowledge the kind assistance granted to them by the World Bank Group, the Lagos State Government, including its agencies LAMATA and LASWA, and the Nigerian Ports Authority. We also wish to thank all other stakeholders consulted during the project mission. Any errors of fact or interpretation are ours.

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Acronyms/Abbreviations

BRT	Bus Rapid Transit
BOT	Build Operate Transfer
BPP	Bureau of Public Procurement
CA	Concession Agreement
CPCS	CPCS Transcom Limited
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
EBIT	Earnings Before Interest and Taxes
ENPV	Economic Net Present Value
EIRR	Economic Rate of Return
FAAN	Federal Airports Authority of Nigeria
FMEnv	Federal Ministry of Environment
GIF	Global Investment Facility
GIS	Geographic Information System
HSV	Hourly Service Volume
IA	Implementing Agencies
ICD	Inland Container Depot
ICRC	Infrastructure Concession Regulatory Commission
ILO	International Labour Organization
IMO	International Maritime Organization
IR	Inception Report
IRR	Internal Rate of Return
ISBT	Interstate Bus Terminals Project (Mega Terminals Project)
IoT	Internet of Things
IWT	Inland Water Transport
Km	Kilometer
KPI	Key Performance Indicators
LAGBUS	LAGBUS Assets Management Company Limited
LAMATA	Lagos Metropolitan Area Transport Authority
LsMoE	Lagos State Ministry of Environment
LASEPA	Lagos State Environmental Protection Agency
LASWA	Lagos State Waterways Authority
LASG	Lagos State Government
LBSL	Lagos Bus Services Ltd
LMA	Lagos Metropolitan Area
LOS	Level of Service
LSPPA	Lagos State Public Procurement Agency
LSWTP	Lagos State Water Transport Program
LSNPA	Lagos State Number Plate Authority
LUA	Land Use Act
LURPD	Lagos State Urban and Regional Planning and Development Law
FGN	Federal Government of Nigeria
FMEnv	Federal Ministry of Environment
FMOT	Federal Ministry of Transport
FMPWH	Federal Ministry of Power, Works and Housing

MCIS	Maersk Container Industry Services
MDA	Ministry, Department or Agency
MoWI	Ministry of Works and Infrastructure, LASG
MoWID	Ministry of Waterfront Infrastructure Development, LASG
MU	Management Unit of Global Investment Facility
NAFITH	National Freight Information and Transportation Hub
NCPP	National Council on Public Procurement
N4P	National Policy on Public Private Partnerships
NIMASA	Nigerian Maritime Administration and Safety Agency
NIWA	National Inland Waterway Authority
NPA	Nigerian Ports Authority
NPV	Net Present Value
NRC	Nigerian Railway Corporation
NSC	Nigerian Shippers Council
NYEDC	New York City Economic Development Corporation
O&M	Operation and Maintenance
OD	Origin Destination
PPIAF	Public Private Infrastructure Advisory Facility
PPP	Public Private Partnership
PSP	Private Sector Participation
PT	Public Transport
RfP	Request for Proposals
RoW	Right of Way
STMP	Strategic Transport Master Plan
Sqm	Square meters
TEU	Twenty Foot Equivalent Unit
TPPAF	Truck Parking and Port Access Facility
WP	Working Paper
WB	World Bank

Key Take-Away

The purpose of this report is to identify and evaluate the feasibility of using water transport in the Lagos Metropolitan Area (LMA) to help alleviate congestion.

Short-sea shipping, and ferry transportation in particular, requires particular conditions to be financially self-sustained. In most places, passenger and/or freight ferries serve hard-to-access areas or provide shorter routes between two points than competing modes (essentially acting as bridges). Even in these cases, ferries are often subsidised, either through public investments in either infrastructure and/or ships. In urban areas, ferries are almost always considered public transportation alternatives, and as such are subsidised in similar ways as other urban transit alternatives such as light rail or bus transportation.

The report provides an in-depth analysis of the potential ferry services over 11 routes in LMA. Based on a detailed analysis of demand, fares, operational costs, terminal development costs and ship acquisition costs, the Badore-Ijede route is identified as not only financially viable on an operational basis (i.e. excluding capital investments and terminal operations), but could potentially contribute to some of the capital investments. Farebox recovery (revenues minus operational costs) on that line with 100-seat capacity vessels operating with a 30-minute headway during peak hours reaches about 360%, much higher than the second-best line at 191% (Marina – Liverpool – Ijegun Egba – Ebute Ojo). The economic analysis, which encompasses social benefits beyond financial returns, confirms that the investment to be undertaken by the Government is socially justified.

We strongly recommend that the first step (**Phase I**) of any PSP strategy in the water sector focus on the **Badore-Ijede route**. An O&M concessionaire could, in our view, take-up the revenue risk for ship acquisition and operations. Concession fees, or contribution to terminal development, would however likely be minimal. This is particularly true given that demand risks are not trivial – the tariff proposed remains relatively high, and establishing the reliability and quality of the service could take a few months to a year.

The next steps for the development of the Badore-Ijede route in Phase I under a PSP are to establish the conditions for an O&M concession (5 years, renewable). Actions required, beyond the legal and institutional issues identified in the accompanying report, are as follows:

- Conduct detailed and targeted market sounding to confirm private sector interest (and degree of risk transfer) for the identified route in Phase I. Receive targeted feedback on vessel specifications, service levels, etc.
- Finalize preliminary design and estimates for terminals (and vessels, as required);
- Secure public funding for capital investments (terminals and, potentially, vessels[1]);
- Prepare tender documents for an O&M concessionaire assuming demand risks. KPI would focus primarily on frequency, reliability and safety of service. Bidders' business plans would indicate their proposed requirements and assumptions for modifications to terminals based on initial specifications in the tender document.

Once the infrastructure and service is in place in Phase I, developing the other routes (**Phase II**) would become easier. In particular, certainty around the requirement for an operational availability payment would be better defined and the model for both terminal and vessel operations could be adjusted to expose the private sector to more or less risk.

[1] We understand Lagos State Government has procured 7 vessels for LAGFerry operations. One of these vessels could be dedicated to the Badore-Ijede Phase IPSP if the private sector cannot support ship acquisition.

Executive Summary

This assignment "Private Sector Participation (PSP) in an Integrated Transport System in Lagos" is intended to assist the Lagos State Government (LASG) for three identified transport sector initiatives with potential for private sector participation: the *Interstate Bus Terminals Project* (Mega Terminals/ISBT Project), the *Lagos State Water Transport Program* (LSWTP), and the *Truck Parking and Port Access Facility* (TPPAF) *using information and communication technologies*. The overall objective of these three projects is to reduce road congestion in the Lagos Metropolitan Area (LMA).

With average travel speeds during peak morning and peak evening being less than 19 miles per hour in most parts of LMA, this workstream (LSWTP) assesses the viability of Inland Water Transport (IWT) delivered through PSP as an alternative to road based transport.

The purpose of this study is to answer the following key questions with respect to LSWTP:

- What are the legal, regulatory and institutional opportunities and bottlenecks, and how they can be resolved to allow for PSP in IWT?;
- What is the potential for PSP in IWT, specifically for passenger transport which is the current focus of Lagos State Waterways Authority (LASWA) and Ministry of Waterfront Infrastructure Development, LASG (MoWID)?; and
- Based on market sounding and feedback from LASG agencies, what are the best options for procuring PSP and necessary next steps to move the project forward?

This report covers the potential for PSP in IWT in Lagos, along with a strategy for taking this forward. The Legal, Regulatory and Institutional issues as well as Social, Environmental and Gender issues are covered in a separate report, which covers all three transport sector initiatives.

The current IWT service in Lagos serves about 14.1 million passengers per year (or 53,590 passengers per weekday) constituting a small share of the public transport system in the city where the demand for trips across all modes (including walking) is estimated at 22 million per day. There is at present a wide variation in the levels of service available to passengers in terms of scale and quality of boat/ferry services (waterside operations). Most operators ply during daylight hours on weekdays with two peak demand periods – 6am-10am in the morning and 4.30pm-7pm in the afternoon, servicing commuter traffic comprised of workers and students from lower socio-economic demographics.

Adherence to a set schedule and reliable service is a major concern, with the frequency of ferry services changing based on spot (current) demand. Published fares also are prone to changes at the discretion of operators based on demand. Both these factors adversely impact passenger patronage and growth. The current boat operator market features small local boat owners, a majority owning single boats with a capacity of seating 20 passengers or less. Quality of boats, maintenance and fueling protocols are reflective of an unorganized setup.

The jurisdiction of jetties and terminals is currently divided between LASWA/MoWID (LASG), NIWA and NPA. In most cases, jetties are operated by the boat operators plying the respective routes. Most jetties require rehabilitation or complete redevelopment. Terminal infrastructure varies from basic ticketing stalls and washroom to just an entry/exit in some cases. Furthermore, only a few ferry terminals provide park and ride facilities. Less than 25% of the terminals reviewed had access to any kind of public transport within a 500 meter radius.

The responsibility of channel management (dredging, navigation charts, etc.) and water quality management is divided between MoWID and LASEPA respectively. MoWID is currently pursuing a dredging programme to achieve navigable depth of 4 meters on 4 routes with 11 more in the pipeline, which target the more viable routes as per LASWA's assessment. Apart from patrolling by 2 motorboats by LASWA, there is no centralized traffic management system.

For the IWT to be a mode of choice for passengers, the following principles must be considered:

Reliable Service: The reliability of a passenger ferry service starts with the adherence to a published schedule (timetable) and fares, which makes the journey time and cost predictable. This is essential to foster demand and justify an appropriate price.

Time and Cost Savings: Passengers need to derive benefits of time and cost savings, including time and cost of last mile transfers, as compared to other options.

Last Mile Connectivity: Apart from the enhanced transit experience on ferries, seamless last mile connectivity for passengers to enable transfers to other public transport or private vehicle options is a key consideration. This requires cohesive action by various agencies including LAMATA and LASWA to work together towards ensuring a seamless passenger transfer experience.

Capacity creation versus Operational efficiency/viability: Apart from navigational constraints, the choice of vessel design and passenger capacity has to be such that it optimizes costs (capital and operational) and delivers a reliable service.

Manpower: The majority of persons associated with the informal boat operations (off deck and deck activities) are not adequately educated and/or certified. While NIMASA lays down manning requirements, as per IMO guidelines, and is a certification body, there is an urgent need for investment in capacity building and training of manpower to play various roles including boat captains, deck hands, engine officers, traffic management personnel, etc.

Competing and Complementary Modes of Public Transport: LASG is pursuing various public transport projects as proposed in the Strategic Transport Master Plan 2014 (STMP). The network as envisaged in the STMP will have the capacity to transport over 7.2 million passengers per day and will require over 12,000 high and medium capacity buses to meet this demand. The STMP also proposes six LRT lines, one monorail line and 5 cable car projects all of which are different stages of planning and construction. In addition, there are various highway/expressway expansion projects being pursued by Ministry of Works and Infrastructure, LASG.

Once the above are in operation, a passenger in Lagos will have a menu of options to choose from based on his Origin/Destination, time and cost of the journey. These alternate modes of public transport will compete with IWT, but will also provide last mile connectivity.

Traffic Modeling and Forecast

Approach to Traffic Analysis

A multi-pronged approach was used to traffic analysis for IWT. This included a combination of secondary data review and primary data collection.

LASWA identified 30 routes for operationalization, the STMP suggested 36 routes and the Haskoning report recommended 6 lines to be operationalized for IWT.

While there is a need to introduce scheduled and efficient IWT services to help present the mode as a viable and reliable alternate means of public transport to Lagos' commuters, given the global experience of ferry services requiring high levels of subsidy[2], the emphasis needs to be on assessing the extent to which this demand can be captured taking into consideration the following supply side constraints:

- Technical/navigation constraints;
- Cost efficiency in determining the optimal size and capacity of the ferry vessels; and
- Level of service requirements - addressing quality and reliability of service.

In cognizance of the above, we recommend 11 routes based on the following criteria:

- Those with the high levels of potential traffic as identified both in the STMP and the Royal Haskoning report;
- Longer routes which would bypass congested road connections, and are therefore expected to deliver higher travel time savings; and
- The above factors would contribute to higher viability as longer routes and the higher travel time savings would translate into higher fares, and combined with higher traffic potential would provide greater revenue generation.

Key Findings from the Ferry Passenger Survey

A Ferry Passenger survey was designed and targeted at existing users of ferry service with the objective of capturing more information regarding the demographics and requirements of an average ferry passenger required in order to determine an effective service pattern.

- Ferry service is used by men and women almost equally – design of service needs to take into account safety and security of both genders, specifically women.
- Ferry service is currently patronized by passengers with monthly income of less than USD 165 per month: Fares will need to be designed taking into account affordability and the cost of alternative modes. In order to attract customers with higher paying capacity, the quality and reliability of service will require significant improvement and a strong track record; marginal short-term measures may fail to build patronage.

[2] In case of the City Cat Ferry System in Brisbane, the operational subsidy amounts to $3.80/passenger-trip. The annual subsidy in New York, United States, for the New York City's East River Ferry amounts to $3.1 million which translates to $2.58/passenger-trip. At the prevailing fare of $4, the service's farebox revenue covers 64% of the services operating costs. In case of Sydney ferries, the fare box collection cover 38% of expenses, the remainder being covered by subsidy and grants. (Source: CPCS Research and Analysis)

- Commuters with repeat journeys (work/education related trips): Since these are regular scheduled trips, they will require a reliable service schedule to be operated by the service provider to build trust in the service.
- Commuter trips will witness heavier traffic during peak hours (7am-10am and 4.30pm-7.30pm): Service patterns will need to be designed to cater to different traffic levels during peak and non-peak hours.
- Cost and convenience of last mile transfers: This is expected to play a significant role in modal choice. The ferry service needs to be integrated with other public/private modes of transport for smooth transit experience.
- Park and ride facility: Scope for parking of private vehicles at terminals needs to be evaluated and provided for.

Estimated Demand

The daily aggregate demand on the 12 routes[3] is close 271,000 trips or over 135,000 passengers in 2018. While IWT may present an alternative public transport option, it seldom captures a sizeable share of public transport within a city[4].

Facility Configuration and Service Design

Approach to Determine Design of the Project

Given the global experience of ferry services requiring high levels of subsidy, the focus needs to be on assessing the extent to which demand can be captured taking into consideration the following supply side constraints.

Table ES - 1: Supply side Considerations for Service Design

Navigation Constraints[5]	Cost Efficiency and Vessel Capacity	Level of Service requirements
▪ Environmental Factors on hull design and type of engine – Quality of water, tidal waves, presence of water hyacinth, etc. ▪ Bridges and average depth of channel/near terminals – constraints of air draft restricting maximum height of vessels and size (length overall) ▪ Multiple uses of IW - Maneuverability and line of sight of vessel and hence recommended speed	▪ Farebox not sufficient to cover O&M for some routes – restrict idle time of vessel or underutilization of capacity ▪ Operational and Capital costs increase as larger vessels are considered– specifically with respect to fuel expenses and crew requirements ▪ Facilities at ferry terminals – Larger vessels/fleets require investment in larger berths/capacity and infrastructure to handle greater passenger flow at a time impacting turnaround	▪ Higher frequency required during peak hours (7am-10am and 4.30pm-7.30pm) to service commuter traffic requires larger fleets ▪ Passenger flows towards commercial/residential centers mean significantly reduced utilization on return voyages during peak hours ▪ Reduced traffic during non-peak hours mean reduced vessel utilization (idle capacity) ▪ Journey Time savings essential value proposition for passengers to choose IWT over

[3] The number of routes eventually considered are 11, based on our subsequent discussions with LASWA.
[4] Some of the international examples cited in Section 3.5 serve between 50,000 to 40,000 passengers per day, but still constitute 1% to 2.5% of total public transportation
[5] Further details in Appendix A

Navigation Constraints[5]	Cost Efficiency and Vessel Capacity	Level of Service requirements
▪ Safety focus – conservative average safe speeds of 12 knots/hour or 22.2 kmph[6]	times, thereby impacting operational schedule	other road/rail based alternatives (which are cheaper) – route prioritization is key

Phased Approach

In cognizance of the fact that the Inland Water Transport (IWT) sector is still in its early development phase, we have propose a two phase approach (Phase I and Phase II). Phase I, would focus efforts on a single route and act as a proof of concept for private involvement in the envisioned ferry network. Success in Phase I would allow for a broader network building approach, focusing on a number of routes. The experience of PSP in Phase I will provide insights into the market for ferry services, the institutional capacity to implement a multitude of such projects, and capacity of State agencies to procure, administer and afford multiple PSP contracts. All this would inform subsequent project design for the routes in Phase II (discussed below) once the concept is proven.

We initially used a multi-criteria analysis to identify/ prioritize routes, but settled instead on phasing the development based on their financial viability given the importance of PSP and financial self-sustainability. As such, our final recommendation were as follows:

Single Route recommended for Phase I:

1. Badore – Ijede

Routes recommended for Phase II:

2. Falomo – Badore
3. Liverpool – Falomo
4. Marina – Liverpool – Ijegun Egba – Ebute Ojo

It should be noted that authorities do not necessarily have to wait until the end of Phase I to commence Phase II. Rather, Phase II could commence as soon as Phase I has established favourable public awareness, a positive track record with respect to ferry demand and a healthy public/private sector working relationship. A period of one to two years, sufficient to assess results and related financial data, should prove sufficient.

Service Design

Value Proposition: The key selling point for the ferry service would be the journey time savings estimated to be 46% across the routes. Reliability of service will build patronage and coupled with time savings, induce modal shift from road-based transport to IWT.

The proposed passenger ferry network system is designed around providing commuter passenger services between major demand centers and routes where travel time savings (as

[6] This is the average cruising speed, while maximum speeds will be much higher close to 16/18 knots per hour, and the design speeds of vessel could be as high as 25/30 knots. But when computing 'economic' speeds to compute fuel consumption and average voyage time for ferry routes, we consider 12 knots/hour as a realistic (although conservative) estimate.

compared to other modes) are high. The service has been designed as a commuter service that targets passengers commuting daily between similar origins and destinations (e.g., from home to work or home to school). Therefore, no operations on Sunday have been proposed, as the demand for services will be much lower. The table below summarizes the key service design parameters of a mature ferry network system in Lagos.

Table ES - 2: Key Service Design Parameters under a Full Blown System

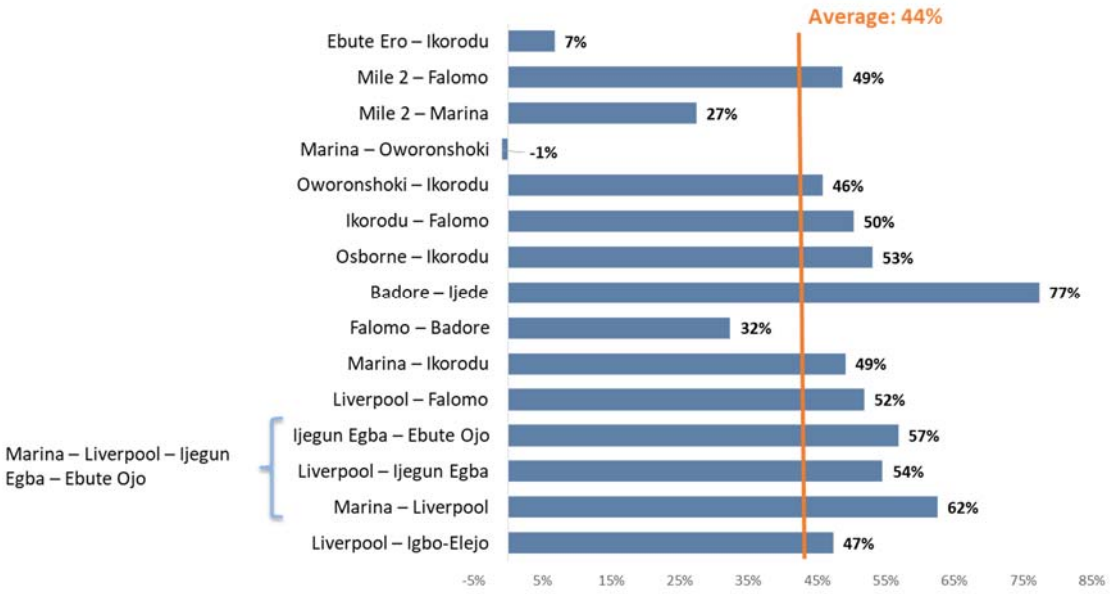
Targeted Users	▪ Commuters with repeat journeys (work/education related trips)
Service frequency/ schedule	▪ Peak hours: Express service which runs every 15 minutes during peak hours (7am-10am and 4.30pm-7.30pm) – 12 round trips every morning and evening. ▪ Non-peak hours: Regular service which runs every hour during 10am-4.30 pm – 6 round trips during the day. ▪ Days of Operation – all days except Sundays.
Interchange between routes	▪ Ferry Terminals at Falomo and Marina will serve as central hubs where passengers can connect to other routes.
Fare Structure	▪ Market driven but fixed for a period of one year, which allow premium pricing for journey time savings which would accrue for a ferry passenger but still be competitive with fares for competing modes. ▪ Premium fare of 15% for an Express Service which provides higher frequency; and ▪ Discount of 20% on advance bulk purchase when passengers buy stored value passes which offer them 30 ferry trips to be used within 2 months.
Vessel Type and Size	▪ 50/100 seaters new Catamaran type vessel (as it provides for increased stability and passenger comfort), jet propulsion (appropriate for shallow draft and providing better riding comfort), and with an aluminum hull for increased robustness; ▪ Average cruise speeds of 12 nautical miles per hour.
Terminal Infrastructure	▪ Marine Infrastructure – An average of two berths at each terminal for each route serviced by that terminal, assuming a turnaround time of 15 minutes per vessel. In the case of terminals servicing more than 1 route, the number of berths will increase proportionately; Provision for mooring bays and fueling dumps ▪ Landside Infrastructure - Air Conditioned Passenger Concourse and Operations area with basic amenities, washrooms, concession stands, access to Wi-Fi ▪ Ticketing Counters – including paper sale for tickets, discounted bulk purchase cards, and internet/automated payment mechanisms ▪ All terminals with be disabled friendly, with adequate security and firefighting equipment ▪ Inter-modal access: Terminals will have dedicated walkways to nearest Public Transport modes (such as bus stops, LRT stations), drop off zones, space for medium capacity shuttles and pay and ride facility ▪ Non-farebox Revenue generation sources based on terminal locations: o Open public spaces for cultural activities; o Entertainment hubs such as cafes/restaurants; o Advertising (billboards); o Commercial/retail space where possible; and o Naming rights for terminals.

Water Infrastructure	▪ LASWA and MoWID will invest in augmentation of navigational aids, develop navigation charts and emergency response systems, vessel traffic management system and take effective measures to manage water pollution.

Fare Structure

We undertook a comparison of costs for alternative modes of transport and journey time savings which are presented in Appendix G. In summary, it was estimated that on average, ferry passengers would be willing to pay a premium fare of about 44% above what they would expect to pay on a competing road-based mode of transport.

Figure ES - 1: Potential fare increase compared to road transport



Tariffs per route are summarized in the table below:

Table ES - 3: Base Ferry Tariff

Route	Tariff Rate for One-way Trip (Naira)	Tariff Rate for One-way Trip (USD)[1]
Marina – Liverpool – Ijegun Egba – Ebute Ojo	2,622	7.28
Liverpool – Falomo	1,063	2.95
Marina – Ikorodu	1,044	2.90
Falomo – Badore	860	2.39
Badore – Ijede	1,862	5.17
Ikorudu – Falomo	451	1.25
Oworonshoki – Ikorodu	364	1.01
Marina – Oworonshoki	149	0.41
Mile 2 – Marina	255	0.71
Mile 2 - Falomo	595	1.65
Ebute Oro - Ikorodu	267	0.74

1. Assumes a 360 Naira/USD exchange rate

Vessel Fleet

For a preferred level of service of 15 minutes headway at peak hours, the vessel fleet requirement varies from 5 vessels on the Badore-Ijede route (due to short journey time) to 12 vessels on other longer routes. The total demand capture across all routes at peak and off-peak hours is an estimated 9% for 50-seater vessel, 19% for 100-seater vessel, 28% for 150-seater vessel and 38% for 200-seater vessel. The navigational constraints and requirements for creating berth capacity make the options for vessels larger than 100 seats less attractive.

Ferry Terminals

The proposed development area at the terminals is summarized in the Table ES- 6.

Table ES - 4: Development Area at Ferry Terminals

Name of Ferry Station (Phase I)	Number of Berths	Passenger Area (sqm)	Commercial Area (sqm)	Additional Park and Ride (sqm)	Current Space available (sqm)	Additional Space Required (sqm)
Falomo**	8	5,000	5,000	7784	2,939	-
Marina	6	3,750	3,750	5,838	No information	16,000
Badore	4	2,500	2,500	3,892	21,100	0
Ikorodu	4	2,500	2,500	3,892	19,300	0
Mile 2**	4	2,500	2,500	3,892	No information	-
Oworonshoki	4	2,500	2,500	3,892	1,691	12,309
Ijede	2	1,015	1,015	3,850	No information	10,200
Liverpool	2	1,015	1,015	3,850	No information	10,200
Ijegun Egba	2	1,015	1,015	3,850	2,745	7,455
Ebute Ojo**	2	1,015	1,015	3,850	1,719	-
Ebute Ero	2	1,015	1,015	3,850	1,643	8,557

** Already under concession arrangement

Options for Project Structure

At present, both MoWID/LASWA seem to have opted for a vertically separated service structure with waterside operations being licensed separately from landside terminal operations. Our financial and economic analyses consider both the vertically integrated and the vertically separated structures for each route.

From a perspective of pure efficiency of operations and the extent to which passenger handling (and ticketing operations) at ferry terminals and turnaround time of vessels at terminals (including embarking/disembarking passengers) are codependent, integrating ferry terminal operations and waterside operations may provide greater reliability of service. This may also contribute to overall sustainability as waterside operators would not be required to pay ferry terminal operators for access to ferry terminals and the private partner would have a diversified revenue base of farebox and non-farebox collections. On the other hand, since some terminals would eventually be used for more than one route, vertical integration may not make sense if

routes are not bundled. Moreover, skillsets required for ferry operations and terminal operations (including commercial uplift) may not fully match.

Both structures can be further tested with focused market sounding ahead of implementing Phase I, so as to define which model generates most private sector interest. For the sake of simplicity however, unless significant interest is expressed for integration, we recommend to have the terminals managed by the State or under a management contract during the initial years as the business model for the core activity is stabilized. This would also conform to MoWID/LASWA current preference and approach.

Economic and Financial Analysis

Economic Analysis

Journey time savings, employment benefits and land value increase were quantified as economic benefits, with the results presented in the table below (a 12% social discount rate was assumed). The combined network delivers a positive Economic NPV and an EIRR of over 21%, which is reasonable.

Table ES - 5: Economic Appraisal Results

Route	ENPV (USD '000s)	EIRR
Marina – Liverpool – Ijegun Egba – Ebute Ojo	49,368	30.8%
Liverpool – Falomo	10,277	26.5%
Marina – Ikorodu	47,096	32.8%
Falomo – Badore	-10,943	-4.0%
Badore – Ijede	13,813	32.1%
Ikorudu – Falomo	3,843	16.4%
Oworonshoki – Ikorodu	-12,279	2.4%
Marina – Oworonshoki	31,208	30.1%
Mile 2 – Marina	26,165	25.3%
Mile 2 - Falomo	5,013	19.3%
Ebute Oro - Ikorodu	-6,155	3.8%
All Routes Combined	**87,220**	**21.5%**

Farebox Recovery

On an unlevered basis (i.e., a project valuation prior to introducing a capital structure), the proposed tariffs are generally not sufficient to cover operating costs and ship acquisition, let alone terminal capital costs. For each route, a tariff that fully covers both capital and operating costs would make transport by waterways grossly uneconomical to the average user.

Hence, to inform the level of financial participation from both the public and private sectors to make the LSWTP viable, an important step is to analyze the level of farebox recovery per route.

Farebox recovery looks at how much passenger fares and other revenues cover ferry operating costs (crew costs, administrative personnel, fuel consumption, etc.).[7]

Table ES-11: Steady State Vessel Capacity Utilization Farebox Recovery Rate per Route

Route	Farebox Recovery %	Proposed Sequencing
Marina – Liverpool – Ijegun Egba – Ebute Ojo	**191%**	**Phase II**
Liverpool – Falomo	**136%**	**Phase II**
Marina – Ikorodu	**85%**	**Not Considered***
Falomo – Badore	**148%**	**Phase II**
Badore – Ijede	**360%**	**Phase I**
Ikorudu – Falomo	**33%**	**Not Considered***
Oworonshoki – Ikorodu	**46%**	**Not Considered***
Marina – Oworonshoki	**16%**	**Not Considered***
Mile 2 – Marina	**23%**	**Not Considered***
Mile 2 - Falomo	**46%**	**Not Considered***
Ebute Oro - Ikorodu	**21%**	**Not Considered***

*Routes designated at "Not Considered" should not be prioritized in the short-to-medium term.
Source: CPCS Analysis

Table ES-11 summarizes the farebox recovery rate per route. The four routes in **green font** generate a farebox recovery rate that is higher than 100% (i.e., tariff revenues cover operating costs and can thus absorb some capital costs). All other routes would require financial support (i.e. operational subsidy) from the Government at this stage of the sector's development in order to make them viable.

The most viable route is Badore-Ijede. Intuitively, these results make sense as the Badore – Ijede route is 109km by road but only 6km by waterways. This large difference in distance results in significant time savings when travelling by water transport. These time savings enables the ferry operator to charge a significant premium on competing ground transport rates on this route – estimated at N1,862 relative to the ground transport tariff of N1,050.

[7] Given that the capacity of the ferries under study is much lower than the potential traffic over these routes, the main driver of revenues is the tariff level. The tariff has been set for each individual route by comparing it to land alternatives prices (i.e. bus & taxi, obtained via a ground survey) and adjusted to consider the time saved by using the ferry, where relevant. While the main driver of cost differentials between routes is the length of the route, many costs are fixed (e.g. crew).

Jump-starting the Passenger Ferry Sector

To jump-start the development and operationalization of passenger ferry services in the LMA, we proposed a phased approach with one route forming Phase I. The objective of Phase I would be to develop a 'proof of concept' for passenger ferry services.

To arrive at the preferred route that forms Phase I, the following routes were short-listed for further financial analysis:

1. Marina – Liverpool – Ijegun Egba – Ebute Ojo
2. Liverpool – Falomo
3. Falomo – Badore
4. Badore – Ijede

An unlevered financial analysis was undertaken on all 4 routes. While the proposed tariff for ferry operations is sufficient to cover related ferry operating costs for the short-listed routes, the profitability of ferry operations is eroded by operating losses exhibited at each of the terminals that service the short-listed routes. This, combined with the upfront investment required for both the terminals and vessels results in an overall negative net present value.

Moreover, assuming that the Government covers the costs of land and terminal development, while the private sector covers the costs of the vessels, we find that only on the Badore-Ideje route has sufficient revenues to cover ship acquisition costs and provide a positive rate of financial return (greater than the threshold of 18%).

In order to maximize the financing coming from the private sector, we recommend that the **Badore – Ijede route should be selected in Phase I**.

We propose that the land acquisition and terminal development required for Phase I be the responsibility of Government. Terminal maintenance and operations, beyond ticketing, should also be separated from ferry operations at this early stage.

Phase I Analysis – Badore - Ijede

In Phase I, we recommend that a private operator be engaged on an O&M concession basis, and be responsible for vessel acquisition and operations while also taking demand risk. We recommend a contract duration of five years (renewable based on KPI) and to set the floor for ferry acquisition (responsibility of the private sector) to at least two vessels with a capacity of approximately 100 passengers[8]. A minimum is set so as to achieve a head-way of approximately 30 minutes for the Badore – Ijede route during peak hours.

Our analysis suggests that at a concession fee may be payable to the Government during the five year operating period (Figure 6-18 summarizes Government's total financial outlays in the Phase I, namely land acquisition and terminal development). However, we also note that it only

[8] Noting that the demand for ferry services still remains largely uncertain, we would recommend not imposing additional vessel acquisition. However, bidding documents can leave it open to the bidders to suggest the ideal number of ferries, with those bidders suggesting more than two ferries scoring higher in a bid evaluation relative to bidders that only propose the minimum ferry requirement.

takes a 1.4% reduction in the tariff for yearly concession fees to become zero. In the interest of attracting ridership, collecting concession fees should not be an objective in Phase I. At a discount rate of 10%, the present value of Government's financial outlays in the Phase I is approximately USD4 million or Naira 1.4 billion (not including any potential concession fees).

The relative fragile balance of the project also suggests that a certain degree of openness should be maintained in the bidding process and at the negotiation stage to set ship acquisition and transfer modalities (lease versus purchase) as well as concession length at an attractive level for the private sector.

Options for Freight Ferry Transport

Our report focused primarily on passenger ferries. Indeed, institutional and jurisdictional issues around water freight transportation are more significant than for passenger services.

Nonetheless, because of a generally stronger capacity and willingness to pay, short-sea freight transportation (most probably via barges) could be an interesting angle for medium-term developments. Of course, financial viability would in no way be assured, especially given the need for multiple handling. Nonetheless, under the right conditions, water freight transportation could be used to reduce congestion at and within the Lagos port system, and potentially cross-subsidized passenger transportation.

While not the focus of our report, we propose a potential way forward to better assess this potential going forward. The proposed approaches are summarized in Table ES-14.

Table ES-14: Proposed Approaches to Freight

Short Term	Long Term
1. Lagos State Government negotiate quota for freight transport between Ports and Ikorodu docks/terminal 2. LASWA identifies passenger ferry routes that can be cross-subsidized with freight operations to cover OPEX costs (using farebox recovery as screening criteria) 3. LASWA licenses such operators to provide freight services between the Ports and Ikorodu 4. Multiple operators can provide standardized service on the same route, allowing LASWA (and NIWA) to monitor performance	1. Ferry operators submit business plans and proposals for LAWSA licence to operate/provide freight transport services on specific routes 2. LASWA selects strongest business plans and issue operators licenses to provide freight services on chosen routes 3. LASWA monitors and regulates performance of operators in line with submitted business plans

Key Recommendations and Way Forward

Our recommended way forward is to jump start the LMA's passenger ferry sector in two phases:

Phase I: We strongly recommend that the first step of any PSP strategy in the water transport sector focus on the **Badore-Ijede route**. An O&M concessionaire could, in our view, take-up the revenue risk for ship acquisition and operations. Concession fees, or contribution to other upfront capital, would however likely be minimal. This is particularly true given that demand

risks are not trivial – the tariff proposed remains relatively high, and establishing the reliability and quality of the service could take a few months to a year.

The next step for the development of that route under a PSP are to establish the conditions for an O&M concession (5 years, renewable) on the Badore-Ijede route in Phase I. Actions required, beyond the legal and institutional issues identified in the accompanying report, are as follows:

- Conduct detailed and targeted market sounding to confirm private sector interest (and degree of risk transfer) for the identified route in Phase I. Receive targeted feedback on vessel specifications, service levels, tariff structure, etc.
- Finalize preliminary design and estimates for terminals (and vessels, as required);
- Secure public funding for capital investments (terminals and, potentially, vessels[9]);
- Prepare tender documents for an O&M concessionaire assuming demand risks. KPI would focus primarily on frequency, reliability and safety of service. Bidders' business plans would indicate their proposed requirements and assumptions for modifications to terminals based on initial specifications in the tender document.

Based on our analysis, the following financial burden would likely fall on the public and private sectors under a PSP for Phase 1.

Table ES-15: Public and Private Sector Financial Responsibilities in Phase I

Public Sector	Private Sector
• Acquire the necessary land at Ijede **(US$198K, 71M Naira)** • Procure terminals at both Badore and Ijede **(US$5.3M, 1.9B Naira)** • Develop inter-modal access and transfers (last mile connectivity) at Badore (Amount to be established separately)[1] • Engage private sector in a contract to manage the terminals through an open tender. Include incentives to source and maximize revenue streams **(up to ~US$345K per annum, ~124M Naira per annum)**[2] • For vessel operations, operational subsidies are not expected	• Private operator to acquire at least two 100-seater capacity vessels **(US$2.4M, 864M Naira)** • Collect tariff revenues to cover route-wise operating expenditures plus a reasonable rate of return **(route-wise average operating expenditures over a five-year period are estimated at US$645K per annum or 232M Naira per annum)**

1. There is a bus stop at Ijede, but signage may be necessary. There is currently little connectivity at Ijede
2. This estimate is based on covering average operating losses at both terminals over a five-year period. Average operating losses are net of average revenues from vessel and passenger handling charges, car park revenues and commercial leases. This amount could be reduced if the terminals are new and maintenance expenses in the first few years are kept to a minimum.

Once the infrastructure and service is in place in Phase I, developing the other routes identified in Phase II would become easier. In particular, certainty around the requirement for an

[9] We understand Lagos State Government has procured 7 vessels for LAGFerry operations. One of these vessels could be dedicated to the Badore-Ijede Phase IPSP if the private sector cannot support ship acquisition.

operational availability payment would be better defined and the model for both terminal and vessel operations could be adjusted to expose the private sector to more or less risk.

Phase II: Routes for consideration in Phase II are as follows:

1. Marina – Liverpool – Ijegun Egba – Ebute Ojo
2. Liverpool – Falomo
3. Falomo – Badore

Based on the results of the Phase I, a reassessment of the viability of Phase II routes could be undertaken, and the appropriate model for PSP chosen. The key question for most routes would be to decide on whom is tasked with vessel acquisition. At that stage, the question of vertically integrating terminal and ship operations should also be reassessed, based on the costs faced by LASG for terminal operations and maintenance.

Based on the information available, if these projects were to be developed immediately, the following financial burden would likely fall on the public and private sectors under a PSP.

Table ES-15: Public and Private Sector Financial Responsibilities in Phase II

Public Sector	Private Sector
• Acquire the necessary land at Marina, Liverpool and Ijegun Egba[1] **(US$22.2M, 8.2B Naira)** • Develop terminals at Marina, Ijegun Egba and Liverpool[2] **(US$12M, 4.5B Naira)** • Develop inter-modal access and transfers (last mile connectivity) at terminal locations (Amount to be established separately) • Engage private sector in a contract to manage the terminals through an open tender. Include incentives to source and maximize revenue streams[3] **(annual costing to be determined based on outcomes of Phase I and specifically, accurate and reliable sourcing of terminal revenues)** • Procure vessels for Phase II **(US$38M, 14.9B Naira)**[4,5] • For vessel operations, operational subsidies are not expected	• Collect tariff revenues to cover route-wise operating expenditures plus a reasonable rate of return **(route-wise average operating expenditures over a ten-year period are estimated at US$3.4M per annum or 1.2B Naira per annum)** • Remit a concession fee to Government for the use of vessels to operate the routes in Phase II **(US$1.3M per annum or 468M Naira per annum)**[6]

1. Land already acquired for terminals at Falamo and Ebute Ojo
2. Terminals already developed at Falamo and Ebute Ojo. Terminal at Badore to be developed in Phase I
3. There may be scope to shift terminal construction risk and revenue risk to the private sector. This would be determined based on outcomes of Phase I
4. A total of 31 100-seater vessels would be required to achieve headways of 15 minutes. The number of vessels to be procured may be adjusted based on a better understanding of demand (to be determined in Phase I) and desired service levels
5. There may be scope to shift vessel acquisition to the private sector (to be determined based on developing a track record in Phase I to better understand demand and tariff affordability)
6. If vessel acquisition is shifted to the private sector in Phase II, concession fees owed to the Government would be minimize

1 Introduction

1.1 The Project Context

Key Messages

Average travel speeds during peak morning and peak evening is less than 19 miles per hour in most parts of LMA. This is a by-product of the severe road congestion in LMA. This workstream assesses the potential of IWT as a viable alternative to road based transport and in addition identify options to procure such a service through PSP.

The tasks and major activities followed for the execution of the assignment and preparation of the Draft Assessment Report are enumerated in this chapter. This includes field missions, conduct of primary surveys, review of secondary data, extensive stakeholder consultations and field reconnaissance, and finally market sounding to provide feedback on project structure.

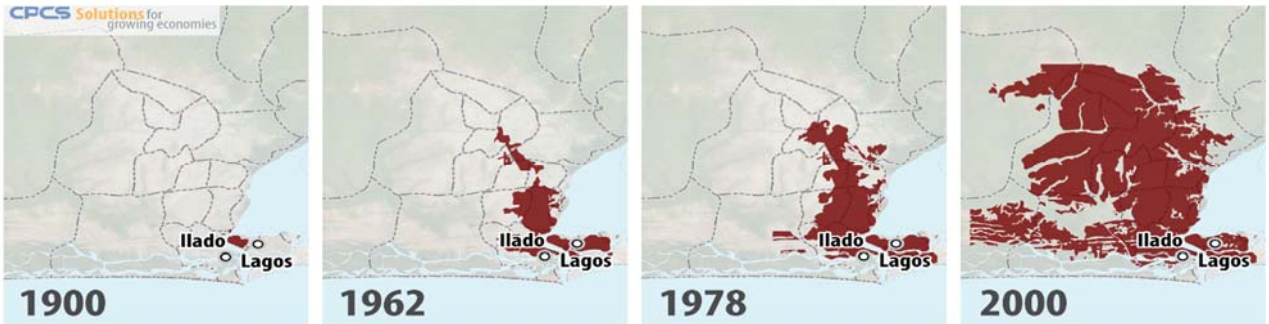
As part of the mandate, we adopted an approach of submitting Working Papers (WPs) on key tasks of the assignment with the objective to continuously seek feedback on our analysis and outputs, address comments and receive suggestions which have been incorporated into this Assessment Report.

A brief on the structure of the report is also presented.

1.1.1 Background

Over the years, Lagos, the commercial capital of Nigeria, has witnessed a rapid increase in population amid significant urbanization and city expansion. The transport system has not grown adequately to meet this demand. The city is congested, with transport services dominated by informal service providers and privately owned cars. Over a century of growth in Lagos State has resulted in an urban sprawl along the main north to south transport corridor, and more recently the western axis.

Figure 1-1: Time Series of Urban Growth in Lagos (1900 - 2000)



Source: Ministry of Physical Planning/Environment (1900, 1963) LAMATA (2000). Data from the Global Human Footprint Dataset's Human Influence Index – HII (2005).

This has resulted in growing traffic congestion in Lagos with peak morning and peak evening speeds between 0 – 19 miles in most sections[10]. The congestion along the primary north to

[10] Frederic Oladeinde. Presentation on the Lagos Strategic Transport Master Plan. Lagos Metropolitan Area Transport Authority (LAMATA). 2017

south transport corridor is so acute that, on the Lagos to Jibiya (the border town in Northern Nigeria) trade route, the short segment from the Apapa or Tin Can Island Port to warehouses outside the port in Lagos (2% of the total distance) costs shippers D434 in transport costs, representing 22% of the total land transport price[11]. Extra costs[12] related to transport from the Ports to Lagos warehouses represent 94% of the total cost, driven mostly by congestion and poor road conditions.

1.1.2 Lagos State Water Transport Program (LSWTP)

This workstream (LSWTP) assesses the potential of Inland Water Transport (IWT) acting as a viable alternative to road based transport and examines the potential for providing this service via PSP.

IWT services in Lagos currently serves about 14.1 million passengers per year (or 53,590 passengers per weekday). The services constitute a small share of the public transport system in the city where the demand for trips across all modes (including walking) is estimated at 22 million per day. The bus network (formal and informal) in comparison serves 5 million passengers per day.

There is at present a wide variation in the levels of service available to passengers in terms of scale and quality of boat/ferry services (waterside operations). Most operators ply during daylight hours on weekdays with two peak demand periods – 6am-10am in the morning and 4.30pm-7pm, servicing commuter traffic comprised of workers and students from lower socio-economic demographic.

The lack of adherence to a set schedule and an unreliable service are major concerns, with the frequency of ferry services changing based on spot (current) demand. Published fares also are prone to changes at the discretion of the operator based on demand. Both these factors impact passenger patronage and growth adversely. The current boat operator market features small local boat owners, majority owning single boats with seating capacity of 20 passengers or less. Quality of boats, their maintenance and fueling protocols are reflective of an unorganized set up.

There is a need to introduce scheduled and efficient IWT services to help present the mode as a viable and reliable alternate means of public transport to Lagos' commuters.

This workstream seeks to answer the following key questions with respect to LSWTP:

- What are the legal, regulatory and institutional opportunities and bottlenecks, and how they can be resolved to allow for PSP in IWT?;
- What is the potential for PSP in IWT, specifically for passenger transport which is the current focus of Lagos State Waterways Authority (LASWA) and Ministry of Waterfront Infrastructure Development, LASG (MoWID)?; and

[11] As per the Nigeria Expanded Trade and Transport Program (NEXTT) Lagos-Kano-Jibiya (Lakaji) Corridor Performance: Baseline Assessment Report On The Time And Cost To Transport Goods, 2015

[12] Ibid. Extra costs include all informal charges and all indirect financial costs of delay, and any other observed costs deemed unnecessary, unjustified, or too expensive, in comparison to international benchmarks; quantified over and above transport costs

- Based on market sounding and feedback from LASG agencies, what are the best options for procuring PSP and necessary next steps to move the project forward?

1.2 Authority of the Assignment

As part of the Lagos State Government's (LASG) commitment to the continued improvement of transport connectivity in the Lagos metropolitan area, LASG has identified three transport sector initiatives with potential for private sector participation (PSP): the Interstate Bus Terminals Project (Mega Terminals Project), the Lagos State Water Transport Program (LSWTP), and the Truck Parking and Port Access Facility (TPPAF) using information and communication technologies. The TPPAF is being implemented by the Nigerian Ports Authority, an agency of the Federal Government, but in close collaboration with Lagos State.

The World Bank, alongside the Management Unit of GIF (MU) and PPIAF (the three are collectively termed as the 'Client'), have engaged with the Lagos Metropolitan Area Transport Authority (LAMATA), the Lagos State Waterways Authority (LASWA), and the Nigerian Ports Authority (NPA) to assess the options available for attracting private sector investment and participation into the three transport initiatives.

The objectives of the assignment are to:

- identify the legal, regulatory and institutional opportunities and bottlenecks and formulate recommendations to solve these within the framework of each of the three projects;
- assess feasibility of the three projects; and
- build consensus regarding the options presented and identify necessary next steps.

This Draft Assessment Report was prepared under the authority of the contract signed between the World Bank Group (WB) and CPCS Transcom Limited (CPCS) on December 21, 2017, for the Project, "Private Sector Participation in an Integrated Transport System in Lagos" (Selection No. 1248779).

1.3 Scope of this Report

This Report consolidates all of our analysis, findings and recommendations, addressing the entire scope and the work undertaken for the LSWTP. The major tasks as defined in the Terms of Reference (ToR) include:

Workstream A: Cross-cutting institutional, legal and regulatory framework diagnostic

- Task A1: Review of cross-cutting institutional, legal and regulatory framework (PPIAF).

Workstream C: Lagos State Water Transport Program

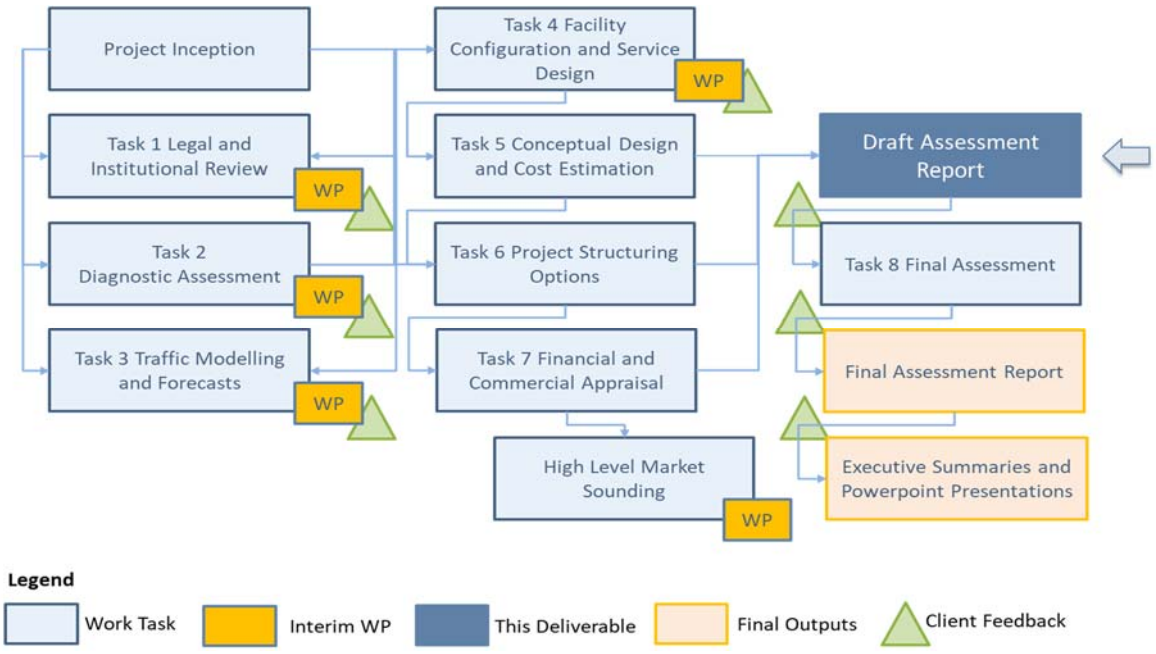
- Task C1: Sector review of existing lagoon-borne services (passenger and freight[13]) and land-side infrastructure (PPIAF);
- Task C2: Assessment/estimation of existing and future passenger demand for lagoon-borne transport (GIF);
- Task C3: Capital Investment Plan (GIF) – based on Tasks C1 and C2, Consultant will assess the likely capital investment required to cater to long-term growth in safe and efficient lagoon travel;
- Task C4: Options analysis for reforming sector to formalize/improve private sector provision (PPIAF) – based on Task C1-C3, the Consultant will assess options to reform sector to improve efficiency and safety of lagoon-based transport. This will ultimately be an assessment of how to achieve a greater level of scale, formality and financial sustainability of the sector. This will include analyzing options that vary across the following key factors to establish a preferred option for reorganizing the sector; and
- Task C5: Financial and commercial analysis of Preferred Option (GIF) – financial modeling of preferred option to assess likely private sector investment in sector.

1.4 Task Organization

1.4.1 Task Organization

Figure 1-2 on the following page enumerates the task organization followed for the execution for the assignment.

Figure 1-2: Task Organization



[13] While the Terms of Reference refer to water transport for freight, it was discussed and agreed during the Inception Mission that LASWA's current focus is on passenger transport and therefore the contours of the study have been defined to be passenger transport.

1.4.2 Inception Mission

We undertook a joint field mission with the World Bank team to Lagos, Nigeria, over the course of five days from January 15 - 19, 2018, followed by meetings in Abuja, Nigeria, on January 22 and 23, 2018.

During the mission, we undertook:

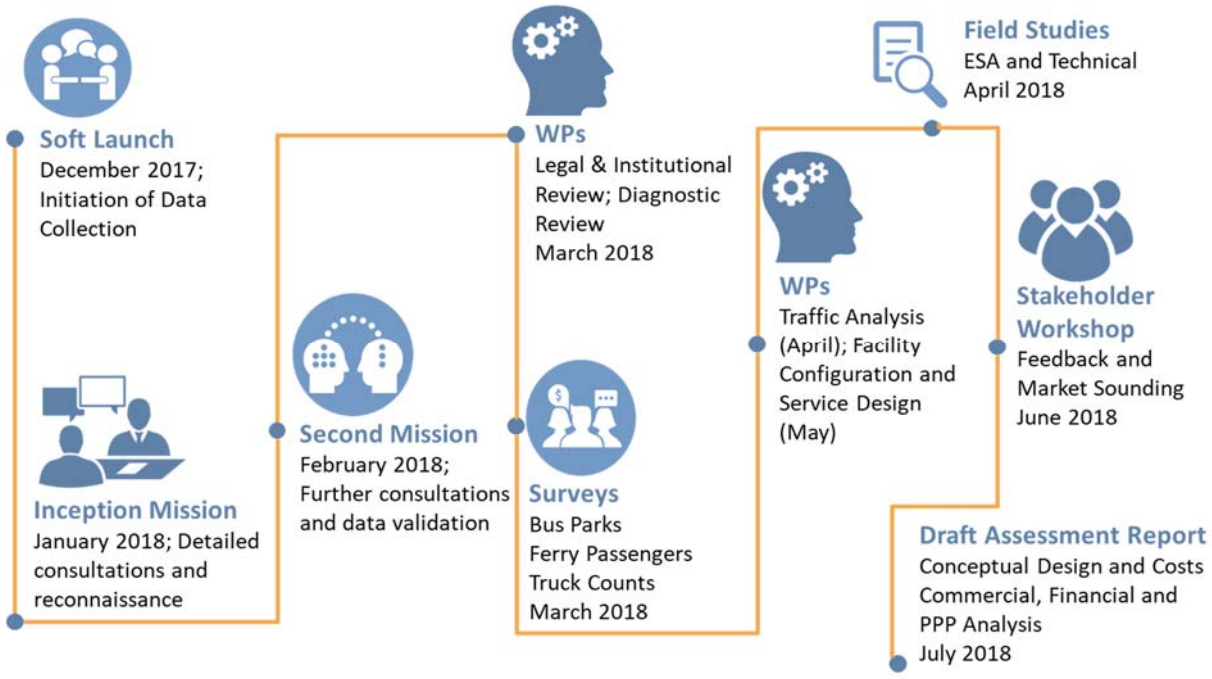
- Discussions with the key Implementing Agencies (IAs) viz. LASWA, MoWID, LAMATA, and NPA;
- Site visits to select ferry terminals; and
- Consultations with other stakeholder including:
  - Lagos Global[14];
  - Planet Projects[15];
  - Association of Maritime Truck Owners (AMTO);
  - Association of Corporate Fleet Owners (ACFO);
  - Tarzan Marine Enterprise Ltd.;
  - Seacoach Ferry Service; and
  - Key ministries at the Federal level.

The findings of the Inception Mission were documented in our Inception Report submitted on February 3, 2018. A revised Inception Report, after addressing comments received from the World Bank team, was submitted on February 23, 2018.

[14] Office of Overseas Affairs and Investment, known as Lagos Global, Lagos Global is a creation of the present administration to make Lagos an investment destination of choice, by creating a favourable environment for local and Foreign Direct Investment (FDI) to thrive.

[15] Planet Project is one of the prominent Nigerian companies operating in construction, operation and consulting for transportation infrastructure in the country. The intra-city Ikeja Bus Terminal facility was constructed by Planet Project under World Bank financing. The CPCS team consulted with Planet Projects to gauge their interest as a potential private sector partner and also to seek their views on the sector as a whole. They shared data with the CPCS team as a matter of courtesy, and have been given due credit in the report.

Figure 1-3: Timeline for major activities



1.4.3 Stakeholder consultation and second field mission

A consultative process was the cornerstone for the execution of the assignment. We conducted a second field mission during the week of February 12-16, 2018, with the purpose of holding further consultations with stakeholders, addressing information gaps and collecting further data.

A complete list of stakeholders consulted as part of this study is presented in Appendix A.

1.4.4 Document/ data review

The three agencies and other stakeholders have been generous with sharing of information and past studies/data, which has aided our analysis. Key among these with respect to the LSWTP are:

- Consultancy Services for the Extension of the Strategic Transport Master Plan (STMP) and Strategic Travel Demand Model (STDM) to Cover the Mega City Region, ALG and europraxis, December 2014;
- Value of Time and Transport Elasticity Study for the Mega City Region - Final Report, Leigh Fischer, May 2015
- Feasibility Studies for the Development of Ferry Services in the LMA, Royal Haskoning, 2008
- Existing and Historical Ridership data shared by LASWA and NIWA

A comprehensive list of secondary data/documents reviewed for this project is presented in Appendix B.

1.4.5 Survey

Interviews were conducted with samples of current passengers at 20 existing ferry terminals using inland water transport in Lagos. The information collected included trip purpose, origin and destination, total cost of trip, demographic characteristics of passengers, and whether they would require a park and ride facility at the ferry station. A total of 3,332 passengers were surveyed across 20 existing ferry terminals/jetties. The survey covered various aspects:

- Information on demographics;
- Trip purpose; and
- Number and cost of last mile transfers.

The survey was undertaken on weekdays in March 2018.[16] The questionnaire template used for the purpose of the survey is presented in Appendix C.

1.4.6 Submission of Interim Deliverables

1.4.6.1 Working Papers

As part of the assignment, we adopted an approach of submitting Working Papers (WPs) on key tasks of the assignment with the objective to continuously seek feedback on our analysis and outputs, address comments and receive suggestions which have been fed into this Assessment Report. We submitted the following working papers:

Table 1-1: List of WPs submitted

S. No.	Working Paper	Submission date	Date of receipt of Comments	Revision date
1	WP1: Legal and Institutional Review	March 14, 2018	April 5, 2018	April 17, 2018
2	WP2: Diagnostic Review	March 13, 2018	April 5, 2018	April 13, 2018
3	WP3: Traffic Modelling and Forecasts	April 24, 2018	May 23, 2018	June 6, 2018
4	WP4: Facility Configuration and Service Design	May 16, 2018	June 11, 2018	Responses submitted on June 15, 2018

1.4.6.2 Engagement with Implementing Agencies

A presentation on WPs 1 and 2 was held via videoconferencing on April 5, 2018, with a view to seek feedback from the respective IAs.

1.4.6.3 Progress Reports

These were submitted every two weeks, after the submission of the Inception Report, for the information of the World Bank team, with an update on the activities conducted and progress

[16] After commencement on February 27, 2018, our teams faced resistance at several of the bus parks which they visited, with bus park operators and fleet owners refusing to cooperate with the surveyors in the absence of an introduction letter from National Union of Road Transport Workers (NURTW) addressed to bus park operators and fleet owners. The survey was temporarily suspended. It resumed after intervention from LAMATA and discussions with NURTW, the survey was completed on March 13, 2018.

of the assignment. The reports also flagged delays and challenges encountered during the execution of the assignment.

1.4.7 Reconnaissance Visits for site verification and ESA review

Our team of Engineers and Environment and Social Expert conducted reconnaissance of proposed ferry terminal sites[17] during the month of April, 2018, with the objective of preparing designs and layout for the sites, and flagging any issues with respect to the environment and social assessment.

1.4.8 Market Sounding Exercise

We commenced the market sounding exercise in the week of June 4, 2018, soliciting feedback from a variety of stakeholders including:

- industry associations;
- boat operators (present, past and potential),
- terminal operators; and
- banks as well as other FIs.

The feedback received is presented in Section 7-8 of this report.

1.5 Structure of this Report

The remainder of this report is structured as follows:

- Chapter 2: Diagnostic Review –presents the findings from our as-is review of existing transport facilities as they pertain specifically to Inland Water Transportation services;
- Chapter 3: Traffic Analysis –presents long term traffic forecasts which have been used to determine the size and specifications of each of the facilities to be built or transport services to be provided;
- Chapter 4: Facility Configuration and Service Design –presents configurations for the various infrastructure facilities and service patterns being proposed, based on the traffic forecasts and potential for optimization of revenue for the projects;
- Chapter 5: Conceptual Design and Layouts –summarizes assumptions for design and layout development for each of the Ferry Terminals;
- Chapter 6: Commercial, Financial and PPP Analysis – presents findings from our commercial analysis and financial modelling of various project/PPP structures;
- Chapter 7: Recommendation on Way Forward – summarizes our key recommendations and documents immediate next steps.

[17] Site Visits were undertaken to the ferry terminals of Ikorodu (old & new), Falomo, Marina/CMS, Badore (old & new), Ijede, Ebute Ero, Ebute-Ojo, Ijegun-Egba, Mile 2 and Liverpool.

1.6 Limitations

This report is not a detailed feasibility study, but rather a prefeasibility of multiples options which may be pursued with the initiation of a feasibility investigation. If the projects are approved to be procured using PSP, it is assumed that a consultant would be hired for Transaction Advisory who would validate the feasibility of the projects in detail.

2 Diagnostic Review

Key Messages

Current Ridership

The current inland water transport services in Lagos serves about 14.1 million passengers per year (or 53,590 passengers per weekday) constituting a small share of the public transport system in the city where the demand for trips across all modes (including walking) is estimated at 24 million per day. The bus network (formal and informal) in comparison serves 5 million passengers per day.

An overview of the IWT ecosystem is provided in the chapter classified into waterside operations (boat operations), landside infrastructure (ferry terminals/jetties) and water infrastructure.

Assessment of Current Ferry Services (Waterside Operations)

There is at present a wide variation in the levels of service available to passengers in terms of scale and quality of boat/ferry services (waterside operations). Most operators ply during daylight hours on weekdays with two peak demand periods – 6am-10am in the morning and 4.30pm-7pm, servicing commuter traffic comprised of workers and students from lower socio-economic demographic.

Adherence to a set schedule and a reliable service is a major concern, with frequency of ferry services changing based on spot (current) demand. Published fares also are prone to changes at the discretion of the operator based on demand. Both these factors impact passenger patronage and growth adversely. The current boat operator market features small local boat owners, majority owning single boats with a capacity of seating 20 passengers or less. Quality of boats, their maintenance and fueling protocols are reflective of an unorganized set up.

Assessment of Landside Infrastructure (Ferry Terminal/Jetty Operations)

The jurisdiction of jetties and terminals is currently divided between LASWA/MoWID (LASG), NIWA and NPA. In most cases, jetties are operated by the boat operators plying the respective routes. Most jetties require rehabilitation or complete redevelopment. Terminal infrastructure varies from basic ticketing stalls and washroom to just an entry/exit in some cases.

Last Mile Connectivity

A few terminals provide park and ride facility. Less than 25% of the terminals reviewed had access to any kind of public transport within a 500 meter radius.

Assessment of Water Infrastructure

The responsibility of channel management (dredging, navigation charts, etc.) and water quality management is divided between MoWID and LASEPA. MoWID is currently pursuing a dredging programme to achieve navigable depth of 4 meters on 4 routes with 11 more in the pipeline. The programme target the more viable routes as per LASWA's assessment. Apart from patrol by 2 motorboats by LASWA, there is no centralized traffic management system. Most boats currently plying on routes have no active radio and GPS based communication protocols, with boat crew relying on mobile communication to contact ferry stations and operators. There is a lack of evident emergency response mechanisms with most boat operators relying on spare boats and own crews for this purpose.

Key Issues

Reliable Service: The reliability of a passenger ferry service starts with the adherence to a published schedule (timetable) and fares, which makes the journey time and cost predictable. This is lacking and is essential to foster demand.

Time and Cost Savings: For IWT to be a mode of choice for passengers, they need to derive benefits of time and cost savings, including time and cost of last mile transfers, as compared to other PT options.

2.1 Overview

Given the geography of the Lagos State, specifically LMA, with its intricate network of lagoons and water bodies, transport along the Inland Waterways (IW) holds good potential to be developed as an alternative means of public transport. LASWA is committed to developing passenger transport on IW and has identified 30 routes that it considers viable for ferry services, four of which are already in operation under separate licensing arrangements.

The sector organization is presented in Table 2-1.

Table 2-1: Sector Organization for Inland Waterways in Lagos

	Waterside Operations	Ferry Terminal or Jetty	Water Infrastructure
Ownership of Asset	▪ Private Sector ▪ Lagos State Ferry Corporation[18] (not yet operational; yet to receive fleet)	▪ Public Sector (LASG, NIWA, NPA as the case may be); and ▪ Private Sector (e.g. Ikorodu	▪ Patrol boats – LASWA ▪ Navigation AIDS - MoWID
Operation and Maintenance of Asset	▪ Private Sector (this includes running of boats and all fueling operations) ▪ Lagos State Ferry Corporation has been accorded a universal license for all routes primarily to serve smaller communities	▪ Public Sector in case a ferry terminal services multiple routes operated by various boat operators (e.g. Falomo); and ▪ Private Sector (usually the main boat operator). ▪ (LASWA has guards at some jetties)	▪ Channel Maintenance (Dredging) – MoWID ▪ Traffic Management and Control - LASWA ▪ Pollution and Environment Control - Lagos State Environmental Protection Agency (LASEPA) ▪ Marine Certification of vessels and manpower- Nigerian Maritime Administration and Safety Agency (NIMASA)
Regulation	▪ LASWA	▪ MoWID	▪ LASWA and NIMASA

Currently, there is a wide variation in the levels of service available to passengers in terms of scale and quality of boat/ferry services (waterside operations). The jetties (ferry terminal operations) are owned by several different agencies including LASWA/MoWID, NPA and NIWA, and the focus on making IWs more navigable through channel management and installation of navigation aids is at a nascent stage.

This section analyses these issues as well as the current market structure, to identify gaps and next steps.

[18] Lagos State Ferry Corporation (Lagferry) is a LASG owned agency which has been authorised to run ferry services. They were incorporated in 2008, but are yet to have operationalized ferry services. Inputs received from their spokesperson suggests that they have received funding in the last one year and have placed an order for a fleet of ferries.

2.2 Review of Existing Facilities

2.2.1 Waterside Operations

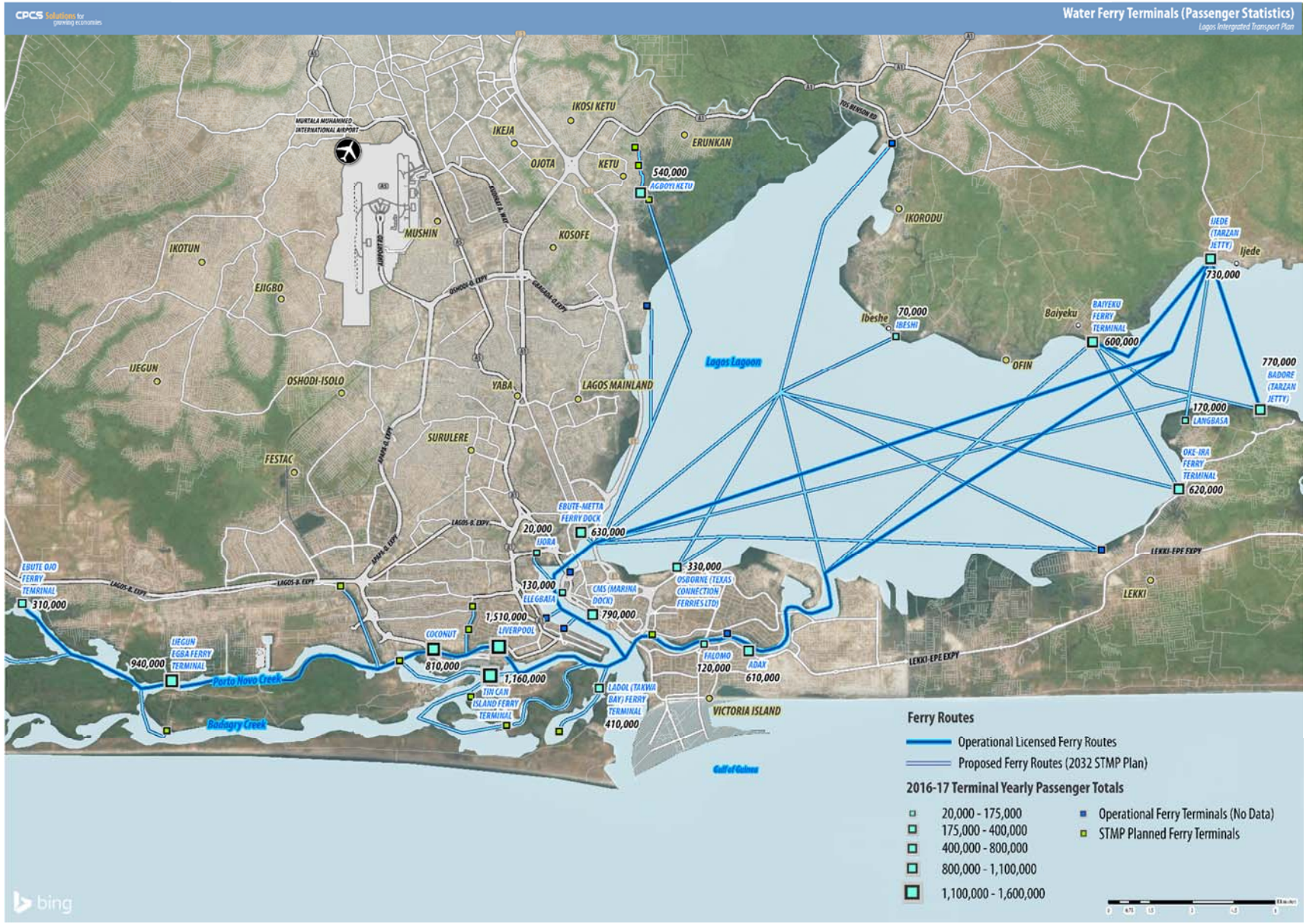
- **Existing Ridership**: The STMP envisages an improved inland water transport services sector in Lagos consisting of 36 routes of which 19 are existing and 17 are planned to be operational by 2022. Based on the projections in the STMP, the passenger demand for the inland water transport system in 2032 is expected to be just over 2.1 million passengers per day[19].

The current inland water transport service in Lagos serving only about 14.1 million passengers per year (or 53,590 passengers per weekday) constitute a small share of the public transport system in the city.

Figure 2-1 presents the relative ridership volumes at each of the existing terminals, the currently licensed routes, and the proposed ferry routes as per the STMP.

[19] 2032 is the last year of the projection in the STMP.

Figure 2-1: Existing Ridership and Licensed routes, compared with STMP projected rotes (2032)



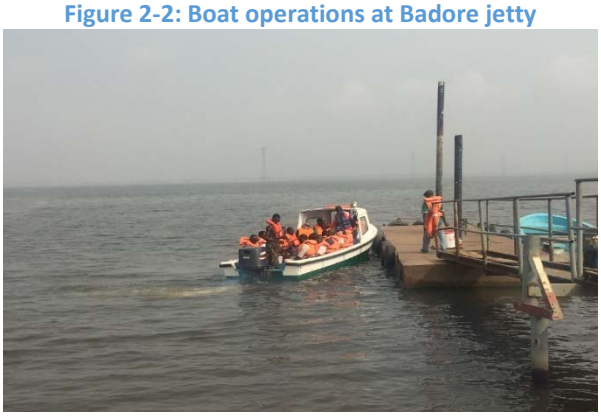
- **Service Pattern**: Most operators ply during daylight hours on weekdays between 6am and 7pm, with two peak periods – 6am-10am in the morning and 4.30pm-7pm in the evening. The frequency of trips varies from 15 minutes to half hourly during peak periods and falls to hourly or demand-driven trips during non-peak periods.
- **Schedule and reliability of service**: Adherence to a set schedule and a reliable service is a major issue for passengers, and is a major factor that will help build trust in the service as an alternative mode. During our visits, we observed instances where the ferry operation schedule was either not displayed, not updated, and in some cases not adhered to when the number of passengers was below a certain capacity of the vessel. It is not uncommon for small ferry operators to cancel or delay scheduled trips in case of insufficient number of passengers. This impacts reliability of service which in turn influences passenger choice. Passengers thus prefer to travel by other more reliable means of transport. This adversely impacts sustainability of operations.
- **Fares**: The fares at present vary with demand, catering to specific routes, and are not directly linked to actual marine distance covered or journey time. At times fares also vary in response to peak-non peak travel, with higher fares charged during peak periods.

Table 2-2: Illustrative Fares, Time and Distance for select ferry routes

Route	Estimated Fare (NGN)	Time Taken	Distance (km)
Badore – Ijede	350	7 minutes	5.7 km
Ikorudu – CMS – Apapa	900	15 minutes	23 km
Marina – Apapa	150	5 minutes	1.6 km

- **Cost and Time of Last Mile Transfers**: We understand that in some cases, passengers may end up spending more on last mile transfers than on the ferry fare itself. The time and effort required to reach certain ferry terminals, in congested areas of the city, adds to the overall journey time. While this factor varies by specific origins/destinations, cost savings and time savings are important factors for modal choice. This issue will be further analysed in subsequent sections
- **Varied Demographics**: The demographic profile of passengers differ by location, from labourers to salaried individuals. The need to keep the ferry fares accessible to passengers with low incomes but at the same time improve quality of operations to attract higher income passengers currently using alternative modes, is a key issue faced by the operators.
- **Ticketing**: The team observed that all ticketing was manual with handwritten receipts issued either on the boat or from counters at the jetty. While this may be sufficient for small operators, other options such as electronic ticketing and travel cards (automated fare collection systems which are applicable across all public transport modes) should be considered as options as the scale of operations grow and the sector becomes more organized.

Figure 2-2: Boat operations at Badore jetty



- **Open Boats**: Most boats that the team observed during the visits were open, exposing passengers to the elements. This choice most likely driven by lower capital and operating costs of running such boats. As initiatives are taken to improve service quality and attract passengers with an ability to pay higher fares (and therefore expect better level of service), other options such as covered boats with air-conditioned interiors will need to be considered.

- **Fueling operations**: The team observed that boats were being refuelled using fuel cans at the passenger jetties, in very unsafe and environmentally harmful conditions. In a modern operational set-up, fueling bays are used for this purpose and fueling is done through fuel dumps located away from passenger handling areas. Regulations and protocols for such fueling operations should be stipulated in licensing agreements with boat operators.

- **Safety Precautions**: In some cases, life jackets were stored in open containers on the jetty, probably with the aim of minimising time spent by passengers in picking up and wearing them, thereby not delaying the departure of boats. However, normal practice would be for ferry station staff to hand over the life jackets and ensure that passengers have worn them securely. Alternately, in the case of larger capacity ferries which are covered and more stable, life jackets are harnessed to seats for passengers to put on only if required.

- **Security**: Based on discussions with staff at ferry stations, we learnt that some boats have recently been attacked by armed men, resulting in armed guards being stationed at certain jetties.

2.2.2 Ferry Terminal Operations

Ownership/Jurisdiction

Table 2-3 (based on LASWA data) shows that of the 24 jetties[20] for which data was received, LASWA exercises jurisdiction over 16 jetties, NPA over 2 jetties and NIWA[21] over 3 jetties. Two are classified as community managed jetties and the jetty at Liverpool is under dispute with the local government. While this is not a comprehensive list, it is observed that there are operational jetties beyond the control of LASWA/MoWID. There are also other jetties (mostly wooden) which are owned by private boat operators. The size of these jetties and facilities vary significantly as seen in Table 2-3.

Marine Infrastructure

- **Jetties**: There are an equal number of wooden and concrete jetties. Majority are floating while some are concrete piers. In several cases, they are in need of rehabilitation. Most have single berths. Only a few have mooring bays.

Landside Infrastructure

- **Passenger amenities**: At most terminals these are restricted to a small waiting area where tickets are sold, and washrooms.
- **Commercial Development**: At present, the terminals are not being utilized for any commercial/retail purposes. The recently constructed ferry station at Falomo will house the LASWA headquarters, and also have concession stands. Leveraging the ferry terminals for value added services for passengers (such as food concessions, WiFi, banking, and retail) and commercial development (through subleases, retail and office space, and advertising) will be key considerations for our proposed terminal design.
- **Parking for vehicles**: At present, the terminals at Ikorudu and Ijegun Egba offer a Park and Ride facility within the terminal boundary. While it is not an essential requirement based on the current demographics of the passengers, such a facility can potentially provide a major boost to ridership as car owners are encouraged to use ferry services. As part of our analysis, we will assess the viability of having such facilities at key ferry terminals.
- **Inter-Modal access and transfers**: Only 25% of the terminals for which data was provided, had access to some sort of organized public transport. At jetties visited by the team, we observed that the access roads to ferry terminals were in urgent need of repair and could also so benefit from better signage. No interchange facilities to transfer to other public transport was available at the ferry terminals visited. Inter-modal transfers are an important element for all public transport systems, but more so in case of IWT as the terminals tend to be located away from major arterial roads. Safe walkways and transits provided at jetties would enhance the passenger experience and build

[20] As per our discussion with MoWID, the state government plans to construct 9 jetties with an average height of embankment of about 1 – 2 meters to connect to the riverine areas. This is to address connectivity requirements on the non-commercially viable routes that are neglected by private operators but where LASG has a public service obligation. He informed the meeting that the design of the jetties was done by MOWID and contract awarded for construction.

[21] NIWA exercises control over 7 jetties including C.M.S, Apapa, Maroko, Oyingbo, Ijoro, Osborne and Oyinka D Bayoni.

patronage for the ferry service. This will require close coordination between agencies such as LASWA and LAMATA to provide seamless connectivity.

Table 2-3: Major Ferry Terminals and facilities

Name of Jetty	Ownership/ Jurisdiction	Type of Jetty/Pier	Status of jetty	Station Facility	Public Amenities	Inter-Modal access
Addax	NIWA	NA	NA	NA	NA	NA
Alex	LASWA/MoWID	Floating	Needs redevelopment	Needs redevelopment	Not Functional	No proper road access
Agboyi Ketu	LASWA/MoWID	Concrete	Needs redevelopment; Shallow cannel		NA	NA
Badore	LASWA/MoWID	Floating	Soon to be concessioned	Needs redevelopment	Not Functional	NA
Baiyeku	LASWA/MoWID	Concrete	Needs redevelopment	Needs redevelopment	Not Functional	NA
CMS/Marina	NPA	Concrete	Functional	NA	NA	CMS Bus Stop
Coconut	LASWA/MoWID	Floating	Needs redevelopment	Needs redevelopment	Not Functional	NA
Ebute Ero	LASWA/MoWID	Needs redevelopment	Needs redevelopment	Needs redevelopment	Not Functional	NA
Ebute Ojo	LASWA/MoWID	Recently concessioned[22]				
Falomo	LASWA/MoWID	Redeveloped (Floating)	Redeveloped	Redeveloped	Redeveloped	Falomo roundabout
Ibasa	Community Jetty	Landing only	NA	NA	NA	No direct access
Ibeshe	LASWA/MoWID	Floating jetty under construction	Needs redevelopment	Needs redevelopment	Not Functional	
Ijede	LASWA/MoWID	Concrete	Needs floating Jetty	Needs redevelopment	Not Functional	Ijede Bus Stop
Ijegun Egba	LASWA/MoWID	Floating	Needs redevelopment	Needs redevelopment	Not Functional	Park and Ride
Ijora	NIWA	NA	NA	NA	NA	NA
Ikorodu	LASWA/MoWID	Wooden	Soon to be concessioned	Needs redevelopment	Not Functional	Ebute Ikorodu Bus stop, Park and Ride
Irewe	Community Jetty	Landing only	NA	NA	NA	No direct access

[22] MoWID signed a concession agreement with Sifax Shipping Company Limited for Redevelopment and O&M on November 6, 2017.

Name of Jetty	Ownership/ Jurisdiction	Type of Jetty/Pier	Status of jetty	Station Facility	Public Amenities	Inter-Modal access
Langbasa	LASWA/MoWID	Wooden	Needs redevelopment	Needs redevelopment	Not Functional	No direct access
Liverpool	Dispute with Local Govt	NA	NA	NA	Waiting area	NA
Mile 2	LASWA/MoWID	To be concessioned				
Mile 12	NIWA	NA	NA	NA	NA	NA
Oworonshoki	LASWA/MoWID	Floating	Not accessible	NA	NA	Not accessible
Oke-Ira-Nla	LASWA/MoWID	Floating	Needs redevelopment	Needs redevelopment	Not Functional	Sandfill Bus Stop
Tin Can	NPA	NA	NA	NA	NA	NA

Source: LASWA

2.2.3 Review of existing contract structure for Sifax Ferry Terminal Concession

MoWID signed a Concession Agreement (CA) on November 06, 2017[23] with the Sifax Shipping Company Limited (Sifax)[24] to *exclusively* finance, equip, test, commission, operate, generate income, maintain and manage the Ebute Ojo Ferry Terminal. The concession term is 10 years, with scope for renewal for a further 5 years.

Marine Infrastructure- The scope calls for development of the following facilities:

i. Berthing/unberthing of passenger vessels and ferries;

ii. Loading and unloading of vehicles, cargo trucks, passengers, coaches/buses; and

iii. Acceptance, conduct and discharge of passengers, passenger vehicles and cargo vehicles.

There are no further specifications on the nature and size of docking areas. Specifically for vehicles and cargo, these could vary substantially depending on size of vehicles (e.g. two-wheelers, four wheelers, larger trucks) and nature of cargo (e.g. containers or bulk cargo).

The CA states that the terminal should be fit for purpose but does not specifically prescribe when additions to berths should be made. For instance, one way would be to add an additional berth once the frequency of vessels serviced reaches 6 vessels per hour (assuming 10 minutes to turnaround a vessel – including disembarking, routine checks and cleaning, and embarking).

Landside Infrastructure - Sifax will be responsible for all required operation and maintenance services to allow the terminal to function effectively and handle expected passenger traffic flow, growth, and ferry berths over the concession period. Sifax is entitled to the following: collect rent on subleased premises; charge and collect charges from the sale of merchandise and food; and to fix tariffs with due consultation and approval of Lagos State Government and collect such tariffs from all users.

The CA lists a park and ride facility and the need to facilitate interchange with other PT modes. It would have been useful if the CA had defined the nature of such interchanges, e.g. walkways, provision for stops for a shuttle services, etc.

Revenue sources – The following are listed:

i. Daily landing fees;

ii. Overnight berthing fees;

iii. Generate income from the use of the terminal (concessions, sublease, parking, advertisements, etc.);

iv. Charge ferry landing fees from ferry operators;

v. Charge passenger service charge for every passenger from ferry operators;

[23] The commencement date is November 6, 2017 with the effective date being within three (3) months from the commencement date subject to satisfaction of the CPs.
[24] The SiFAX group operates other cargo logistics facilities at the Tin Can Port.

vi. Charge vehicle service fees (from ferry operator); and

vii. Charge other users (presumably cargo movers).

From (ii) above, it appears that the CA allows for overnight mooring of vessels at the terminal but it does not specify the nature of vessels (e.g. passenger ferry, cargo barges, etc.) which may require specific design and manpower to be stationed overnight at the ferry terminal. The CA also does not specify any ticketing interfaces or provisions for smart ticketing options either now or at a later date.

2.2.4 Assessment of navigation factors, safety, environment and traffic management modalities

Navigational Channel Management

Dredging programme: Ensuring minimum navigable depth is not only an operational requirement but can also be an important factor in the choice of type of ferry boat. MoWID is the agency responsible for making routes navigable through dredging and marking navigation lanes. MoWID has currently awarded contracts for dredging on 4 routes and two more are expected to commence in 2018 (refer to Appendix A). The 4 routes are:

- Ijede – Badore (6km)
- Ajah – Bayu (7km)
- Ojo – Marina (10km)
- Ijede to Marina (16km)

The routes will be dredged to a depth of 4 meters and the dredged channel would be 40 meters wide. Identification of 15 additional routes to be dredged is underway.

Navigation Aids

- **Navigation Aids:** MoWID is also responsible for installing navigational aids and channel markers which will be made operational after dredging is completed. It has proposed to install buoys on 15 routes, the details of which are provided in Appendix A.
- **Potential Navigation hazards**: The team observed that navigation lanes are not clearly marked. We understand that MoWID is currently in the process of undertaking channel demarcation. We also observed fishing activity in the close proximity of routes currently taken by ferry. If unregulated this can potentially lead to stalling of boats.
- **Removal of hazards**: Some routes also have wrecks and illegally berthed or abandoned boats which are not marked and can cause problems in navigation especially in case of low visibility conditions. LASWA is in process of preparing draft regulations, specifically boating standards[25], which cover issues ranging from identification and removal of wrecks and abandoned vessels.

[25] LASWA (Boating Standards) Regulations, 2016

Safety and Emergency response

- **Accidents and Incidents on Inland Waterways**: Based on the data shared by LASWA, a total of 52 cases of accidents/incidents were reported between 2014-2017[26], claiming 111 lives and injuries to 181 persons.
  - Boat Capsizing: 16 such incidents were reported, including an incident in August 2017 in which 14 passengers/crew died when a banana boat capsized
  - Causes of accidents include collision, technical/human error and a case of armed robbery
- **Emergency rescue services**: During the field visits, the team did not observe any visible signs of an active Rescue Service. Lagos State Environmental Protection Agency (LASEPA) is the agency charged with regulating water, air, land forest and wildlife in Lagos State. It is our understanding that LASEPA is currently putting a plan in place for the creation of such a service.
- **Emergency response issues:** While determining safety and emergency response strategies the authorities will have to consider the following issues based on international best practice.
  - Ensuring a co-ordinated response from all Federal and State Government agencies;
  - Ensuring the safe movement of survivors post any incident;
  - Assisting with transportation of first responders and disaster service workers; and
  - Provision of basic mobility for the public, especially in corridors where bridges or passenger rail systems are affected.
- **Gender mainstreaming issues:** Despite the proliferation of IWT services, the organization of the sector is still at a nascent stage. Insufficient attention has been paid to environmental issues, as well as important social issues such as gender and protection of vulnerable users. Some of the critical issues that arise out of the current state of the IWT sector are as follows:
  - The absence of universals standards in vessels tends to encourage simplistic and safe designs. As with other informal transport vehicles, women and vulnerable groups can sometimes be victimized in such vessels (theft, assault, poor accessibility, etc.);
  - Difficult to access and long travel times to access terminal stations exposes vulnerable groups in already inefficiency and unsafe informal feeder systems;

As Lagos State moves towards formalizing mass transit services, it will be important for LAMATA to develop a robust urban transport policy focusing on gender sensitive frameworks for developing/approving service standards, designs and operations. While it will be useful for LASWA to have a water transport specific gender mainstreaming policy, for the purpose of coordination across other public transport services, we recommend such a policy be developed at LAMATA so it cuts across all transport services.[27]

[26] Data available until October, 2017
[27] For exampke, the STMP is silent on gender issues.

Environmental factors

- **Pollutants and Floating garbage/ Presence of Water hyacinth**: The gravity of this problem can increase /decrease depending on season and tides. LASEPA undertakes periodic water quality monitoring as well[28].

Traffic Management and Control

- **Radio communication enabled vessels**: Most boats currently plying on routes use mobile communication to contact ferry stations and operators. There appears to be no active radio and GPS based communication protocols for the majority of passenger boats, which are an important tool for traffic management, monitoring of boats, and emergency services. LASWA is in process of preparing draft regulations, specifically boating standards[29], which have regulations with respect to ferry vessels being equipped with GPS and Echo Sounder Systems.
- **Patrolling**: LASWA has invested in two patrol boats that are stationed at the Falamo jetty and patrol the waterways twice a day. Once the scale of operations increases, a more active decentralized patrolling will be required given the vast expanse of the IWs.
- **Centralized Traffic Management system**: A larger scale and more organized traffic management system will be required to direct traffic, which includes a variety of boats and vessels ranging from passenger ferry/boats, canoes, fishermen, cargo barges, etc. on IWs. This is essential to maintain safe speeds and warn traffic of slow moving boats. While LASWA's draft regulations, specifically boating standards, have requirements for ferry vessels to be equipped with radio communication, it does not list measures for an overall traffic management system.

2.3 Market Structure

2.3.1 Current Number and Size of Boat Operators

Based on a study of data on registered boat owners received from LASWA, NIWA and LAMATA, it is observed in Table 2-4 that the current boat operator market features small local boat owners, majority owning single boats with a capacity of seating 20 passengers or less.

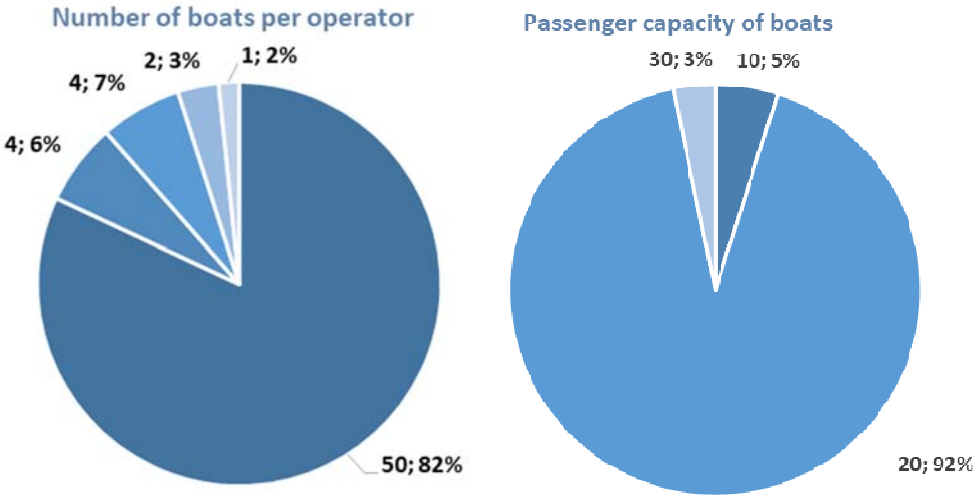
Table 2-4: Boat Operator Statistics

	LASWA (Registered as in Feb. 2018)	LAMATA (Registered Taxis as in 2015)
Number of boat operators	61	56
Total Number of Boats	83[30]	130[31]
Average number of boats per operator	1.36 boats ▪ 82% are single boat owners	2.3 boats ▪ 59% are single boat owners

[28] ibid
[29] LASWA (Boating Standards) Regulations, 2016
[30] As per data received from NIWA, the total number of boats is estimated to be over 700 including unregistered small boats, community taxis, etc.
[31] As per data published by Lagos Bureau of Statistics, Transport Statistics 2015, this figure was estimated to be 157 boats on average over the year

	▪ 4 operators own 2 boats each ▪ 4 operators own 3 boats each ▪ 3 operators own 4 or more boats	▪ 16% operators own 2 boats each ▪ 25% operators own 3 or more boats ▪ 3 operators have fleet of 9 or more boats
Average seated capacity of boat	20 passengers ▪ 92% operators operate boats having a seated passenger capacity of 20 passengers	24 passengers ▪ 85% of operators operate boats having a seated passenger capacity of 20-24 passengers ▪ 11% of operators operate boats having a seated passenger capacity of 28-30 passengers

Figure 2-3: Boat Operators based on LASWA data



Texas Connection Ferries and LAGFerry are listed as the only two operators which operated boats with a capacity of 50 seats or more passengers.

Figure 2-4: Typical 20-30 seater boat currently in operation

2.3.2 Review of LASWA's draft boating standards

In LASWA proposed boating standards, it is envisaged that the following would be the eligibility criteria for applicants wishing to be ferry operators:

- Submission of detailed business plan for 3 years, including operational expenditure and revenue projections;
- Type of vessel – double hull and twin engines;
- Acquisition plan of vessels within 6 months:
  - 2 watercrafts with a capacity of a minimum of 125 passengers each; or
  - 4 watercrafts with a capacity of a minimum of 70 passengers each; or
  - 8 watercrafts with a capacity of a minimum of 30 passengers each.
- Have prescribed safety equipment such as fire extinguishers, life jackets, flares, life buoys;
- Passenger amenities;
- Comprehensive insurance policies; and
- Mechanism for radio communication including Global Positioning System (GPS) and echo sounder systems.

The regulations also list mandatory requirements for navigation, safe speed limits, operational restrictions and rules.

The above indicates that LASWA in future expects a higher quality and larger scale of operations. Since the requirements stipulated by boating standards require larger scale of investment, this would require that the private sectors partners be more organized and commercially driven. This would require an identification of potential private partners, both large local and regional players once a decision to solicit PSP has been undertaken.

2.4 Analysis of Competing and Complementary modes of Public Transport

The current inland water transport service in Lagos serves only about 53,000 passengers per weekday and is significantly smaller than the estimated 5 million passengers per day utilising the formal and informal bus networks in the city[32]. This low modal share of the inland water transport system can be attributed to its low competitiveness compared to other modes of transportation. This is in spite of the faster journey times on inland water transport. A review of the key aspects of the current water transport system highlights some of the limitations of the inland water system compared to other modes of transport

- **Capacity** – The current system has low capacity compared to the formal and informal bus network. Apart from the open fibre informal operators, the licensed operators generally have a small vessel fleet with a low capacity of 20 passengers. Further, current regulations dictate that operators are required to stop transport operations by 7:00pm each day.
- **Fare –** The *total transport cost* for the inland water transport system is more expensive than the informal and formal bus network system. For example, the fare from Ikorodu – CMS – Apapa using the ferry is about NGN 900[33] compared to the

[32] Development of Bus Route Network for Lagos State - Final Report. Integrated Transport Planning. April 2015.
[33] Based on interview with current operators

cost of BRT-Lite fare of NGN 300[34] from Ikorodu to TBS (close to CMS) and NGN 165[35] from CMS to Apapa using Danfo. Passengers using the water transport also generally utilise other modes of transport (such as motorcycles and tricycles) between the jetties and their origin/destination, further increasing the total cost of transportation. This is an important factor in the cost sensitive market.

- **Socio-Economic Profile** – Given the low socio-economic status of the majority of passengers using the public transport system in Lagos, the total cost of transportation represents a key factor in deciding which mode of transportation to use.
- **Journey Time –** The current water transport system in Lagos offers faster journey times than road-based transit. The current system also provides for a more reliable and predictable journey time from jetty to jetty. The reliability of journey time in Lagos is particularly important given the congestion on the roads. For instance, the journey time from Marina to Apapa by ferry is about 5 mins compared to about 43 mins by bus. However, passengers often have to travel to jetties through congested roads, therefore reducing the overall time savings from utilising the inland water transportation.
- **Infrastructure –** The current inland water infrastructure requires rehabilitation and in some cases construction of new facilities. Data from LASWA show that some jetties are "failing" and need "complete rehabilitation". Given the safety concerns associated with water transport, the poor state of the jetty infrastructure reduces the competitiveness of the system.

LASG recognises the complementary role inland water transport plays in the city's overall transport plan and has articulated its vision for an improved water transport system in the STMP which envisages up to 36 routes to be operational by 2032 serving an estimated 2.1 million passengers per day[36]. The government envisages that the development of a whole new system of inland waterway routes within the State will provide an effective and potentially integrated transport mode for passengers.

The next sub-sections presents LASG plans for other modes of public transport in the STMP and examines the competitiveness of an improved inland water transport system in comparison to the other planned transportation projects.

2.4.1 Bus Transport /BRT Corridor Expansion Plans

The LASG has developed a plan for a new bus network for the mega city region. The new improved bus network plan includes 485 individual bus routes covering 6,605km of road network with an average route length of 14km. The network will have the capacity to transport over 7.2 million passengers per day and will require over 12,000 buses to meet this demand. The LASG has commenced implementation of the improved bus network and the construction of the required infrastructure (such as the Ikeja and Oshodi mega bus terminals) to support the plans.

[34] http://dailypost.ng/2017/08/04/brt-reduce-bus-fares-lagos/ accessed February 21
[35] Development of Bus Route Network for Lagos State - Final Report. Integrated Transport Planning. April 2015. Adjusted for price increases.
[36] 2032 is the last year of the projection in the STMP.

Furthermore, the STMP proposes the development the 14 BRT routes in Lagos with staggered implementation through to 2032.

Table 2-5 Traffic Projections by BRT Route (2032)

	BRT Route	2-way Hourly flow	Daily 2-way flow	Year of Implementation	Current status
1.	Mile 12-Ikorodu	11,793	188,688	2017	Completed and Operational
2.	CMS-Badagry	11,161	178,576	2017	Project under construction
3.	Apapa-Oworonshoki	26,230	419,680	2022	Planning stage
4.	Berger-Iyana Isolo (orange)	25,984	415,744	2022	Planning stage
5.	Maryland-Otta	20,015	320,240	2022	Planning stage
6.	Ijede-Isawo through Ikorodu	30,762	492,192	2032	To be considered in future
7.	Lekki Green Corridor	25,026	400,416	2032	
8.	Okun-Ajah-Ikorodu	18,142	290,272	2032	
9.	Lekki Lagoon Road	17,655	282,480	2032	
10.	Majidun/Ipakodo-Shagamu through Ikorodu	17,241	275,856	2032	
11.	CMS-Berger	14,799	236,784	2032	
12.	Berger-Local Airport	14,181	226,896	2032	
13.	Ikorodu-Epe	12,746	203,936	2032	
14.	Lekki Coastal Road	8,983	143,728	2032	
	BRT Global Demand	**254,718**	**4,075,488**		

2.4.2 Rail based transport – LRT/Monorail

The STMP proposes six LRT lines and one monorail line. Two of these rail lines (blue and red) are presently being developed by the LASG. The monorail would serve the well-built urban centre of Victoria Island and the expected significant increase in passenger flow at the newly built Eko Atlantic City.

Table 2-6: Proposed Rail lines

	Rail lines	Distance (km)	2-way Hourly flow	Daily 2-way flow	Year of Implementation	Current status
1.	Red line (Marina – Agbado)	29	99,764	1,596,224	2017	Project under Planning (prefeasibility ongoing)
	Red line Extension to Ifo	23				Yet to commence
2.	Blue line (TBS – Okokomaiko)	29	70,500	1,128,000	2017	Implementation phase - Survey and design from Marina to Okokomaiko – 100% completed

	Rail lines	Distance (km)	2-way Hourly flow	Daily 2-way flow	Year of Implementation	Current status
						- National Theatre to Mile 2 – 98% complete - National Theatre to Marina – 65% complete - Mile 2 to Okokomaiko – yet to commence - Procurement of Operation and Maintenance Infrastructure contract - ongoing
3.	Purple Line Purple Line (extension to Shagamu)	48 32	78,618	1,257,894	2022 2022	Project Initiation phase - LAMATA in discussion with potential investors
4.	Victoria Island Monorail	24	35,687	570,989	2022	Project Initiation phase - LAMATA in discussion with potential investors
5.	Green line (Marina to Ajah) Green line Extension to Lekki Airport and FTZ)	22 62	83,025	1,328,395	2022 2032	Project Initiation phase - LAMATA in discussion with potential investors
6.	Yellow line (Otta/MMA to Iddo)	34	80,255	1,281,779	2032	Project Initiation phase - LAMATA in discussion with potential investors
7.	Brown line (Mile 12 to Marina)	19	73,340	1,173,440	2032	May be considered in future

2.4.3 Proposed Lagos Cable Car Initiative

The LASG also plans to build 5 cable car projects mainly on Lagos Island, as outlined in Table 2-7.

Table 2-7: Proposed Cable Car Projects

	Cable Car project	Distance (km)	2-way Hourly flow	Daily 2-way flow	Year of Implementation	Current Status
1.	Adeniji Adele - Ozumba	5	7,685	122,956	2017	Under Planning
2.	Adeniji Adele - Ijora	4	2,778	44,448	2017	Under Planning
3.	Adeniji Adele - Apapa	3	2,892	46,268	2017	Under Planning
4.	Apapa - Ipaja	19	10,132	162,116	2022	Under Planning
5.	Ipaja - Alimosho	12	5,672	90,752	2022	Under Planning

2.4.4 Highway improvement/ expressways

The STMP includes plans by the LASG for major road construction and rehabilitation across the state to improve land transport. The planned projects are outlined in Table 2-8.

Table 2-8 Proposed Road/Highway Construction

	Road/Highway Projects	Distance (km)	Year of Implementation	Current Status
1.	Lagos Outer Ring Road: Ojo – Apapa	21	2017	Not currently under planning
2.	Lagos Outer Ring Road: Ikorodu – Lekki (including 4th Mainland Bridge)	18	2017	Concept design completed by LASG, funding arrangement being sought
3.	Lagos Outer Ring Road: Ojo - Alagbado	48	2022	Update sought from Ministry of Works & Infrastructures (MoWI)
4.	Lagos Outer Ring Road: Lekki – V.I / Apapa	36	2022	Update sought from MoWI
5.	Owode – Otta (by-pass) – Itele - Lagos-Abeokuta Road	56	2032	Update sought from MoWI
6.	Agbara – Sokoto Road - Shagamu	102	2032	Update sought from MoWI
7.	Shagamu - Ijebu Ode – Lekki Airport / FTZ	62	2032	Update sought from MoWI
8.	Trade Fair – Ikotun (through Ijedodo Road)	7	2032	Ongoing construction work along Lagos Badagry Expressway extends to Trade Fair; Ministry of Works & Infrastructure has drawings for Ijedodo Road.
9.	Badagry – Seme (Expressway)	Not Stated	2032	Update sought from MoWI
10.	New bridge connecting Apapa Port and Sagbokoji	1	2032	Update sought from MoWI

2.4.5 Competitiveness of the Lagos Inland Water Transport System

Given the number of planned transit projects across multiple modes of transportation by the State it is important to consider the competitiveness of the proposed inland water transport scheme.

Based on the analysis presented in the STMP, the LASG seems to have considered the impact of modal competition in designing the inland water routes and the other transit projects. These considerations have resulted in the elimination of some of the transit projects that were initially proposed. For example, inland water transport routes to Lekki peninsula and Badagary were discarded following the STMP analysis which found that the planned improved bus network was going to cover similar routes. Similarly, the STMP discarded three BRT projects[37] due to modal competition from the planned LRT and bus network projects.

The analysis presented in the STMP shows that the main waterway routes with the highest number of projected passenger demand are those that connect remote and difficult-to-reach areas, as well as routes that present alternatives to long distance road journeys such as the Ijede to Marina and Marina to Ikorodu.

2.5 Case Studies

This section presents a number of case studies, both from developing and developed countries, which contain valuable lessons on the development of sustainable ferry systems. While the intention is not to replicate these case studies, they have been selected to drive home key points or weak links which need attention during planning of the projects. The cases include:

- Ferry Service in **Abidjan** (Cote D'Ivoire);
- Regulating inland navigation on the **Paraná River** (Paraguay);
- Transit and tourism ferries on the Chao Phraya River in and around **Bangkok** (Thailand);
- Urban ferries in **Sydney** (New South Wales, Australia);
- Ferries for transit and economic development in **New York City** (United States); and
- Passenger Ferries on the **San Francisco Bay** (United States).

2.5.1 Ferry service in Abidjan (Côte d'Ivoire)

Abidjan is the economic capital of Côte d'Ivoire and is one of the most populous French-speaking cities in Africa. Recently, a private firm Snedai commenced a ferry service to connect various locations in a phased manner. This short distance ferry will also be complemented by charter services for tourists. The geography of the city is very similar to Lagos, comprising of a series of islands and numerous inland waterway channels to operate a ferry service on.

[37] This includes the conversion of the existing TBS to Mile 12 BRT-Lite route to the proposed LRT Brown Line.

Phase 1

- Marcory - M'pouto 2.60 Km
- M'pouto - Plateau - Treichville 7.30 Km
- Kumasi - Marcory - Plateau - Treichville 10.60 Km
- Niangon lokoua - Plateau - Treichville 10.26 Km

Phase 2

- Niangonlokoua - Vridi Pont 10.29 Km
- Plateau - Treichville - Vridi Bridge 6,11 Km
- Mossikro - Lokodjro - Plateau - Treichville 5.05 Km

Phase 3

- Abata - Mbadon - M'pouto - Plateau - Treichville 12.11 Km

Figure 2-5: Abidjan Ferry Service Map

Key takeaway – Phased implementation to help develop public patronage and proposed scale up of operations as utilization increases. The geography of its waterways are very similar to what exists in Lagos.

2.5.2 Regulating Inland Waterways: Paraná River

2.5.2.1 Background

Figure 2-6: Paraná River Work Boat

Paraguay is a landlocked country bordering Argentina, Brazil and Bolivia, in South America. It takes its name from the Paraná River, which produces the highest amount of hydroelectric power in the world. Paraguay has 3,100 kilometers of inland waterways. The Paraguay and Paraná are the country's two main rivers. The Paraguay River, with headwaters at Mato Grosso, Brazil, flows southward, converging with the Paraná in southwestern Paraguay, and then flowing to the Río de la Plata Estuary in Argentina, the entrance for the great majority of ships servicing Paraguay's ports.

2.5.2.2 Regulation of Inland Waterways in Paraguay

Paraguay has ports and wharfs on the Paraguay River and the Paraná River. The majority of domestic river traffic in the public ports, controlled by the National Shipping and Ports Authority (ANNP)[38], is in Asunción (capital of Paraguay). Traffic in the private ports was 28 million tonnes in 2013 and expected to double by 2020.

Given the heavy cargo volumes, appropriate governance and regulatory instruments to control the effective usage of the waterways are of paramount importance. Maintenance of the navigability of the Paraguay and Paraná rivers is performed by the ANNP. This maintenance consists of dredging, navigation lights and beacons and a network of sophisticated water meters that monitor depths, currents and flooding.

Dredging tasks are performed to maintain a minimal depth of 3.65m on the Paraná River and 3.5m on the Paraguay River. This investment has been estimated at USD112.5 million starting in 2011 with ongoing maintenance at USD10 million per annum.

The services are financed through charges levied in State-owned ports, towage surcharges, and navigation levies. There are also additional costs for the use of public ports depending on the type and value of goods transported. In addition, there are government charges for storage according to the length of time the goods remain in the port areas.

The regulation and governance of the river systems in Paraguay has been developed over the past 50 years to become one the most resilient and future looking schemes in the world. The regulatory process is the responsibility of the ANNP which establishes legal limits and rules for private investment of ports, fleets, and industries along navigable rivers, and the undertaking of public investment works to foster the development of inland navigation and transport. This has transformed the river waterways into all-purpose transport systems, enhanced with dredging works, buoyage, waiting areas, improvement of sharp turns, roadsteads, ports, industries, dams and floodway monitoring.

This is an example of an institutional agency developing and managing navigation channel as sole authority with financing through levies and charges of users of the IW i.e. cargo vessels, ports, and industry, etc.

Key takeaway – Jurisdiction of IWT needs to be clearly defined and vested in a single agency. All uses of the IWT need to be regulated and monitored. Like Lagos it also had multiple agencies responsible for inland waterways.

2.5.3 Chao Phraya Express Boat Co. Ltd. (Bangkok)

2.5.3.1 Background

The Chao Phraya Express Boat Company is a transportation service in Thailand that operates on the Chao Phraya River[39]. It provides express river transport between stops within Bangkok and to Nonthaburi, the province immediately to the north. Established in 1971, the Chao Phraya Express Boat Company serves both local commuters and tourists. It also offers special tourist boats and weekend river boat tours, as well as offering boats available for charter. Along with

[38] AdministraciónNacional de Navegación y Puertos.
[39] http://www.chaophrayaexpressboat.com/en/home/

BTS Skytrain and Bangkok Metro the service allows commuters an option to avoid traffic jams during the peak hours on weekdays. Some of the main features are summarized in Table 2-9.

Table 2-9: Chao Phraya Express Boat Co. Ltd: Service Features

Feature	Description
Length of route	21 km
Operating Hours [first and last departure]	Weekdays: 06:00-21:30 Weekends: 06:00-18:40
Fares	Within one zone – THB 9 (PHP 12) (USD0.22) Entire route – THB 30 (PHP 40) (USD0.75)
Types of service	Peak service (two lines) Off-peak service Tour boats
Number of vessels	43 single-screw [90-120 pax] 14 twin screw [120-180 pax]
Intermodal connections	Interchange at Sathorn pier with connections to ferry, longtail boat, BTS Skytrain and bus
Average daily traffic	40,000

2.5.3.2 Communications Strategy

Chao Phraya is also a good model in terms of communications with potential users, as the home page of their web site indicates, offering convenient information about routes, fares, schedules and transfers to other modes of transport. The metropolitan transit authority also publicizes the ferry services in its system maps and brochures, while the ferry is well featured in national and city tourism media.

Figure 2-7: Chao Phraya Express Boat web site home page

This is an example of a communication strategy to uplift the profile of a ferry service and enhance customer experience.

Key takeaway – Communication with users (passengers) and public at large (media/social media) is central to develop public patronage. Like Lagos, Bangkok is a densely populated urban area with competing modes of public and private transport.

2.5.4 Ferries and Urban Transit: Sydney

2.5.4.1 Background

Sydney Ferries has operated on Sydney Harbour, New South Wales (NSW) Australia and its related waterways for over 135 years. In its current network design it operates 175,000 services, transporting more than 14 million people across Sydney Harbour and the Parramatta River annually. Sydney Ferries is a government agency of Transport for NSW, which is responsible for New South Wales' transport coordination, policy and planning.

Figure 2-8: Sydney Harbour Ferry Fleet With

2.5.4.2 PPP Program

NSW Government began a process of privatisation of the ferry network in 2010 that involved leasing, maintenance and operation of the ferry fleet under a Public Private Partnership (PPP). In 2013 the transfer to Harbour City Ferries (HCF) a private joint venture of multinationals Transdev and Transfield Services was completed.

The privatisation agreement takes the form of a seven-year Operations and Maintenance (O&M) concession contract, with performance targets which stipulate minimum service level targets for frequency, transit and supply of capacity by route and importantly is linked to patronage increase targets. Concession performance targets (minimum service standards) were included in the concession contract (bidding docs) that stipulated operational services levels and sub levels that were divided into the following key requirements:

- The Route Network – describing the route and minimum number of piers, transit times and frequency that must be called at within the agreed period;
- Vessels – describing the compliance of safety and security regulations and standards for maintenance, speed, minimum passenger capacity, air-conditioning, wireless WIFI onboard and other onboard services for disabled access;
- Provisions for Carriage – how the service will deliver its services;
- Timetables – minimum levels for issuing and publishing timetables which can stipulate web based updates on the hour, etc.;
- Fares Structure, including Concessions – minimum standards for how to issue notices on fare levels and period of reviews;
- Brand and Marketing;
- Integrated Transport, Ticketing and Information;
- Network-Wide Support Services;

- Passenger Facilities standards for construction and maintenance, extra services for wheelchair access, baggage and parcels, lockers, etc.;
- Language(s) to be used for print notices and onboard announcements;
- Consultation and dispute resolution process;
- Utilisation of Vessels and Ports;
- Performance Regime;
- Safety regime including PBS;
- Ports and Safety compliance;
- Environmental Protection and compliance

A number of issues remain for HCF including:

- The aging fleet, which was constructed between the 1950s and 2002;
- Meeting the rigorous auditing and reporting requirements of the regulatory body, NSW Maritime (Maritime Authority – governing safety and compliance);
- Tough operating conditions: the ferries work in salt water, and operate up to 20 hours a day. With limited supply of backup vessels where services require different types of ferry; HCF cannot afford for more than one ferry to break down unexpectedly;
- Limited dry dock facilities: Sydney Ferries has just one dry dock which must be shared with military vessels; alternative facilities are expensive to use.
- Labour issues: The legacy of trade unions dominating the maritime industry remains in various forms with a total of eight different unions representing ferry workers from engineers to deck hands, each of which have separate enterprise bargaining agreements to satisfy wage and working conditions.

Moving some way to address these operating issues HCF introduced a new Enterprise Resource Planning (ERP) system that aided the supply of critical spare parts and reduced the risk of stock-outs of critical items; it also meant a reduction in unnecessary inventory. It also moved to improve its planned vessel maintenance program by identifying potential problem areas and correcting them ahead of time. It also made improvements to its fuel management by measuring the fuel in each ferries' diesel tank automatically and alerting the ferry captain and fuel station by WiFi message of the time required for refuelling, which avoided delays at the fuel pump pier.

This is an example of a privatization of an existing government run ferry service with a focus on performance targets across areas – minimum level of service for boat operations, fare revisions, maintenance and operation standards built into the O&M agreement for the private partner to comply. At the same time, HCF invested in its own ERP for its own inventory management.

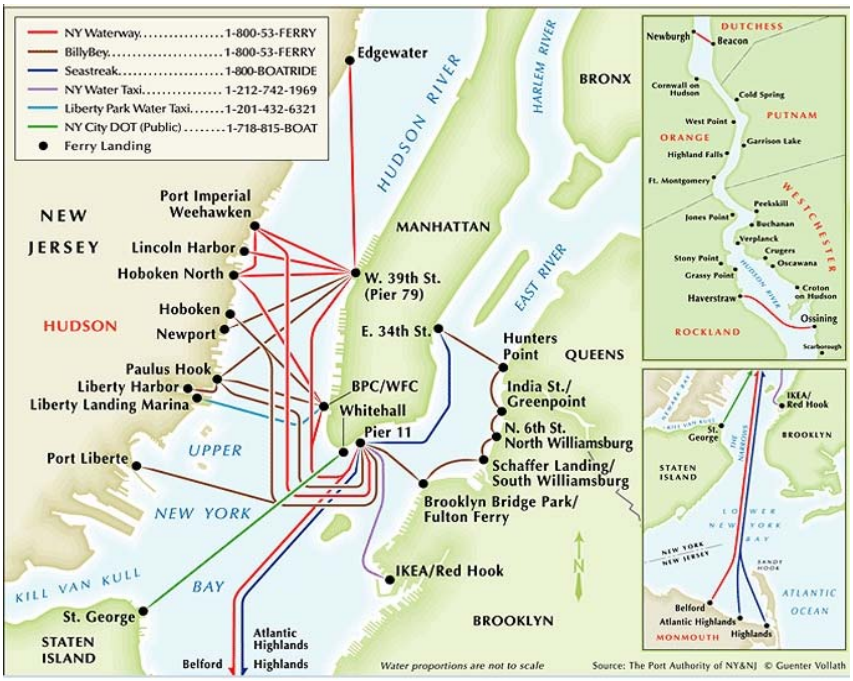
Key takeaway – Performance based targets and monitoring of private sector partner across a wide array of areas along with investment in monitoring mechanisms is required to plan for the development of the LSWTP holistically. The current levels of patronage are very similar to those in Lagos.

2.5.5 Ferries as an Instrument of Economic Development: New York City

2.5.5.1 Background

New York City is an example of a metropolitan area that has successfully integrated ferry services as part of an integrated metropolitan development strategy. Ferry transportation offers good connections between Manhattan and points in Brooklyn and Queens, and is designed to complement the city's mass transit system, offering waterfront residents more convenient transit options (some waterfront locations are quite distant from subway stops).

Figure 2-9: New York Harbor Commuter Ferry Routes



2.5.5.2 Integration of Ferry System in Economic Development

The NYC ferry system is a partnership involving Port NYC, the New York City Department of Transportation, the New York City Office of Emergency Management, the Port Authority of New York and New Jersey, as well as private operators.

New York City Economic Development Corporation is a good model for the LASWA in terms of its approach to ferry transportation as an instrument in a broader metropolitan economic development strategy. In recent years it has produced a number of citywide ferry studies laying out the sector strategy with well thought out demand analysis, strategies for waterfront development and analysis of the economic impact of the sector.[40]

This is an example of an institutional agency proactively developing and managing IWT through emphasis on project preparation and bringing together various stakeholders.

Key takeaway – Engagement with stakeholders (multiple areas of jurisdiction) and proactive approach for sector development are required for IWT to act as driver for economic change. Like Lagos, New York also has a series of islands connected by waterways, making it conducive to operating a ferry service.

[40]NYCEDC, Waves, Steer Davies Gleave, Citywide Ferry Study 2013: Preliminary Report (2013).

2.5.6 Inter-modal Transit and Connectivity: San Francisco Bay Ferry

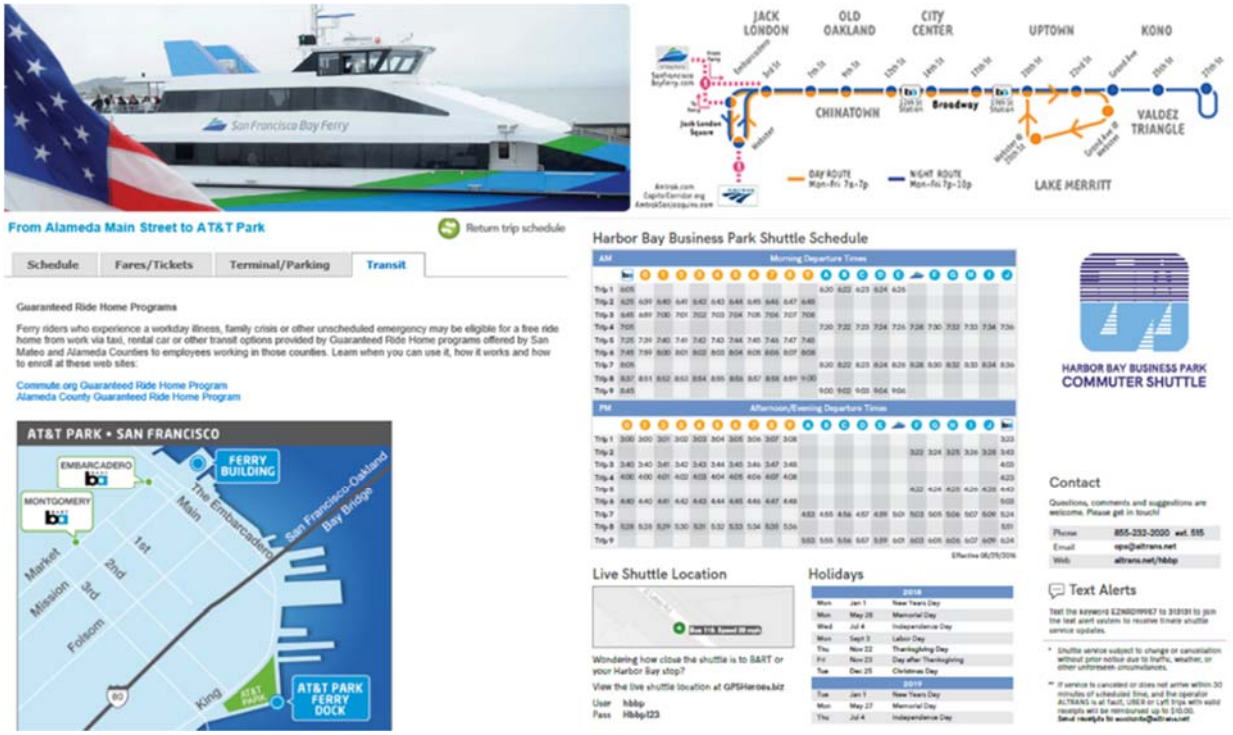
2.5.6.1 Background

The San Francisco Bay Ferry provides weekday, weekend, holiday, and seasonal services to nine terminal locations around the bay. Administered by the San Francisco Bay Area Water Emergency Transportation Authority (WETA), it serves more than 2 million passengers annually.

2.5.6.2 Inter-modal Transit Options

The San Francisco Bay Ferry is a good model for providing information about last mile transit options available to passengers at each ferry terminal.

Figure 2-10: Inter-modal Transfer options for San Francisco Bay Ferry



The website and mobile application provide information on:

- Nearest Bus station, including walking distance
- Other MRTS options such as tram or cable car
- Availability and schedule of shuttle service, which can be tracked on the mobile app

The shuttle service is a collaboration with the Harbor Bay Business Park association. Other counties served by the ferry service also provide special services to passengers. An example of this is the San Mateo County Guaranteed Ride Home Program which reimburses people who commute to a workplace in San Mateo County or students who commute to a participating college in San Mateo County for the cost of their ride home in the event that they have an emergency or other qualifying circumstance.

This is an example of a ferry service with a focus on last mile connectivity and facilitating passenger transfers through integration with web-based and mobile based platforms.

Key takeaway – Focus on passenger transit is expected to be key for modal shift to IWT.

2.6 Conclusions

2.6.1 Key Issues

The following are some key factors that need to be factored in for the design of the IWT project:

- **Reliable Service**: The reliability of a passenger ferry service starts with the adherence to a published schedule (timetable), which makes predictable the frequency and transit times between passenger stations. This schedule integrity allows ridership loyalty to develop over time and then moves to embed the ferries as a reliable transit option for the daily commute of passengers within LMA. This may be through an incentive/disincentive structure for adhering to Key Performance Indicators (KPIs).
- **Time and Cost Savings**: For IWT to be a mode of choice for passengers, they need to derive benefits of time and cost savings, including time and cost of last mile transfers, as compared to other public transport options. This will be one of the key determining factors to select routes and ferry stations in a phased manner (See more in Section 5).
- **Inter-modal Access**: Apart from the enhanced transit experience on ferries, seamless last mile connectivity for passengers to enable transfers to other public transport or private vehicle options is a key consideration. This will impact on the choice of location and/or selection of ferry terminals. This requires cohesive action by various agencies including LAMATA and LASWA to work together towards ensuring a seamless passenger transfer experience.
- **Manpower:** The majority of persons associated with the informal boat operations (off deck and deck activities) are not adequately trained and/or certified. While NIMASA lays down manning requirements, as per IMO guidelines, and is a certification body, there is an urgent need for investment in capacity building and training of manpower to play various roles including boat captains, deck hands, engine officers, traffic management personnel, etc. This needs to be studied in further detail and infrastructure created to facilitate the same.
- **Capacity creation versus Operational efficiency/viability**: Apart from navigational constraints, the choice of vessel design and passenger capacity has to be such that it optimizes costs (capital and operational) and delivers a reliable service without requiring a significant public subsidy. Vessel design and size determine:
  - passenger handling capacity at ferry terminal
  - docking capacity at ferry terminal, including turnaround time and dock design itself
  - capital cost (vessel acquisition)
  - Operational cost (manpower, fuel, consumables, etc.)

- **Project Structure**: At present, the LASG seems to have opted for a vertically separated service structure with waterside operations being licensed separately from landside terminal operations. We will evaluate both options to assess which is more efficient and provides greater reliability of service, and at the same time contributes to overall sustainability and lowers risk.

2.6.2 Data/Knowledge Gaps and Survey

While the STMP provides overall origin-destination and traffic flow patterns, some more information regarding the demographics and requirements of an average ferry passenger is required in order to determine an effective service pattern. The proposed ferry passenger survey was designed to capture the following:

- Trip purpose
- Trip origin and destination
- Total cost of trip (segregated into inter-modal transfer and ferry fare)
- Demographic characteristics of passengers including income and occupation
- Whether they would require a park and ride facility, where private vehicles are being used to reach the ferry station

Outputs of the survey are presented in Section 3.

3 Traffic Analysis

Key Messages

Approach

We followed a multi-pronged approach to traffic analysis for IWT. This included a combination of secondary data review and primary data collection.

LASWA identified 30 routes for operationalization, the STMP suggested 36 routes and the Haskoning report recommended 6 lines to be operationalized for IWT.

Given the global experience of ferry services requiring high levels of subsidy, the emphasis is on assessing the extent to which this demand can be captured taking into consideration the following supply side constraints:

1. Technical/navigation constraints;
2. Cost efficiency in determining the optimal size and capacity of the ferry vessels; and
3. Level of service requirements - addressing quality and reliability of service.

In cognizance of the above, we selected 12 routes based on the following criteria:

4. Those with the high levels of potential traffic as identified both in the STMP and the Royal Haskoning report;
5. Longer routes which would bypass congested road connections, and are therefore expected to deliver higher travel time savings; and
6. The above factors would contribute to higher viability as longer routes and higher the travel time savings would translate into higher fares and combined with higher traffic potential would provide greater revenue generation.

Key Findings from the Ferry Passenger Survey

While the STMP provides overall origin-destination and traffic flow patterns, it lacked several key parameters about trip purpose, demographic profiling of the passengers, cost and number of last mile transfers. We designed a Ferry Passenger survey targeted to capture more information regarding the demographics and requirements of an average ferry passenger in order to determine an effective service pattern.

7. Ferry service is used by men and women almost equally – design of service needs to take into account safety and security of both genders, specifically women.
8. Ferry service is currently patronized by passengers with monthly income of less than USD 165 per month: Fares will need to be designed taking into account affordability and cost of alternative modes. In order to attract customers with higher paying capacity, the quality and reliability of service will require significant improvement.
9. Commuters with repeat journeys (work/education related trips): Since these are regular scheduled trips, they will require a reliable service schedule to build trust in the service.
10. Commuter trips will witness heavier traffic during peak hours (7am-10am and 4.30pm-7.30pm): Service patterns will need to be designed to cater to different traffic levels during peak and non-peak hours.
11. Cost and convenience of last mile transfers: The ferry service needs to be integrated with other public/private modes of transport for smooth transit experience and induce modal shift.
12. Park and ride facility: Scope for parking of private vehicles at terminals needs to be evaluated and provided for.

Key Messages (contd.)

Estimated Demand

The daily aggregate demand on the 12 routes is close 271,000 trips or over 135,000 passengers in 2018. While IWT may present an alternative public transport option, it seldom captures a sizeable share of PT within a city.

3.1 Approach to Traffic Analysis

We followed a two-pronged approach to traffic analysis for IWT: a review of secondary data plus primary data collection.

3.1.1 Secondary Data Review

We reviewed data from the following sources:

- Macroeconomic factors and historical traffic data based on annual ridership figures shared by LASWA (2017)
- Strategic Transport Master Plan (STMP) and Strategic Travel Demand Model (STDM) to Cover the Mega City Region, ALG and europraxis, (2014) which took into account various public and private transport modes, and therefore provide a comprehensive picture of travel patterns and demand in LMA
- Feasibility Study Report for the Development of Ferry Services in the LMA, Royal Haskoning, (2008) which presents an analysis of ferry routes

3.1.2 Primary Data Collection

While the STMP provides overall origin-destination and traffic flow patterns, it lacked several key parameters about trip purpose, demographic profiling of the passengers, cost and number of last mile transfers. We designed a ferry passenger survey targeted at the existing users of ferry service with the objective to capture more information regarding the demographics and requirements of an average ferry passenger required in order to determine an effective service pattern. A total of 3,332 passengers were surveyed on weekdays across 20 existing ferry terminals/jetties (specified in Section 4.4.1), using the questionnaire template in Appendix C , which was administered by our survey team.

The key findings and how they may feed into the service design are reflected in Section 4.4.2.

Given the objective of the survey, we looked at inconsistencies and general trends at specific terminals and across survey locations. We believe the findings to be reflective of the as-is service and not inconsistent with other ferry systems worldwide which are similar to what is currently the situation in Lagos, i.e. a system yet to mature and are largely unorganised.

3.1.3 Phased approach with need to address supply side constraints

Given the geography of the Lagos state, specifically LMA, with its intricate network of lagoons and water bodies, transport along the inland waterways holds good potential for development

as an alternative means of public transport. Lagos State Government through the LASWA is committed to develop passenger transport on the inland waterways and has identified 30 routes that it considers viable for ferry services, four of which are already in operation under a licensing arrangement. The Lagos STMP identified a total of 36 routes for proposed IW services and made traffic projections till 2032.

There is a need to introduce scheduled and efficient IWT services to help present the mode as a viable and reliable alternate means of public transport to Lagos' commuters. At the same time, given the global experience of ferry services requiring high levels of subsidy[41], the emphasis needs to be on assessing the extent to which this demand can be captured taking into consideration the following supply side constraints:

- Technical/navigation constraints;
- Cost efficiency in determining the optimal size and capacity of the ferry vessels; and
- Level of service requirements - addressing quality and reliability of service.

These factors are further elaborated in Section 5.3.

Based on this approach, we selected 12 routes of the ones suggested in the STMP based on the following criteria:

- Those with the high levels of potential traffic as identified both in the STMP and the Royal Haskoning report;
- Longer routes which would bypass congested road connections, and are therefore expected to deliver higher travel time savings; and
- The above factors would contribute to higher viability as longer routes and higher the travel time savings would translate into higher fares and combined with higher traffic potential would provide greater revenue generation.

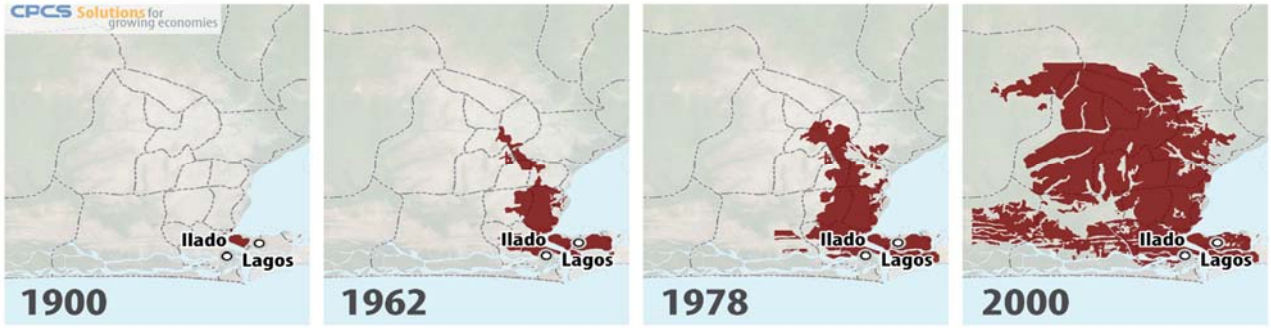
3.2 Macroeconomic and Historical Demand Analysis

3.2.1 Macroeconomic factors

Over the years, Lagos, the commercial capital of Nigeria, has witnessed a rapid increase in population amid tremendous urbanization and expansion. The transport system has not grown adequately to meet this demand. The city is congested with transport services dominated by informal service providers and privately owned cars. Over a century of growth in Lagos State has resulted in an urban sprawl along the main north to south transport corridor.

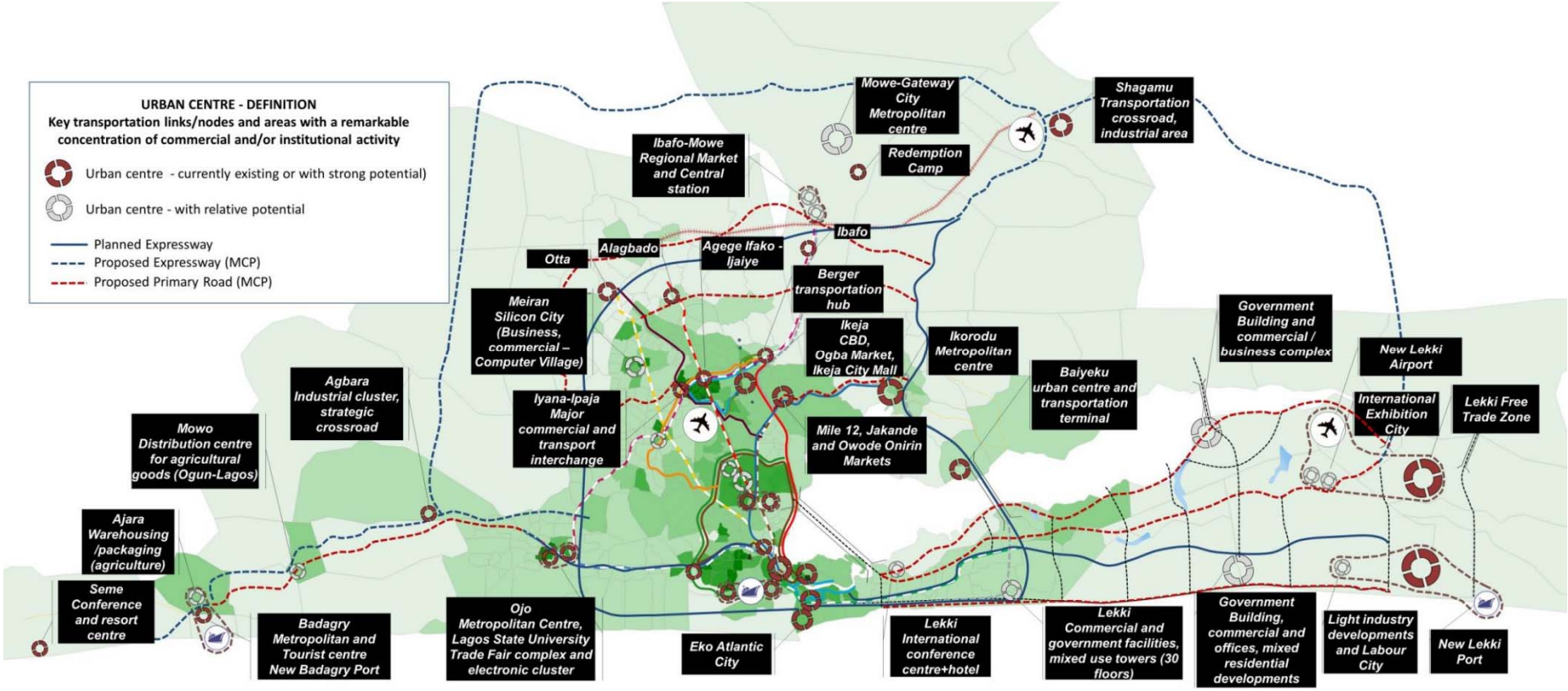
[41] In case of the City Cat Ferry System in Brisbane, the operational subsidy amounts to $3.80/passenger-trip. The annual subsidy in New York, United States, for the New York City's East River Ferry amounts to $3.1 million which translates to $2.58/passenger-trip. At the prevailing fare of $4, the service's farebox revenue covers 64% of the services operating costs. In case of Sydney ferries, the fare box collection cover 38% of expenses, the remainder being covered by subsidy and grants.

Figure 3-1: Tme Series of Urban Growth in Lagos (1900 – 2000)



Source: Ministry of Physical Planning/Environment (1900, 1963) LAMATA (2000). Data from the Global Human Footprint Dataset's Human Influence Index – HII (2005).

Figure 3-2: Projected urban centres as per STMP



Source: Consultancy Services for the Extension of the Strategic Transport Master Plan (STMP) and Strategic Travel Demand Model (STDM) to Cover the Mega City Region, ALG and europraxis, December 2014

3.3 Historical demand

A total of around 22 million trips are made in the LMA on a daily basis. Of these 40% are walking trips. Of the remaining 60%, minibuses (with an occupancy of between 8-25 passengers) account for 72% of the trips. Other public transport accounts for very low proportions of the remaining trips with BRT at 3%, conventional bus at 2% and mainline rail services at less than 1%[42].

Currently only 53,590 trips per day (14.1 million trips annually) are made using inland water transport services in Lagos. This constitutes a small fraction of the total trips made in the LMA and is significantly smaller than the estimated 5 million passengers per day utilising the formal and informal bus networks in the city[43]. Internationally, most water transport systems contribute only a small proportion to public transport. In Lagos, it is the quality and level of service of IWT which really needs to be enhanced. Section 2.5 provides comparisons of other ferry systems across some major cities in the world and the demand they serve proportionate to public transport in those cities.

3.3.1 Current routes and ridership

LASWA has proposed a total of 30 commercial routes, of which 4 are operational under separate licencing arrangements. In addition, there are routes serviced by smaller operators plying passengers on open 1-2 fibre boats and operators licenced by NIWA. These 30 routes are listed in Table 4-1.

Table 3-1: Current and proposed routes as projected by LASWA

S.No.	Ferry Route	Status
1	Badore - Ijede	Operational
2	Baiyeku - Ajah	Operational
3	Ebute Ojo - Ijegun Egba - Marina C.M.S	Operational
4	Ijede - Marina C.M.S	Operational
5	Ajah - Five Cowries - Marina/C.M.S	Proposed
6	Badore - Five Cowries	Proposed
7	Baiyeku - Victoria Island	Proposed
8	Ebute Ero - Ikorodu	Proposed
9	Ikorodu - Addax/Falomo	Proposed
10	Liverpool - Igbo Elejo	Proposed
11	Liverpool - Olodi Apapa	Proposed
12	Marina/C.M.S – Ikorodu	Proposed
13	Baiyeku - Langbasa	Proposed
14	Ebute Ojo - Ibasa	Proposed (Ebute Ojo Terminal has been concessioned to M/s Sifax for redevelopment)
15	Ebute Ojo - Ijegun Egba	
16	Ebute Ojo - Irewe	
17	Ijegun Egba - Ibasa	Proposed
18	Liverpool - Five Cowries	Proposed
19	Marina/C.M.S – Liverpool	Proposed
20	Agboyi Ketu - Five Cowries	Proposed
21	Agboyi Ketu - Marina/C.M.S	Proposed

[42] Source: *The Second Data Collection Survey on Mass Rapid Transit in the Federal Republic of Nigeria, Final Report, November 2014, JICA.*

[43] Development of Bus Route Network for Lagos State - Final Report. Integrated Transport Planning. April 2015.

S.No.	Ferry Route	Status
22	Agboyi Ketu - Mile 12	Proposed
23	Ajah - Oworonshoki	Proposed
24	Ijora - Ebute Ero	Proposed
25	Ikorodu - Oworonshoki	Proposed (After the completion of the reclamation project, Oworonshoki is planned to be redeveloped as a ferry terminal and commercial hub)
26	Marina/C.M.S - Oworonshoki	
27	Mile 2 - Addax/Falomo	Proposed (Mile 2 terminal to M/s Crownsworth Marines Development Company and is expected to serve has headquaters for Lagos Ferry Service Corp)
28	Mile 2 - Marina/C.M.S	
29	Oworonshoki - Ebute Ero	Proposed (See comment above regarding Oworonshoki)
30	Oworonsoki - Five Cowries	

Source: LASWA

There are around 26 major ferry terminals in the LMA, and the existing annual ridership at these terminals is given in the Table 4-2.

Table 3-2: Existing Annual Ridership at Major Ferry Terminals

S.No.	Name of Ferry terminal/Jetty	Number of passengers[44] (December 2016-November 2017)
1	Addax	545,549
2	Alex	861,143
3	Agboyi Ketu	500,125
4	Badore	746,004
5	Bayeku	555,864
6	CMS/Marina	730,650
7	Coconut	859,493
8	Elegbata	117,405
9	Epe	300,150
10	Falomo	108,924
11	Ijede	669,380
12	Ijegun Egba	998,551
13	Ijora	18,821
14	Iya Afin	859,482
15	Langbasa	154,875
16	Liverpool	1,393,761
17	Metro Ferry[45]	0
18	Ebute Ikorodu	672,278
19	Ojo	330,130

[44] Record of passengers alighting/boarding at the terminals. The numbers provided by LASWA have a variance with data provided by NIWA by ± 10%. NIWA additionally records some numbers for private jetties/clubs and charters.

[45] License was suspended in 2016. Serviced terminals at Oworonshoki, Elegbeta and Ikorodu. From https://www.vanguardngr.com/2016/06/lagos-clarifies-eviction-tarzan-metro-ferry-operators-jetties/

S.No.	Name of Ferry terminal/Jetty	Number of passengers[44] (December 2016-November 2017)
20	Oworonshoki[46]	0
21	Ibeshe	61,863
22	Oke Ira Nla	574,350
23	Sagbokoji	841,367
24	Slave Route	621,601
25	Takwa Bay	382,703
26	Tin Can	1,243,225
	Total	**14,147,694**

Source: LASWA

3.3.2 Proposed/Future routes and ridership

The Lagos STMP identified a total of 36 routes for proposed IW services. Table 4-3 lists the routes as well as the traffic projections for 2032, as well as the year when lines are expected to be put into service. The STMP projections assume that ferry services will operate for 16 hours a day.

Table 3-3 2032 Traffic Projections by Inland Waterway Route

S.No	Route Name	2-way Hourly flow	Daily 2-way flow	Year of implementation[47]	Current Status
1	Liverpool-IgboElejo	14,279	228,464	2022	
2	Marina-Liverpool	14,148	226,368	2022	Operational
3	Ijede-Marina	13,284	212,544	2014	Operational
4	Marina-ToluAjegunle	12,489	199,824	2022	
5	EbuteO_I-Egba_Marina	11,862	189,792	2014	Operational
6	Liverpool-FiveCowries	10,723	171,568	2017	
7	Marina/CMS_Ikodoru	6,453	103,248	2014	Operational
8	Marina-Ekpeme	6,105	97,680	2022	
9	Badore_Five Cowries	5,668	90,688	2014	
10	Mekwen-Ekpeme	5,301	84,816	2014	
11	Badore_Ijede	3,844	61,504	2014	Operational
12	Ijede-Badore	2,905	46,480	2014	Operational
13	Mile 2-Marina	2,855	45,680	2014	
14	AgboyiKetu-FiveCowries	2,592	41,472	2017	
15	Ikorodu_Addax/Falomo	2,453	39,248	2017	
16	EbuteOjo_IjegunEgba	2,420	38,720	2014	
17	IjegunEgba-Ekpeme	1,993	31,888	2022	
18	AgboyiKetu-Mile12	1,836	29,376	2022	
19	Baiyeku-Victoria Island	1,835	29,360	2014	
20	Liverpool-OlodiApapa	1,483	23,728	2022	

[46] Was earlier serviced by Metroferry. It is now the site for reclamation activities where larger ferry terminals will be developed, along with Epe, Badagry and Mile 2 (https://lagosstate.gov.ng/blog/2017/08/14/lagos-moves-to-transform-oworonshoki-to-transport-entertainment-hub/)

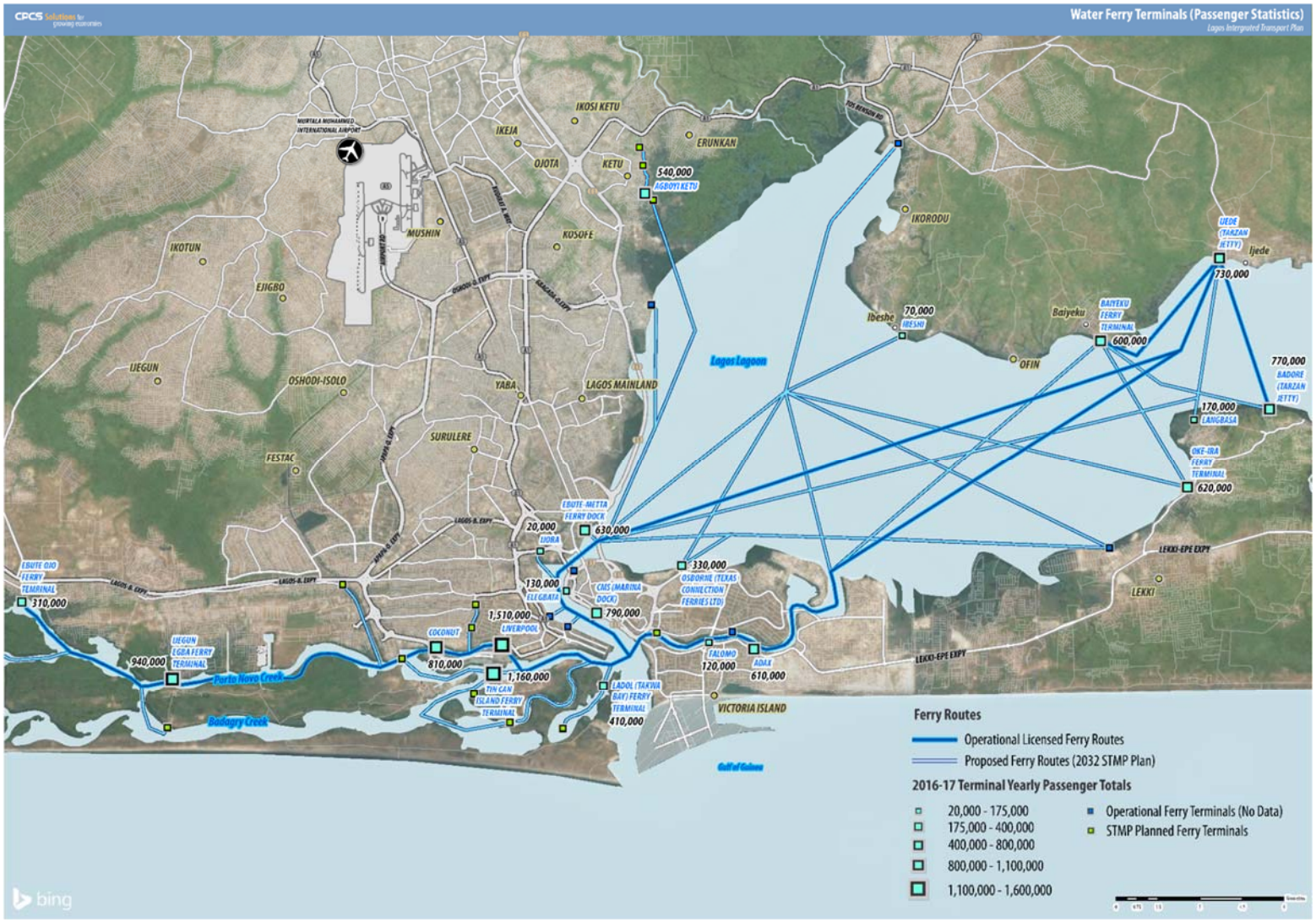
[47] For routes where year of implementation is indicated as 2014, the routes were operational at the time of development of STMP.

S.No	Route Name	2-way Hourly flow	Daily 2-way flow	Year of implementation[47]	Current Status
21	Ebute Ero-Ikorodu	1,309	20,944	2014	
22	Marina/CMS_Oworonshoki	1,243	19,888	2017	
23	Ikorodu-Osborne	987	15,792	2017	
24	Ebute Ojo-Irewe	892	14,272	2014	
25	Ikorodu-Oworonshoki	826	13,216	2017	
25	Baiyeku-Langbasa	811	12,976	2014	Operational
27	Mile 2-Addax/Falomo	586	9,376	2014	
28	Ajah-FiveCowries-Marina	435	6,960	2022	
29	Ijora_Ebute Ero	360	5,760	2014	
30	Baiyeku-Ajah	326	5,216	2014	Operational
31	Oworonshoki_Five Cowries	199	3,184	2014	
32	IjegunEgba-Ibasa	168	2,688	2014	Operational
33	Ajah-Osborne-Marina	120	1,920	2022	
34	Oworonshoki-Osborne	93	1,488	2022	
35	AgboyiKetu-Marina	54	864	2017	
36	EbuteOjo-Ibasa	34	544	2014	

Source: STMP

Figure 3-3 shows the map of the IW routes proposed to be operational by 2032, juxtaposed with currently operational routes and ridership.

Figure 3-3: Existing Ridership and Licensed routes, compared with STMP projected rotes (2032)



In January 2008, consultants Royal Haskoning undertook a study for LAMATA – *Feasibility Studies for the Development of Ferry Services in the Lagos Metropolitan Area*. The report recommended three priority IW routes to service potential passenger traffic headed towards the Central Business District (CBD) comprising Lagos Island, Ikoyi, and Victoria Island. The main points of origin of these passengers being central Lagos, Ikorodu and Victoria Island / Lekki area, during the morning peak hours (between 7am and 10am to CBD) and the afternoon (between 4pm and 7pm from CBD).

In total, the report proposed 6 routes (not all routes were financially viable):

- West Line: Lasu (Ojo) - Satellite Town (Ijegun) - Marina
- Central Line: Oke Afa - Festac - Mile 2 - Marina
- Apapa Line: Olodi Apapa - Liverpool - Marina
- North Hopper Line: Mile 12 - Oworonsoki - IBB - Marina
- North Direct Line: Ikorodu - Marina
- East Line: Ijede - Badore West - Lekki - Falomo Bridge – Marina

The West Line, North Direct Line and East Line were identified as the priority routes.

The routes suggested as part of this study are in line with the routes proposed by the Haskoning report. In some cases however, different terminal locations have been recommended.

3.4 Data Collection and Surveys

3.4.1 Survey data

A total of 3,332 passengers were surveyed on weekdays across 20 existing ferry terminals/jetties using the questionnaire template in Appendix C which was administered by a survey team. While the STMP provides overall origin-destination and traffic flow patterns, this survey was designed to capture more information regarding the demographics and requirements of an average ferry passenger. This demographic and requirements profile is required in order to determine an effective service pattern.

Table 3-4: Ferry Passenger Survey - spread of sample

S.no.	Name of ferry terminal/ jetty	Number of passengers interviewed[48]
1	Alex	75
2	Apapa	227
3	Badore	150
4	Baiyeku	266
5	CMS	165
6	Coconut	159

[48] At each terminal, the survey was conducted for one weekday by a team of 4 enumerators and 1 supervisor during hours of operation 6am – 7pm. The variation in number of passengers surveyed is due to the response received from passengers when they were requested to participate in the survey and number of passengers opting to take the ferry on that day.

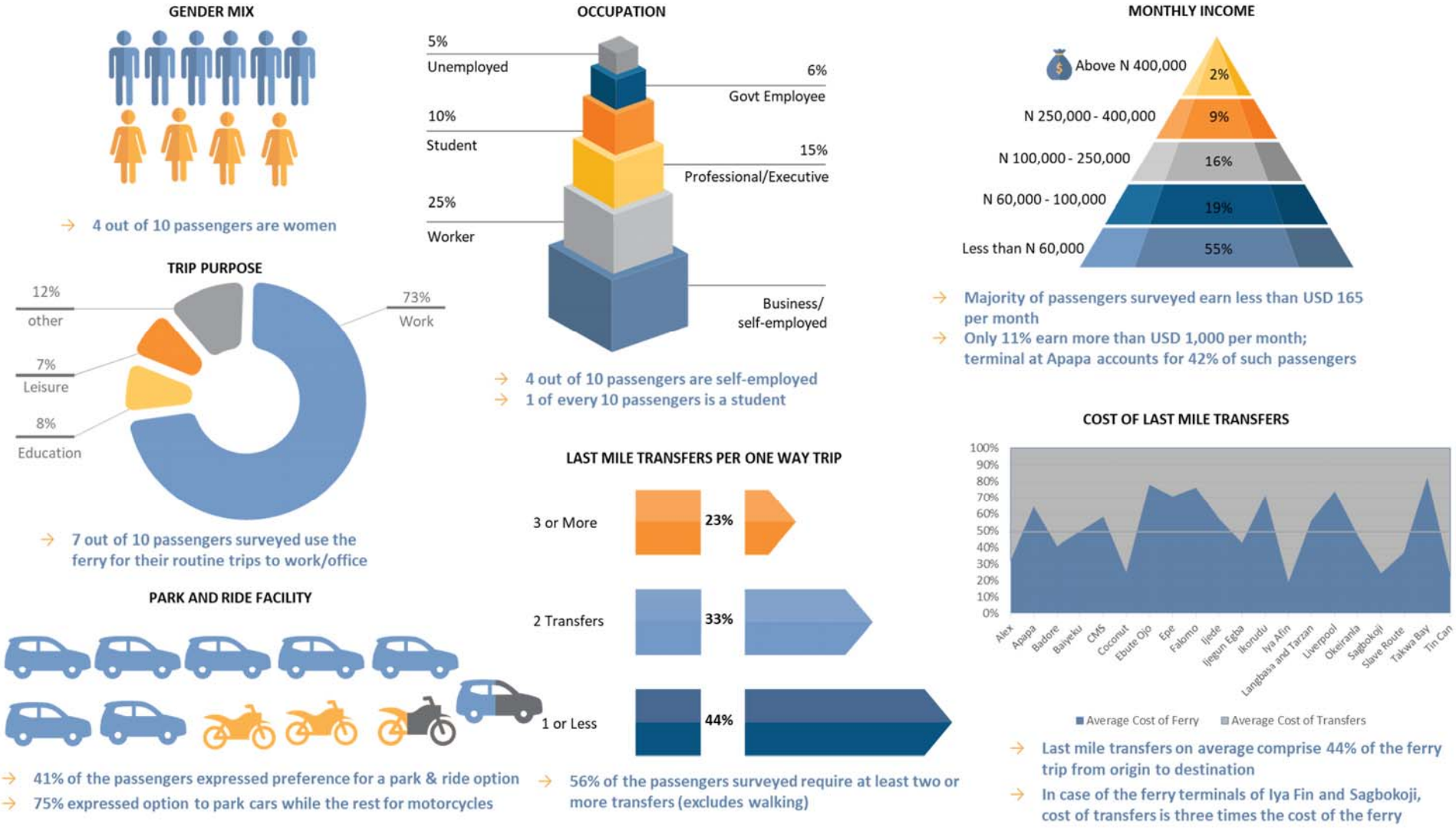
S.no.	Name of ferry terminal/ jetty	Number of passengers interviewed[48]
7	Ebute Ojo	151
8	Epe	206
9	Falomo	192
10	Ijede	232
11	Ijegun Egba	160
12	Ikorudu	182
13	Iya Afin	103
14	Langbasa and Tarzan	88
15	Liverpool	171
16	Okeiranla	193
17	Sagbokoji	158
18	Slave Route	160
19	Takwa Bay	149
20	Tin Can	145
	Total	**3,332**

The survey covered various aspects:

- Information on Demographics;
- Trip Purpose; and
- Number and cost of last mile transfers.

The main observations are summarised in Figure 3-4.

Figure 3-4: Key Results from Ferry Passenger Survey



3.4.2 Key Findings

Based on the Survey Results in Figure 3-4, following are the key findings which have been used to determine the Service Design and Pattern in Section 4.

- Ferry service is used by men and women almost equally – design of service needs to take into account safety and security of both genders, specifically women (e.g. safe transit, amenities, accessibility, etc.)
- Ferry service is currently patronized by passengers with monthly income of less than USD 165 per month[49]: Fares will need to be designed taking into account affordability and cost of alternative modes. In order to attract customers with higher paying capacity, the quality and reliability of service will require significant improvement; marginal short-term measures may fail to build patronage.
- Commuters with repeat journeys (work/education related trips): Since these are regular scheduled trips, they will require a reliable service schedule to be operated by the service provider to build trust in the service.
- Commuter trips will witness heavier traffic during peak hours (7am-10am and 4.30pm-7.30pm): Service patterns will need to be designed to cater to different traffic levels during peak and non-peak hours.
- Cost and convenience of last mile transfers: This is expected to play a significant role in modal choice. The ferry service needs to be integrated with other public/private modes of transport for smooth transit experience.
- Park and ride facility: Scope for parking of private vehicles at terminals needs to be evaluated and provided for.

3.5 Traffic Projections

3.5.1 Modelling methodology

The STMP identified 36 routes for the development of IW services (details in Table 4-3). These routes were based on a detailed demand and revenue modelling exercise, taking into consideration public and private transport modes, future demand projections, and the development of other transport projects including road expansions and bridges, BRT, LRT, and monorail.

The IW routes were designed to cover the creek areas with poor quality and congested road connections, and offer an alternative service to road-based modes. The STMP strategy was based on IW playing a key role in providing an alternative means of transportation around the Lagos Lagoon area.

[49] The estimated mean net annual household income for Lagos was 2.67 million Naira (222.8k Naira/month) as per estimated household income and GDP per capita (2013) in Lagos; Lagos Value of Time Study, 2015, Leigh Fisher

Based on the selection criteria specified in Section 3.1.3, an initial list of 7 routes have been identified as key routes, which should be taken forward for development of IW services in a phased manner. The routes are as follows:

- Badore – Ideje
- Liverpool – Igbo-Elejo
- Marina – Liverpool – Ijegun Egba – Ebute Ojo
- Liverpool – Five Cowries
- Marina – Ikorodu
- Five Cowries – Badore
- Osborne – Ikorodu

In addition, there are already other ferry terminals which have been concessioned, re-developed or in the process of redevelopment. The following additional routes will also be considered in order to capitalize on the investment that has already been made in the development of the terminals at Falomo, Oworonshoki and Mile 2.

- Ikorudu – Falomo
- Oworonshoki – Ikorudu
- Marina – Oworonshoki
- Mile 2 – Marina
- Mile 2 - Falomo

For each of these routes the total daily 2-way passenger demand was based on the forecasts given in the STMP. No separate demand modeling exercise was undertaken, but the STMP forecasts were adjusted to give us current year (2018) demand. It was also assumed that if adequate capacity in terms of number of vessels, frequency of services, and terminal sizes was provided, all the potential demand would be met.

3.5.2 Traffic projections

Based on the modelling methodology outlined above, the daily IW traffic projections (i.e. passenger flows) for the 7 key routes and the 5 additional routes, 3 scenarios, were developed. The STMP provided passenger traffic projections under two scenarios:

- Do minimum – The baseline scenario without any of the STMP projects being undertaken; and
- With STMP – With all the various STMP projects (including road improvements, BRT, LRT and monorail) being implemented.

The STMP forecasts were based on a transport demand model covering 11 transport modes, including private vehicles, waterways (i.e. ferry services), and other forms of public transport. Passenger demand surveys were undertaken to develop the origin-destination matrices used in the transport model. Under the STMP the number of ferry routes increases from 25 in 2017 to

36 in 2032. The number of daily ferry passengers (with the implementation of the STMP) increases from 518,304 in 2017 to 2,127,536 in 2032 – a 310% increase in 15 years.

For the purpose of our analysis, the following passenger forecasts were developed under the following 3 scenarios:

- Base case – Based on the 'with STMP' passenger ridership forecasts given in the STMP;
- High case – The base case plus 20% additional passenger demand; and
- Low case – Based on the 'do minimum' passenger ridership forecasts given in the STMP.

The IW passenger trip (ridership) forecasts under these 3 scenarios are given in Table 3-5. It must be noted that the forecasts are for daily 2-way (i.e. return) trips.

Table 3-5: Forecast of Daily IW Two-way Trips by Route

	2023	2028	2033	2037
Liverpool – Igbo-Elejo				
Base	110,554	176,059	241,565	301,926
High	132,665	211,271	289,878	362,311
Low	65,611	72,228	81,967	102,448
Marina – Liverpool – Ijegun Egba – Ebute Ojo				
Base	128,276	204,283	280,289	350,326
High	153,931	245,139	336,347	420,391
Low	76,129	83,806	95,106	118,871
Liverpool – Falomo				
Base	83,022	132,214	181,406	226,735
High	99,626	158,657	217,688	272,082
Low	49,271	54,240	61,554	76,935
Marina – Ikorodu				
Base	49,962	79,565	109,169	136,447
High	59,954	95,478	131,002	163,736
Low	29,651	32,641	37,043	46,298
Falomo – Badore				
Base	43,884	69,886	95,888	119,848
High	52,661	83,863	115,066	143,818
Low	26,044	28,671	32,536	40,666
Badore – Ideje				
Base	29,762	47,396	65,031	81,280
High	35,714	56,876	78,037	97,536

	2023	2028	2033	2037
Low	17,663	19,444	22,066	27,580
Osborne – Ikorodu				
Base	7,642	12,170	16,698	20,870
High	9,170	14,604	20,037	25,044
Low	4,535	4,993	5,666	7,081
Ikorodu – Falomo				
Base	18,992	30,245	41,499	51,868
High	22,791	36,294	49,798	62,242
Low	11,271	12,408	14,081	17,600
Oworonshoki – Ikorodu				
Base	6,395	10,185	13,974	17,466
High	7,674	12,221	16,769	20,959
Low	3,795	4,178	4,742	5,926
Marina – Oworonshoki				
Base	9,624	15,326	21,028	26,283
High	11,549	18,391	25,234	31,539
Low	5,711	6,287	7,135	8,918
Mile 2 – Marina				
Base	22,105	35,202	48,299	60,368
High	26,525	42,242	57,959	72,442
Low	13,118	14,441	16,389	20,484
Mile 2 – Falomo				
Base	4,537	7,225	9,914	12,391
High	5,444	8,670	11,896	14,869
Low	2,693	2,964	3,364	4,204

Source: STMP

Estimates in Table 3-5 suggest that the daily aggregate demand on the 12 routes is close to 525,000 trips or over 260,000 passengers in 2023. This rises to 1.43 million trips or around 715,000 trips in 2037.

3.5.2.1 Global Comparisons

In comparison, some of the international examples cited in Section 2.5 serve between 50,000 to 40,000 passengers per day, but still constitute 1% to 2.5% of total public transportation.

- Chao Phraya Express Boat Co. Ltd. (Bangkok, Thailand) serves 40,000 passengers daily – IW serves less than 1% of public transport traffic.

- Sydney Ferries (Sydney, Australia) has a ridership of 14.9 million annually (50,000 per day approximately) – Total IWT system serves about 2.5% of the public transport traffic.
- San Francisco Bay Ferry (San Francisco, U.S.A.) serves more than 14 million passengers annually (46,000 per day approximately) – Total IWT system serves less than 1% of the Bay Area's total Public Transport Traffic.

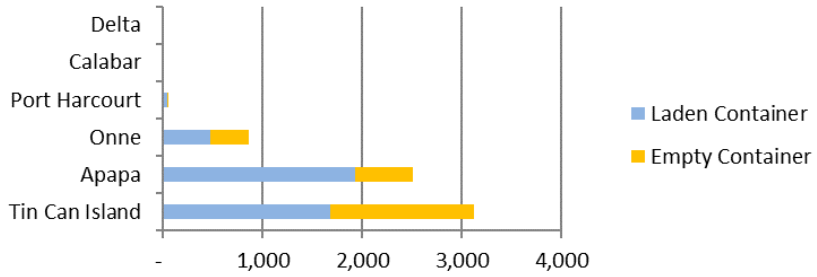
While IWT may present an alternative public transport option, it seldom captures a sizeable share of public transport within a city.

3.6 Cargo Transport

3.6.1 Background

The Lagos ports area hosts two of the busiest ports of final destination in Nigeria: the Apapa Port Complex and the Tin Can Island Port Complex. In 2017, both ports accounted for over 45 percent of all import and export traffic in Nigeria by sea[50]. In addition, the Nigerian Ports Authority (NPA) estimates that the ports of Tin Can Island and Apapa accounted for over 85% of Nigerian container trade (between 5,000 – 6,000 container a day) in the first half of 2017[51] (Figure 3-5). The Port Complex is thus the largest freight generator, and operating conditions have cascading implications for Nigerian trade and the economy.

Figure 3-5: Average daily container handling estimates at Nigeria ports in 2017, with over 85% in Lagos ports



Source: CPCS analysis of NPA data

When cargo trucks depart the port area, they not only encounter congestion but also exacerbate it, with average travel speeds during peak morning and peak evening being less than 30 kilometers per hour (19 miles per hour) in most parts of the LMA[52], and especially within the Lagos logistics ring. The congestion in the "first / last mile" -- the short segment from the ports to Lagos warehouses -- is so acute that it costs shippers USD 434, representing 22% of the total

[50] National Bureau of Statistics. Nigerian Ports Statistics (2012 – 2017). http://www.nigerianstat.gov.ng/download/735
Nigerian Ports Statistics (2012 – 2017) prepared by the National Bureau of Statistics
[51] Nigerian Port Authority, 2018. Ports Statistics; Container Traffic (TEUs). www.nigerianports.gov.ng/ports-statistics/.
[52] Frederic Oladeinde. Presentation on the Lagos Strategic Transport Master Plan. Lagos Metropolitan Area Transport Authority (LAMATA). 2017

land transport price of shipping along the entire 1,225 km north-south Lagos-Kano-Jibiya (LAKAJI) corridor[53]. About 94% (USD 408) of this local transportation cost is deemed an "extra cost" attributable to congestion, poor road conditions, handling charges and delays, and other inefficiencies such as long cargo dwell times.

On the land-side, extensive truck queues are a primary reason for long turn times at the Lagos ports. These queues in turn impose significant negative externalities by compounding congestion in the Lagos Metropolitan area (LMA), generating higher concentrations of pollutants and Greenhouse Gas (GHG) emissions from idling trucks, noise, and driving up the cost of doing business. Considering the extensive water network connecting the Lagos area ports with other transport infrastructure in Lagos, the scope for inland water transport for freight cargo seems enormous.

3.6.2 Main Truck Transport Corridors

The map of heavy commercial traffic flows in Figure 3-6 shows that truck freight predominantly moves along two major transport corridors, namely the Lagos – Jibya axis (North-South, known as the LAKAJI corridor) and the Lagos – East axis. The former, is a 1,225km freight corridor linking Apapa and Tin Can Island ports to Nigeria's heartland, the commercial center of Kano, and the Niger border at Jibiya.

Within a regional context, both freight corridors converge on the Lagos Ibadan Expressway (E1) near Logbara and funnel truck traffic south to Ojota (illustrated in Figure 3-7). Survey estimates in a 2016 LAMATA study revealed 7,820 trucks converging daily.

Four other smaller corridors have similar shares of the daily traffic and represent 52% of the total daily traffic:

- A1 via Ikorodu (inland east-west axis) with 1,976 trucks,
- Lekki-E. Expy (coastal east-west axis) with 1,885 trucks,
- Lagos-B. Expy (coastal east-west axis) with 1,750 trucks, and;
- A5/Old Abeokuta Rd (northwest axis) with 2,977 trucks

These flows when added to the 7,820 trucks on the main E1 expressway, amounts to 16,408 trucks entering/exiting the LMA on a daily basis.

[53] Nigeria Expanded Trade and Transport Program (NEXTT) Lagos-Kano-Jibiya (Lakaji) Corridor Performance: Baseline Assessment Report On The Time And Cost To Transport Goods, 2015

Figure 3-6: Map of Average Daily Heavy Commercial Vehicle Traffic Projections for 2018

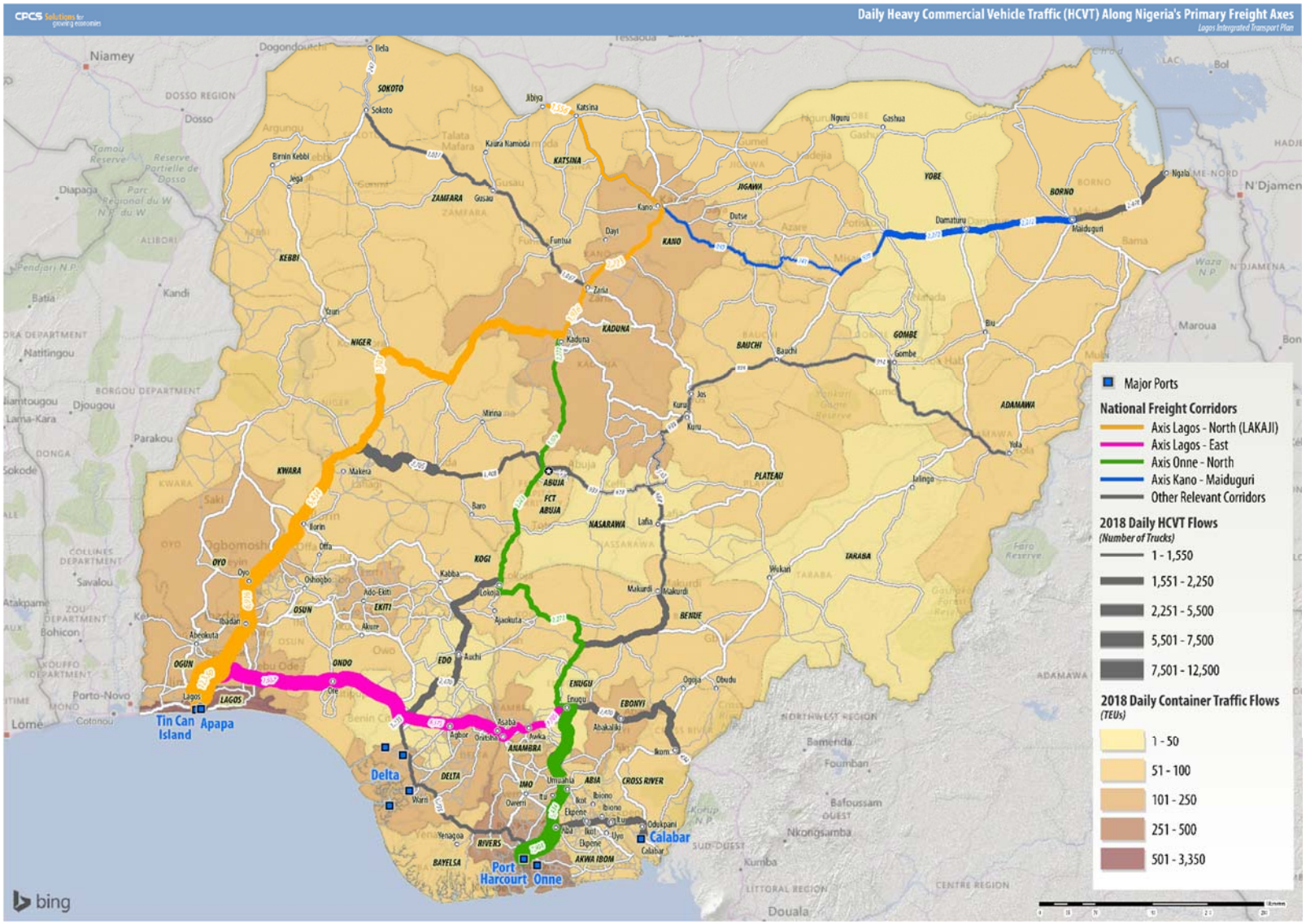
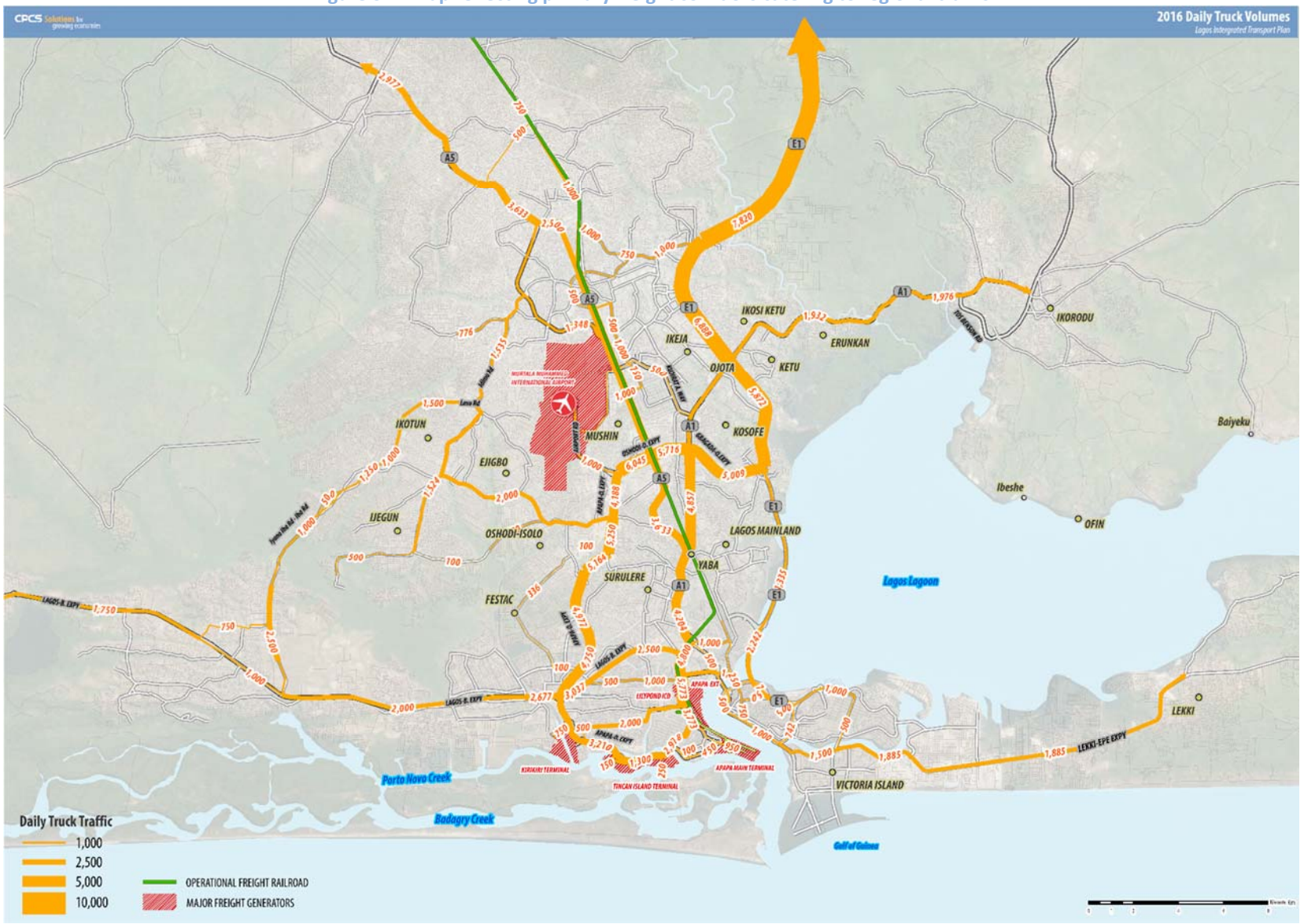


Figure 3-7: Map reflecting primary freight corridors catering to regional traffic



Based on a further analysis of these 5 corridors, the following inner city motorways and/or combinations of major arterials were deemed to be the major freight generators in Lagos:

- A1-Apapa Road; South of the Ijora Causeway with 5,773 trucks
- Oshodi-Oworonshoki Expressways; South of Airport Road to Lagos-B. Expressway sees varying volumes ranging from 4,188 to 5,250 trucks, while Oshodi-Oworonshoki Expressway and Gbagada-Oworonshoki Expressway portions range between 5,776 and 6,045 trucks
- Lagos-B. Expressway; East of the Apapa-O Oworonshoki. Interchange towards Ojo Road and Cemetery Rd with 3,037 trucks and the remainder to the A1-Apapa Road with 2,500 trucks

Within the port terminal area (5km vicinity), daily traffic estimates from the 2016 survey range from 2,500 to 3,773 trucks via several route combinations. Truck traffic is captured along Apapa Road (3,773), Apapa-O Oworonshoki. / Tin Can Island Access Rd (3,210 west of Tin Can Island and 2,978 east of Tin Can Island) and Lagos-B. Expressway (3,037 west and 2,500 east) to reach the terminal gates.

Other major arterials and expressways serve as local delivery roads, routes for bypassing the downtown core, or congested expressways. The E1 into Lagos/Victoria Island has traffic of about 2,242 trucks a day that eventually move on to the Lekki-Epe Expressway or divert for local delivery. Kirikiri, Ojo, Malu and Cementry roads are all roads used for local delivery as a way to avoid using expressways. Other major arterials and feeder roads closer to the port gates are severely congested, details of which are discussed in the Truck Parking and Port Access Facility Project Assessment Report.

Figure 3-8: Map showing accumulation of trucks at major freight generators

3.6.3 Inland Water Shipping of Freight Cargo

The inland waterways are a potential mode for moving bulk freight commodity in and around Lagos and outside of Lagos. For traffic moving within Lagos, the added convenience of door-to-door shipping for cargo owners moving commodity by truck must be examined against the potential benefit of switching to inland waterway. Double handling (transfer of cargo from truck to barge/ferry and back to truck) could increase the logistics costs beyond the point where it is advantageous to ship via water. Such analyses and ultimately, the cost of cargo transport within Lagos by inland waterways would need to be compared to that of direct delivery by truck. Incremental costs of moving cargo via the inland waterways relative to truck include, but are not limited to:

- Costs of port and inland handling charges;
- Regulatory fees to NIWA or LASWA (which likely need to be determined);
- Potential time savings of using the waterways relative to road.

Section 6.8 discusses options for integrating freight transport into ferry services in Lagos. This discussion is presented at a **high level** because the level of detailed analysis required to determine the viability of freight ferry transport and its cost-benefit for passenger services is beyond the scope of the current study.

Transit traffic – this is traffic arriving in Lagos and then shipped to elsewhere in Nigeria (including some bulk and containerized cargo) represent the largest potential market for inland water transport in Lagos. On a previous assignment where CPCS consulted with terminal operators, shippers and other stakeholders, transit traffic was estimated at over 35 million MT. Over 99 percent of this traffic is currently moving out of Lagos via road mode and primarily along the corridors identified in sub-section 3.6.2.

Using the Lagos waterways, most of this traffic traveling out of Lagos can be transshipped from the Apapa and Tin Can Island Ports to Ikorodu (a major hub for traffic going north and east), via the Ikorodu Lighter Terminal (ILT). The ILT is an NPA jetty, and NPA is contemplating introducing private sector participation in the operation and maintenance of ILT, by designating the terminal as an agro-export terminal. Presently, an NPA licencee is providing barge transport service from ILT to terminals in Apapa and Tin Can.[54] This licencee indicated to our team that their services have moved approximately 5,000 TEUs between ILT and terminals in Apapa and Tin Can as at November 2018 after starting operations in February 2018. From ILT, this traffic is then shipped via road mode to destinations around the country. The licensee expects to significantly ramp up activities in the medium to long term.

Presently, very few terminals owned or managed by LASWA are equipped to be transshipment points between any of the Lagos ports and out-of-State destinations in Nigeria. This is assuming the added handling costs are outweighed by trucking costs. In a transshipment model, potential revenue for LASWA could be in the form of dues or charges for using LASWA owned/managed terminals or use of the Lagos waterways. However, LASWA claims to any revenues from waterways use could encounter significant challenges from NIWA and NIMASA and perhaps the

[54] Connect Rail Services Ltd moves containers from/to the Ikorodu Lighter Terminal from the Lagos Ports

Nigerian Navy. Currently, the licensee operating between ILT and Apapa/Tin Can is required to register its barges not only with NIMASA, but with NIWA and the Nigerian Navy as well.

Transshipment from the Lagos area ports via ILT or other jetties owned or managed by LASWA along the freight corridor would need to be examined in greater detail. This form of transshipment will require double handling and very likely the payment of fees to the different agencies that may be involved in the freight flow. A detailed analysis of the cost of IW transport, relative to the cost of shipping by truck (the status quo) would need to be examined to determine the potential costs and benefits of this modal flow.

3.6.4 Recommendations

Presently, none of the IW operators or LASWA is providing cargo transport service. In our consultations with the management of LASWA and LAGFerry, we were informed that the current strategy is to focus on the effective and safe delivery of passenger transport service. LAGFerry reported that any short or medium term cargo transport services would mostly be in the form of providing storage services at different terminals for freight cargo. Considering the significant volume of freight traffic moving within Lagos State, there is the potential for this form of services across several terminals within Lagos. Cargo services by inland waterway ferry operators and/or concessionaires may help subsidize passenger operations.

However, as indicated, inland waterways cargo transport will result in the doubling, and in some cases, tripling of cargo handling (moving cargo from truck to water vessel and then back to truck). The benefit of any cost savings under this strategy would have to be compared to the cost of shipping by truck directly from the port or processing and manufacturing centers directly to end users warehouses and/or depots.

It is our recommendation that LASG, in collaboration with NPA, follow-up this study with a detailed assessment of the feasibility of cargo shipping from the NPA ports using the Lagos inland waterways. Such a study would need to examine:

- Cost of trucking within the Lagos area
- Origin-and-destination of freight cargo commodities, particularly industrial inputs and outputs within Lagos
- Cost of barge transport or cargo shipping on the IW, particularly examining what fees and charges will apply, including:
    - Handling charges at the Nigerian ports for transit cargo
    - Handling charges for freight cargo at Lagos IW terminals
- Regional distribution of freight cargo arriving at the Lagos area ports

Since one of the key benefit of such a solution would likely be reduce congestion and improved efficiency within the port, NPA is best placed to lead this effort.

4 Facility Configuration and Service Design

Key Messages

Approach to Determine Project Design

Given the global experience of ferry services requiring high levels of subsidy (Chapter 4.1.3), the emphasis is needs to be on assessing the extent to which demand can be captured taking into consideration the following supply side constraints:

1. Technical/navigation constraints;
2. Cost efficiency in determining the optimal size and capacity of the ferry vessels; and
3. Level of service requirements - addressing quality and reliability of service.

Phased Approach

In cognizance of the fact that the Inland Water Transport (IWT) sector is still developing, we recommend a phased approach wherein one selected route is developed on a PSP-basis in Phase I. The selected route will be chosen from a route prioritization exercise identifying the most viable routes for PSP. We use a multi-criteria analysis to identify/prioritize routes for Phase II (following implementation of Phase I). The routes which scored more than 70 points for the route selection criteria were chosen for priority implementation for Phase II while the remaining should only be considered once the passenger ferry sector is significantly more mature. As such, they are excluded from the implementation path of this project.

Service Design

Value Proposition: The key selling point for the ferry service would be the journey time savings estimated to be 46% across the routes. Reliability of service will build patronage and coupled with time savings induce modal shift from road-based transport to IWT.

The proposed passenger ferry network system is designed around providing commuter passenger services between major demand centers and routes where travel time savings (as compared to other modes) are high. The service has been designed as a commuter service to target traffic demand of the regular daily commute to work/education. Therefore, no operations on Sunday have been proposed, as the demand for services will be much lower.

4. Peak hours: Express service which runs every 15 minutes during peak hours (7am-10am and 4.30pm-7.30pm) – 12 round trips every morning and evening.
5. Non-peak hours: Regular service which runs every hour during 10am-4.30 pm – 6 round trips during the day.

Fare Structure

Market driven but fixed for a period of one year, which allow premium pricing for journey time savings which would accrue for a ferry passenger but still be competitive with fares for alternative modes.

6. Premium fare of 15% for an Express Service which provides higher frequency; and
7. Stored value passes offering discounts of 20%

Vessel Type and Design

8. 50/100 seaters new Catamaran type vessel (as it provides for increased stability and passenger comfort), jet propulsion (appropriate for shallow draft and providing better riding comfort), and with an aluminum hull for increased robustness.

Key Messages (contd.)

Vessel Type and Design

9. For a preferred level of service of 15 minutes headway at peak hours, the vessel fleet requirement varies from 5 vessels on the Badore-Ijede route (due to short journey time) to 12 vessels on other longer routes.

Ferry Terminal Infrastructure

10. Marine Infrastructure – An average of two berths at each terminal for each route serviced by that terminal, assuming a turnaround time of 15 minutes per vessel. In the case of terminals servicing more than 1 route, the number of berths will increase proportionately; Provision for mooring bays and fueling dumps
11. Landside Infrastructure - Air Conditioned Passenger Concourse and Operations area with basic amenities, washrooms, concession stands, access to Wi-Fi
12. Ticketing Counters – including paper sale for tickets, discounted bulk purchase cards, and internet/automated payment mechanisms
13. All terminals with be disabled friendly, with adequate security and firefighting equipment
14. Inter-modal access: Terminals will have dedicated walkways to nearest Public Transport modes (such as bus stops, LRT stations), drop off zones, space for medium capacity shuttles and pay and ride facility
15. Non-farebox Revenue generation sources based on attractiveness at terminal locations.

Water Infrastructure

16. LASWA and MoWID will invest in augmentation of navigational aids, develop navigation charts and emergency response systems, vessel traffic management system and take effective measures to manage water pollution.

Ridership Estimates

Assuming a 15 minute headway during peak hours of operation and a 60 minute headway during off-peak hours serviced by a fleet of 100 seater capacity vessels, the passengers carried across the 11 routes in year 1 is 1,870,440 growing up to 3,725,040.

Options for Project Structure

At present, the MoWID/LASWA seems to have opted for a vertically separated service structure with waterside operations being licensed separately from landside terminal operations. We have evaluated both options as part of our financial analysis.

However, from a perspective of efficiency of operations and the extent to which passenger handling (and ticketing operations) at ferry terminals and turnaround time of vessels at terminals (including embarking/disembarking passengers) are codependent, integrating ferry terminal operations and waterside operations may provide greater reliability of service. This may also contribute to overall sustainability as waterside operators would not be required to pay ferry terminal operators for access to ferry terminals and the private partner would have a diversified revenue bases of farebox and non-farebox collections. This may also lower the overall risk profile of the project and may attract more private investment.

4.1 Background

4.1.1 Route Options based on Traffic Analysis

In Section 3, we identified 12 ferry routes to be taken up for consideration based on the factors described in Section 3.1.3. Additional routes in cases where ferry terminals have recently been redeveloped (Falomo) or have been concessioned (Ebute Ojo[55], Oworonshoki[56] and Mile 2[57]) and expected to be re-developed or in the process of redevelopment were also included.

As per subsequent discussions with LASWA, we were informed that two routes should be dropped:

- Liverpool – Igbo-Elejo (Snake island): Services on this route maybe provided on different terms and not operated as a commercial route; and
- Osborne – Ikorodu: The site for the ferry terminal at Osborne is under dispute and an alternative site has not yet been identified.

The team has been advised to evaluate the route Ebute Ero – Ikorodu instead.

Table 4-1 lists all 13 routes, including the ones that will be dropped, and the one that has been added for further evaluation.

Table 4-1: Route Options with Forecast of Daily Two-way Trips

S.No.	Routes	2018	2023	2028	2033	2037
1	Liverpool – Igbo-Elejo *(dropped)*	57,228	110,554	176,059	241,565	301,926
2	Marina – Liverpool – Ijegun Egba – Ebute Ojo	66,402	128,276	204,283	280,289	350,326
3	Liverpool – Falomo	42,976	83,022	132,214	181,406	226,735
4	Marina – Ikorodu	25,863	49,962	79,565	109,169	136,447
5	Falomo – Badore	22,717	43,884	69,886	95,888	119,848
6	Badore – Ideje	15,406	29,762	47,396	65,031	81,280
7	Osborne – Ikorodu *(dropped)*	3,956	7,642	12,170	16,698	20,870
8	Ikorodu – Falomo	9,831	18,992	30,245	41,499	51,868
9	Oworonshoki – Ikorodu	3,311	6,395	10,185	13,974	17,466
10	Marina – Oworonshoki	4,982	9,624	15,326	21,028	26,283
11	Mile 2 – Marina	11,442	22,105	35,202	48,299	60,368
12	Mile 2 – Falomo	2,349	4,537	7,225	9,914	12,391
13	Ebute Ero – Ikorodu *(added)*	5,246	10,135	16,140	22,145	27,2678

[55] Concession Agreement signed with M/s Sifax Shipping Company Limited for redevelopment of ferry terminal in November 2017, to exclusively develop, finance, operate and maintain for a period of 10 years (renewable for another 5 years).

[56] It is now the site for reclamation activities where larger ferry terminals will be developed, along with Epe, Badagry and Mile 2 (https://lagosstate.gov.ng/blog/2017/08/14/lagos-moves-to-transform-oworonshoki-to-transport-entertainment-hub/).

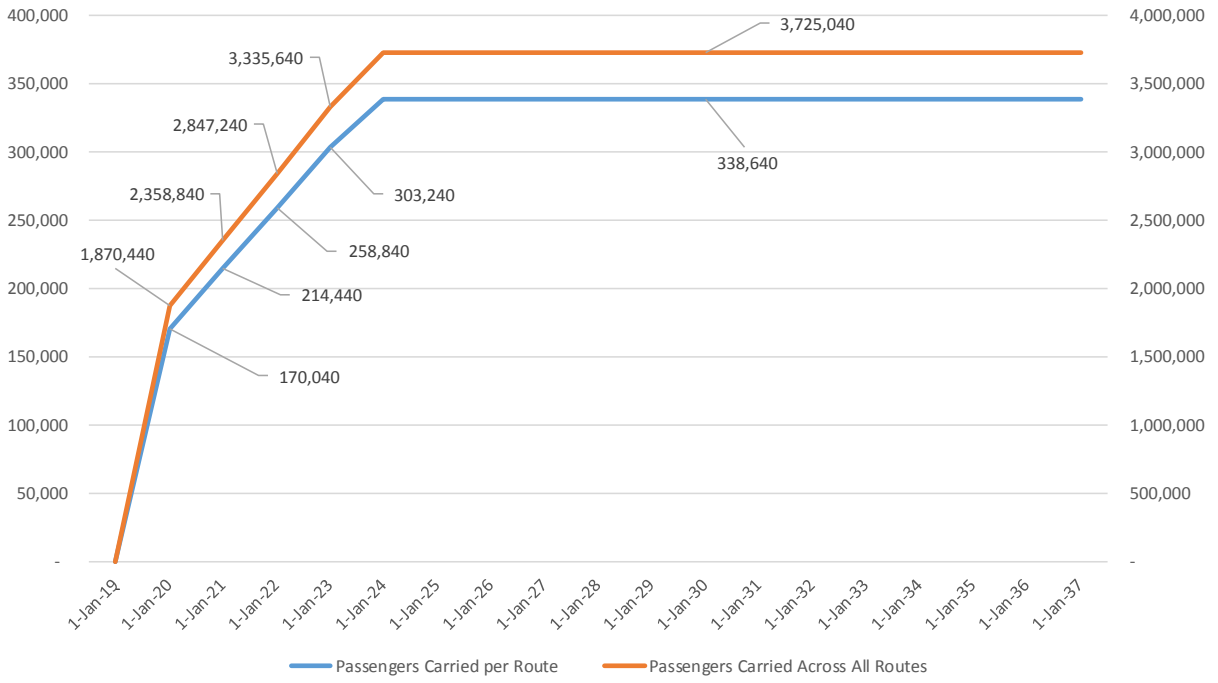
[57] Concession Agreement signed with Crownsworth Marines Development Company Limited, ferry terminal to be redeveloped, along with headquarters for Lagos Ferry Services Company (LFSC). This information was stated in the status report for LFSC. The Concession Agreement has so far not been shared with the CPCS team.

Section 5.2 provides evaluation of these routes based on a multi-criteria analysis.

4.2 Ridership Estimates

4.2.1 Annual Ridership Estimates

Figure 4-1: Ridership estimates



Assuming a 15 minute headway during peak hours of operation and a 60 minute headway during off-peak hours serviced by a fleet of 100 seater capacity vessels, the passengers carried across the 11 routes in year 1 is 1,870,440 growing up to 3,725,040. These are based on the capacity utilization and ramp-up assumptions listed in Table 4-2. The target headways and vessel capacity are the same across all routes. Thus, passengers carried are also the same across all routes. Further growth in ridership is possible only when more vessels are added to the fleet.

Table 4-2: Ramp up of capacity utlization

Operational Year	Peak Hour Departure Leg Capacity Utilization	Peak Hour Return Leg Capacity Utilization	Off-Peak Capacity Utilization (Departure and Return)
01-Jan-20	75%	20%	15%
01-Jan-21	80%	25%	20%
01-Jan-22	85%	30%	25%
01-Jan-23	90%	35%	30%
01-Jan-24 onward	90%	40%	30%

4.3 Route Selection and Prioritization

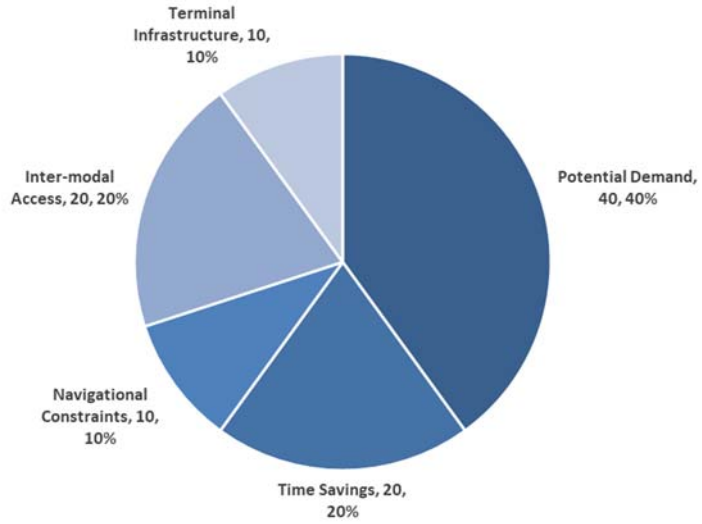
4.3.1 Route Selection Criteria

In cognizance of the fact that the Inland Water Transport (IWT) sector is still in its early development phase, we have proposed a phased approach (Phase I and Phase II). Phase I would focus efforts on a single route and act as a proof of concept for private involvement in the envisioned ferry network. Success in Phase I would allow for a broader network building approach, focusing on a number of routes. The experience of PSP in Phase I will provide insights into the market for ferry services, the institutional capacity to implement a multitude of such projects, and capacity of State agencies to procure, administer and afford multiple PSP contracts. All this would inform subsequent project design for the routes in Phase II (discussed below) once the concept is proven.

We initially used a multi-criteria analysis (discussed below) to identify/ prioritize routes, but settled instead on phasing the development based on their financial viability given the importance of PSP and financial self-sustainability.

The approach to the multi-criteria analysis involves selecting the preferred routes along rated dimensions which add up in score to 100 points (the detailed parameters and basis for scoring is provided in Appendix F).

Figure 4-2: Weightage of Evaluation Parameters for selection



The first three selection parameters are basic but critical eligibility threshold criteria and these account for 70% of the total score of 100. These are:

- Potential demand (relevant for making routes economically attractive);
- Time savings (value proposition for the ferry service and trigger for modal shift); and,
- Navigational constraints (operational constraints).

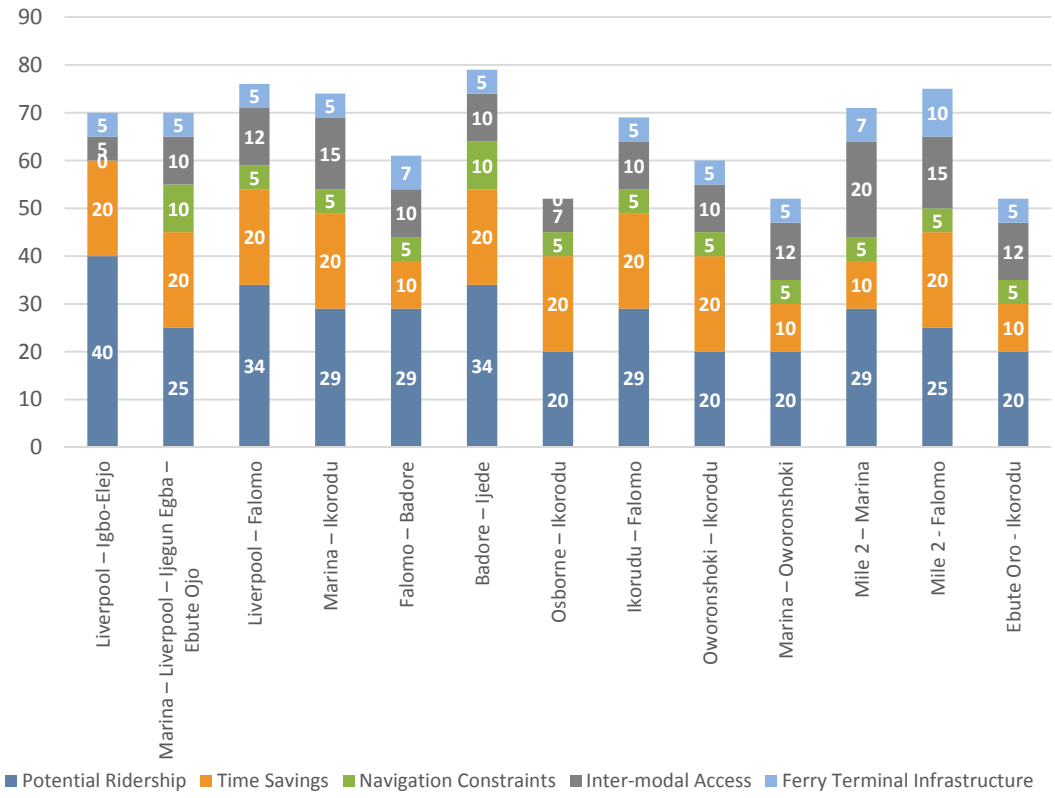
Only those routes which obtained an aggregate score of above 70% on these threshold criteria were considered for further evaluation on the following two parameters:

- Intermodal access (ease of access and influences journey experience for the passenger); and,
- Terminal infrastructure (investment required for and ease of operationalization of a route).

4.3.2 Route prioritization

The scores of all 13 routes are presented in Figure 4-3.

Figure 4-3: Route scores based on multi criteria analysis



The routes Liverpool – Igbo-Elejo and Osborne-Ikorodu were dropped as advised by LASWA.

The highest scoring route is Badore-Ijede. It also happens to be the only route with a positive farebox recovery ratio. As such, it is the chosen route for Phase I.

For Phase II, the following routes are recommended for implementation:

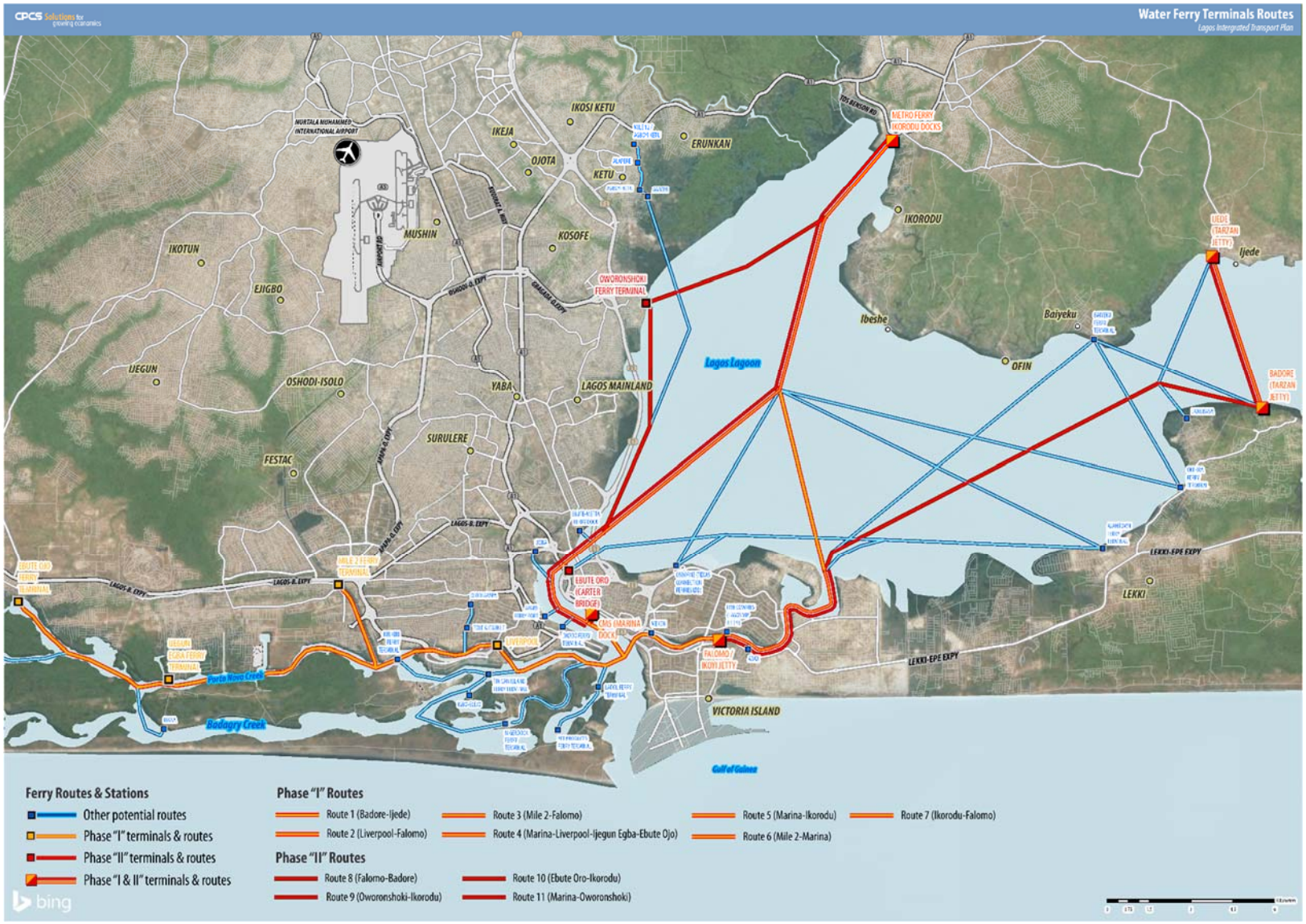
1. Falomo – Badore
2. Liverpool – Falomo
3. Marina – Liverpool – Ijegun Egba – Ebute Ojo

All remaining routes should be considered once the passenger ferry sector in the LMA significantly matures.

Figure 4-4 illustrates the selected routes. Of note, this priorization process using a set of multiple criteria is appropriate if LASG wishes to prioritize lines based on a balanced view of these

different factors. If PSP and financial self-sustainability is instead prioritized, the phasing proposed in Chapter 6 should be retained. It is our recommendation.

Figure 4-4: Map of Proposed Route



4.4 Service Design

The proposed passenger ferry network system is designed around providing commuter passenger services[58] between major demand centers and routes where travel time savings (as compared to other modes) are high. The STMP established that the current public transport system is overloaded, and that there is scope for Inland Water Transport (IWT) especially to capture some part of the high levels of demand for public transport.

At present, IWT in Lagos is to a certain extent unreliable with ferry schedules and fares susceptible to change without prior notice (in response to fluctuations in demand).

Select photos from the site visits to the proposed ferry terminal locations are presented in Figure 4-5.

[58] No specific proposals for tourist charters or transportation of cargo have been proposed.

Figure 4-5: Site Photos


Badore New Terminal


Badore Tarzan Jetty


Ebute Ero Landing site


Ebute Ojo Terminal


Falomo New Terminal


Ijede Jetty


Ijegun Egba

Ikorodu New Terminal


Liverpool landing


Marina/CMS


Mile 2


Falomo Old site

There is a need to introduce scheduled and efficient IWT services to help present the mode as a viable and reliable alternate means of public transport to Lagos' commuters.

We have focused our efforts on assessing the extent to which this demand can be captured taking into consideration the following supply side constraints:

- Technical/navigation constraints;
- Cost efficiency in determining the optimal size and capacity of the ferry vessels; and
- Level of service requirements.

These are summarised in Table 4-3.

Table 4-3: Supply side Considerations for Service Design

Navigation Constraints[59]	Cost Efficiency and Vessel Capacity	Level of Service requirements
▪ Environmental factors on hull design and type of engine – Quality of water, tidal waves, presence of water hyacinth, etc. ▪ Bridges and average depth of channel/near terminals – constraints of air draft restricting maximum height of vessels and size (length overall) ▪ Multiple uses of IW - Manoeuverability and line of sight of vessel and hence recommended speed ▪ Safety focus – conservative average safe speeds of 12 knots/hour or 22.2 kmph[60]	▪ Farebox not sufficient to cover O&M – restrict idle time of vessel or underutilization of capacity ▪ Operational and Capital costs increase exponentially for larger vessels – specifically with respect to fuel expenses and crew requirements ▪ Facilities at ferry terminals – Larger vessels/fleets require investment in larger berths/capacity and infrastructure to handle greater passenger flow at a time impacting turnaround times, thereby impacting operational schedule	▪ Higher frequency required during peak hours (7am-10am and 4.30pm-7.30pm) to service commuter traffic requires larger fleets ▪ Passenger flows towards commercial/residential centers mean significantly reduced utilization on return voyages during peak hours ▪ Reduced traffic during non-peak hours mean reduced vessel utilization (idle capacity) ▪ Journey Time savings essential value proposition for passengers to choose IWT over other road/rail based alternatives (which are cheaper) – route prioritization is key

The above considerations imply that there is a need to optimize vessel capacity and fleet size. These are discussed further in Section 5.4.2.

4.4.1 Level of Service

Following are the basic service parameters for routes recommended for Phase I:

[59] Further details in Appendix A

[60] This is the average cruising speed, while maximum speeds will be much higher close to 16/18 knots per hour, and the design speeds of vessel could be as high as 25/30 knots. But when computing 'economic' speeds to compute fuel consumption and average voyage time for ferry routes, we consider 12 knots/hour as a realistic (although conservative) estimate.

4.4.1.1 Targeted users

- Commuters with repeat journeys (work/education related trips): Since these are regular scheduled trips, they will require a reliable service schedule to be operated by the service provider to build trust in the service.
- At the same time, given the regularity of such trips, they will also result in a higher capacity utilization once patronage is built up.

4.4.1.2 Service frequency/schedule

- Peak hours: Express service which runs every 15 minutes during peak hours (7am-10am and 4.30pm-7.30pm) – 12 round trips every morning and evening.
- Non-peak hours: Regular service which runs every hour during 10am-4.30 pm – 6 round trips during the day.
- Days of Operation – all days except Sundays. The service has been designed as a commuter service to target traffic demand of the regular daily commute to work/education. Therefore, no operations on Sunday have been proposed, as the demand for services will be much lower. This is common for commuter ferry services across the world.

4.4.1.3 Interchange between routes

- Ferry Terminals at Falomo and Marina will serve as central hubs where passengers can connect to other routes.

4.4.2 Fare Structure

Fares can either be linked to distance travelled and/or structured that they compete with alternative modes of transport with comparable travel times.

We undertook a comparison of costs for alternative modes of transport and journey time savings which are presented in Appendix K. The time savings for using the ferry would on an average be around 46% across routes. The *Value of Time and Transport Elasticity Study for the Mega City Region*[61] lists the following elasticities of demand for public transport in the LMA:

- Long run time elasticity of demand – (-)0.57
- Long run fare elasticity of demand – (-)0.60
- Short run time elasticity of demand – (-)0.27
- Short run fare elasticity of demand – (-)0.30

Using a combination of the long run time and fare elasticities of demand, for each of the routes we have estimated the proportion of premium fare the passengers are willing to pay to benefit from the journey time savings on that route. On an average it has been estimated that ferry passengers would be willing to pay a premium fare of 40% above what they would expect to pay on a competing road based mode of transport.

[61] Value of Time and Transport Elasticity Study for the Mega City Region - Final Report, Leigh Fisher, May 2015

Table 4-4: Potential Base fares for routes

#	Routes	Journey Time using road transport	Journey Time using Ferry incl. transfers	Travel Time Savings		Demand Increase	Potential Fare Increase	Cost of Alternative Mode	Potential base price for ferry Service
		minutes	minutes	min.	%	%	%	Naira	Naira
1	Liverpool – Igbo-Elejo	46[62]	23	23	50%	28%	47%	600	884
2	Marina – Liverpool – Ijegun Egba – Ebute Ojo		87						
2.1	Marina – Liverpool	101	35	66	66%	37%	62%	800	1300
2.2	Liverpool – Ijegun Egba	116	49	67	57%	33%	54%	450	695
2.3	Ijegun Egba – Ebute Ojo	81	33	48	60%	34%	57%	400	627
3	Liverpool – Falomo	88	40	48	55%	31%	52%	700	1063
4	Marina – Ikorodu	157	76	81	52%	29%	49%	250	1044
5	Falomo – Badore	120	79	41	34%	19%	32%	650	860
6	Badore – Ijede	164	31	133	81%	46%	77%	1050	1,862
7	Osborne – Ikorodu	141	62	79	56%	32%	53%	300	459
8	Ikorodu – Falomo	161	76	85	53%	30%	50%	300	451
9	Oworonshoki – Ikorodu	85	44	41	48%	27%	46%	250	364
10	Marina – Oworonshoki	51	51	0	-1%	-1%	-1%	150	149
11	Mile 2 – Marina	78	56	22	29%	16%	27%	200	255
12	Mile 2 – Falomo	125	61	64	51%	29%	49%	400	595
13	Ebute Ero – Ikorodu	70	65	5	7%	4%	7%	250	267
				Average	47%		44%		

Source: CPCS analysis

Detailed results are in Appendix G.

We further recommend:

- Premium fare of 15% for an Express Service which provides higher frequency; and
- Discount of 20% on advance bulk purchase when passengers buy stored value passes which offer them 30 ferry trips to be used within 2 months from date of purchase.

[62] Igbo Elojo is on Snake Island. Journey time includes 35 minutes travelled by road transport and 11 minutes by ferry.

4.5 Choice of Vessel Type, Capacity and Fleet Size

4.5.1 Vessel Type

Based on the factors listed in Table 4-5, we have determined the ferry type most conducive for plying on the water channels in Lagos is a Catamaran, as it provides for increased stability and passenger comfort, jet propulsion (appropriate for shallow draft and providing better riding comfort), and with an aluminum hull for increased robustness.

Table 4-5: Considerations for Vessel Type

Factors	Considerations
Navigation Consideration[63] within area of operation: ▪ Physical condition of navigational route ▪ Depth of water of the navigational areas ▪ Berthing depth at proposed terminals ▪ Natural condition of the target navigational waters like the effects of the tides, currents, conditions of the rivers waters at certain times ▪ Height of Bridges	▪ Navigable depth: Varies between 1 - 4 meters. After completion of dredging the design navigable depth is expected to be 4 meters ▪ Air draft: 1.5 meters after considering seasonal variations in water depth and height of bridges ▪ Water Hyacinth and Pollution: Recurrent growth of water hyacinth and solid waste disposed off on water channels. LASEPA needs to address this through periodic cleaning and regular monitoring. ▪ Fish traps: These are present across the lagoon and frequently change location. The navigation zones need to be clearly marked on navigation charts. ▪ Other traffic: Barges transporting timber/wood, cargo vessels headed for ports and smaller canoes. While the cargo vessels can be brought under the traffic management system, exclusion zones must be marked for smaller canoes. ▪ Submerged wrecks and water bed features: These need to be clearly marked on navigation charts.
Technical Requirements ▪ Hull Type ▪ Propulsion ▪ Construction Material of Hull ▪ Engine	▪ Choice between Monohull, Catamaran and Trimaran ▪ Choice between Conventional Screw, Outboard screw and Jet Drive ▪ Choice between Aluminum or Fibre Glass ▪ Aim fuel efficiency and reduced emissions
Operational Requirements ▪ Manpower ▪ Speed ▪ Fuel Consumption, Operation and Maintenance ▪ Several curves in the navigation channel	▪ Easy availability or easy to train manpower ▪ Achieve desired average cruise speed of 12 knots; design speed of 16 knots or higher ▪ Economical to operate in terms of fuel consumption, spares and maintenance ▪ High stability during manoeuver
Riding Comfort ▪ Desirable interior appointments and features ▪ Convenience of the boarding and disembarkation of the passenger	▪ Enclosed, to provide protection against weather, foul odours and splashes of water during operation of vessel ▪ Air-conditioned ▪ Easy and safe boarding and disembarkation ▪ Passenger amenities such as WiFi, Washrooms ▪ Concession stands

[63] A more detailed table is presented in Appendix B.

Factors	Considerations
Navigational Aids	▪ Two radars onboard; the vessel Master is required to have a radar observer license endorsement ▪ Global Positioning Satellite, Automatic Identification System ▪ Electronic charting navigation systems installed and used to assist navigation ▪ Forward looking infrared (FLIR) cameras on board each high speed ferry

The purpose of recommending advanced multihull forms for commercial use has consistently been to provide faster and/or more comfortable vessels to carry passengers. Table 4-6 comparison of different hull configurations on various parameters such as Stability, Manoeuverability, Space, Maintenance, Cost, etc.

Table 4-6: Comparison of Various Vessel Hull Design Options

S.No.	Particular	Mono	Catamaran	Trimaran	Remarks
1	Propulsion Type	Conventional Screw Outboard Screw Jet Drive	Conventional Screw Outboard Screw Jet Drive	Conventional Screw Outboard Screw Jet Drive	No difference
2	Embarkation and Disembarkation Difficulties/ procedures	Design to withstand load but only within the center has a poor handling of shifting of weight.	Design to have good stability but found to have poor handling of shifting of weight, the reason why trimaran was developed	Design for transverse stability and good handling of shifting of weight because center serves as a lever.	Trimaran and Catamaran are preferable over Mono.
3	Passenger Space	Lesser space affected at forward limits because of hull shape option.	Better space because of wider beam and even affected at forward limits of hull shape option.	Best space because has wide beam and forward limit is not problem because of hull shape option.	Trimaran and Catamaran are preferable over Mono.
4	Stability	Design to withstand load but only within the center has a poor handling of shifting of weight.	Design to have good stability but found out lately for a poor handling of shifting of weight, the reason why trimaran was discovered.	Design for transverse stability and good handling of shifting of weight because center serves as a lever.	Trimaran and Catamaran are preferable over Mono.
5	Maneuverability	Better and can be driven for an all type of propulsion drive.	Good but no option but to be driven for (2) propulsion drive because of its hull.	Better and has option but to be driven for (3) propulsion drive because of its hull. (Can handle better sea class in terms of situational problems due to more drive)	Trimaran and Catamaran are preferable over Mono.
6	Maintenance	Lesser cost for lesser painted area of hull.	More cost for more painted area of hull.	Higher cost for bigger painted area of hull.	Cost of maintaining a Mono would be lesser than

S.No.	Particular	Mono	Catamaran	Trimaran	Remarks
					that of a Catamaran and Trimaran.
7	Cost	Lesser cost for lesser frames/plating area of hull.	More cost for more frames/plating area of hull.	Bigger cost for bigger frames/plating area of hull.	Cost of constructing a Mono would be lesser than that of a Catamaran and Trimaran.

While we have used the cost and operational parameters for costing purpose of the project, the potential bidders maybe the given the choice of the type of vessel they would like to put in service as long as it meets defined performance parameters and requirements.

4.5.2 Vessel Capacity and Fleet Size

An important consideration for the fleet deployment is the operation of a standard type of ferry to allow interchangeability between service routes, and cost efficiencies in holding standard spare parts, fuel and lube oils. A standard ferry type will also ensure that all crews can, swap between ferries and services, an important consideration when operating a fleet of highly specialized fast passenger ferries with that require crew training and switching between assigned routes.

While recommendations for vessel capacity and fleet size may differ by route based on traffic and technical factors, in the event that more than one routes are packaged to provide economies of scale to a single operator, the same vessel capacity can be considered for those routes. This will allow for greater operational efficiency and potentially lower acquisition price of the vessel due to the ticket size of the order of a higher number of vessels. There are global examples of ferry operators using a standard design/capacity for their fleet:

- Langkawi Ferry Services operates a fleet of 12 high speed ferries of a standard design operating daily between Langkawi, Kuala Kedah, Kuala Perlis, Penang, Puala Payar Marine Park and Satun (Thailand);
- Batam Fast Ferry Ltd operates a fleet of 15 high speed ferries of a standard design from Singapore to / from Batam Centre, Sekupang, NongsaPura in Pulau Indonesia; and
- Macau Turbo jet Ferries operates a total fleet of 42 high speed ferries split between very high speed hydro foil ferries and high speed multihull designs between Hong Kong airport, Hong Kong city Macau and Chinese terminals in the Pearl River Delta.

The key determinants of optimal fleet capacity and number include:

I. Route distance (the determined navigation distance between two ferry terminals);

II. Vessel speed (average safe speeds of 12 knots per hour or 22.2kmph);

III. Demand capture[64] based on service frequency (during peak and non-peak hours to create capacity to address serviceable demand) and utilization of capacity (during return voyages and idle capacity at non-peak hours);

IV. Interdependent demand on port infrastructure in terms of berth and terminal capacity;

V. Navigation constraints, such as air draft (due to height of bridges) and depth near ferry terminals, which may render ferry sizes above a certain threshold technically unviable;

VI. Operational cost (primarily fuel consumption which can account for as much as 50% and manpower which can be as high as 35% of total operational costs); and,

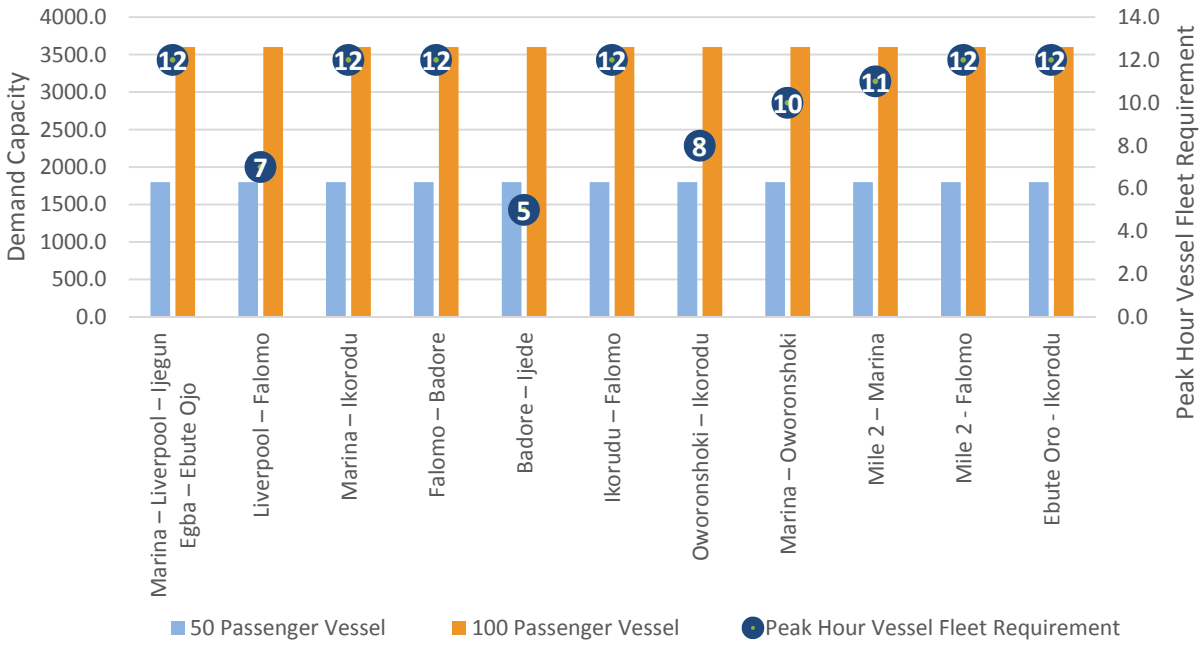
VII. Capital cost (this can range from USD 0.5 million for a 50-seater vessel to USD 8 million for a 200 seater capacity vessel and can vary greatly based on technical specifications).

Based on the top 4 factors, we evaluated options for 50-seater, 100-seater, 150-seater and 200-seater vessels. The navigational constraints and requirements for creating berth capacity make the options for vessels larger than 100 seats less attractive.

Figure 4-6 and Figure 4-7 present our analysis for operating 50-seater and 100-seater vessels for the following two strategy options:

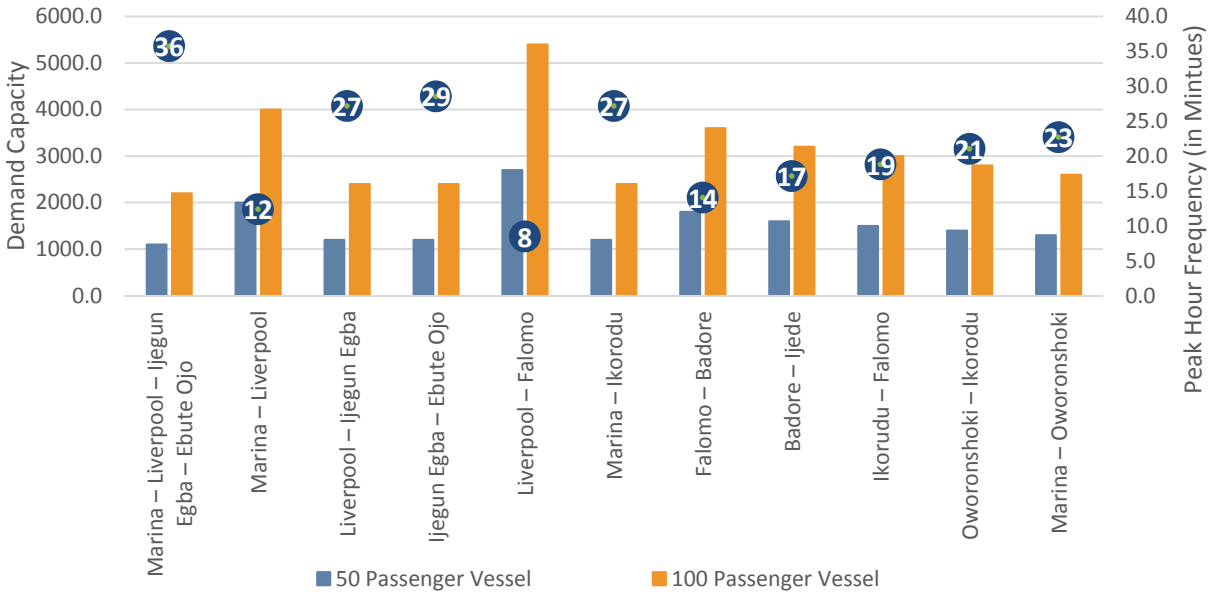
- Deploying vessel fleet required to operate peak hour services at 15 minute frequency/headway; and
- Frequency achieved with a standard fleet size of 8 vessels.

Figure 4-6: Daily Demand Capacity / Fleet Requirement per route (15 minute frequency during peak hour)



[64] We have assumed 80% on onward and 20% on return voyage. Distribution of traffic is 80% during peak hours and 20% during non-peak hours.

Figure 4-7: Daily Demand Capacity / Peak Hour Frequency (8 Vessel Fleet per Route)



For a preferred level of service of 15 minutes headway at peak hours, the vessel fleet requirement varies from 5 vessels on the Badore-Ijede route (due to short journey time) to 12 vessels on other longer routes. The total demand capture across all routes at peak and off-peak hours is an estimated 9% for 50-seater vessel, 19% for 100-seater vessel, 28% for 150-seater vessel and 38% for 200-seater vessel.

In addition to vessels in operation, there is a need to have spare vessels, usually 10%-20% of total fleet size. This requirement would likely not apply during Phase I, but rather during the more aggressive network expansion.

Additions to vessel fleet could be linked to time (new vessels purchased in certain years based on projected demand) or achievement of capacity utilization thresholds (typically 85% based on realised demand), with a period of ramping up provided for the private partner to establish operations. For example, at the commencement of operations for a wider network, a fleet of 8 vessels maybe mandated as the minimum, increasing to a number adequate to provide a frequency of 15 minutes at peak hour by year 3.

Related to fleet size is the decision of whether to outsource maintenance to existing dockyards or for the private partner to have a captive dockyard for this purpose. The latter may increase initial capital cost but may prove to be operationally more cost effective in the medium to long term with the added benefit of greater control and monitoring.

4.5.3 Preliminary Cost

Table 4-7 lists the illustrative costs for vessels of different capacity:

Table 4-7: Illustrative Unit Cost for Waterside Operations

Ferry Specification Option	Description	Unit	50 seats	100 seats
Option One	Vessel Cost (Fast Ferry Aluminium Hull Catamaran) – Brand New	USD million/vessel	4.5	5
	Fuel Consumption (Marine Grade at 12 knots/hr)	ltrs/km	2.5	3
Option Two	Vessel Cost (Steel Displacement MonoHull) – Brand New	USD million/vessel	0.75	1.2
	Fuel Consumption (Marine Grade at 12 knots/hr)	ltrs/km	1.3	1.5
Option Three	Vessel Cost (Fast Ferry Aluminium Hull Catamaran) – Second Hand	USD million	2.0	3
	Fuel Consumption (Marine Grade at 12 knots/hr)	ltrs/km	2.5	3

Source: CPCS Estimate based on Industry Research

Table 4-8: Illustrarive Crew and Other Costs or Waterside Operations

	Unit	50 seats	100 seats
Manpower[65] (Two Crew Supplement[66] per Vessel)	USD per annum/ Crew supplement	USD 60,000	USD 72,000
Captain	12,000	1	1
Deputy Captain	10,000	1	1
Engineer	5,000	1	1
Deck hand	3,000	1	3
Others Miscellaneous Items (Lubricants, Spares, Maintenance, Insurance, Certifications)	% of Op.Ex.	15%	15%

Source: CPCS Estimate based on Industry Research

4.6 Terminal Infrastructure

4.6.1 Marine Infrastructure

A frequency of 15 minutes during peak-hours implies the need for an average of two berths at each terminal for each route serviced by that terminal, assuming a turnaround time of 15 minutes per vessel. In the case of terminals servicing more than 1 route, the number of berths will increase proportionately. For example, at Falomo which services four routes proposed for Phase I, the number of berths required will be 8 (2 per route).

The minimum infrastructure requirements with respect to berths are listed below.

[65] Manning levels are defined by national regulations which are issued by NIMASA. We have requested for a copy of the relevant regulations. In the interim, we have assumed manning levels as per industry benchmarks.
[66] Each vessel will require two crew supplements as the total operating hours will be more than 8 hours. In addition, a buffer of 15% will be accounted for to provide for contingencies.

4.6.1.1 Berthing Structure

- Fixed berthing structure on-piles or Pier-type berthing depending on specific terminal locations;
- Manually operated gangway of with a minimum width of 1.2 meters[67] and railings for embarking/disembarking;
- Rubber fenders (5 units) for berthing procedure; and
- Mooring bitts at both ends of the structure

4.6.1.2 Walkway to Berthing Structure

- 4-meter width for causeway area for 2-way lane for arriving and departing passengers;
- 2.5-meter width for trestle area for 1-way lane only for arriving passengers;
- Steel railings for trestle; and
- Canopy cover for trestle and causeway areas

4.6.1.3 Mooring Bays

- We recommend that mooring bays be created where ferry vessels will be moored at the respective terminus overnight. These would be harboured on a floating pontoons such as those shown in Figure 4-8.

Figure 4-8: Mooring Bays

4.6.1.4 Fuel Dumps

To be created at all ferry terminals to facilitate quick turnaround of vessels, with IMO fueling protocols to be followed for the activity.

4.6.2 Landside Infrastructure

Landside infrastructure is divided into two: (i) essential infrastructure for passenger handling (would be accessible to only valid ticket holders), and (ii) additional commercial area (would be open as a public space to general public) to enable generation of non-farebox revenue for the private partner.

4.6.2.1 Essential Passenger Amenities

The following basic amenities are proposed to be provided for the passengers at the ferry terminals:

- Air conditioned seating area for passengers;
- Alighting and boarding passages, clearly demarcated;
- Washrooms;
- LED TV– displaying schedule and fare information, broadcasting ferry arrival and departure status and seat availability;

[67] For a 50 seater vessel; will be scaled for larger vessels.

- First-aid box and toolkit;
- Access to free WiFi;
- Snack bar (to provide value added services to passengers and serve as an additional source of revenue);
- ATM machines (to provide value added services to passengers and serve as an additional source of revenue);

4.6.2.2 Sizing for Passenger Concourse

In order to estimate passenger handling areas, we recommend that standards such as the Terminal Design Manual published by Washington State Department of Transportation for Ferries[68] be followed which allows a seated area provided is 13 ft2 / pax or 1.20 square meter/person, standing area is 8.5 ft2/pax (0.80 m2/pax).

The Manual prescribes the following formula to compute size, based on passenger traffic:

For the departing passengers' area (DPA):	For arriving passengers' area (APA):
DPA = N x LSC x A1 x PF x FDP	APA = N x LSC x A2 x PF x FAP
Where:	Where:
N = number of berths	N = number of berths
LSC = estimated departing passengers per vessel	LSC = estimated departing passengers per vessel
A1 = factor of area per person, 1.5 sqm.	A2 = factor of area per person, 0.6 sqm.
PF = peak factor, 1.25	PF = peak factor, 1.25
FDP = factor for departing passengers, 1.0	FAP = factor for arriving passengers, 0.3

Source: Washington State Department of Transportation

The area for management, operation, equipment and other utilities, is assumed to be twice that of the passenger area.

Based on the use of a 50-seater vessel, Table 4-9 provides the estimated terminal sizes.

[68] Terminal Design Manual for Ferries by Washington State Department of Transportation Division 400 - Terminal Building, Chapter 410 - Circulation and Passenger Waiting, 7-Calculate Net Passenger Waiting (p 410-11)

Table 4-9: Estimated Terminal Sizes (Based on 100-Seater Vessels)

Name of Ferry Station (Phase I)	Number of Berths	Departure Area (m^2)	Arrival Area (m^2)	Total Passenger area (m^2)	Additional Operations Area	Total Area[69] (m^2)	Current Space available (m^2)	Additional Space Required (m^2)
Falomo	8	1200	36	1236	2472	3708	2,939	769
Marina	6	900	27	927	1854	2781	No information	16,000
Badore	4	600	18	618	1236	1854	21,100	0
Ikorodu	4	600	18	618	1236	1854	19,300	0
Mile 2	4	600	18	618	1236	1854	No information	-
Oworonshoki	4	600	18	618	1236	1854	1,691	12,309
Ijede	2	300	9	309	618	927	No information	10,200
Liverpool	2	300	9	309	618	927	No information	10,200
Ijegun Egba	2	300	9	309	618	927	2,745	7,455
Ebute Ojo	2	300	9	309	618	927	1,719	-
Ebute Ero	2	300	9	309	618	927	1,643	8,557

4.6.2.3 Security Detail at Ferry Terminals

All ferry terminals shall be equipped with a minimum level of security equipment; fire-fighting equipment; CCTV cameras; cyclone fence around back-up area with gates; guardhouse for guard-on-duty; and yard lighting.

4.6.2.4 Access for Persons with Disablities

We would recommend that all terminals be designed as disabled friendly spaces with ramps, signage, adequately wide corridors, and turnabout spaces for wheelchairs.

4.6.3 Ticketing

Options for fare collection systems include:

- **Pay as you enter.** In this system, passengers are issued a ticket by an employee while boarding the vessel. The advantages of this system include simplicity of operations, and simple terminal design.
- **Barrier system.** This is a common system for subways and many ferry operations. Fares are collected at a designated point inside the terminal and away from the vessel. This could include staffed ticket booth and/or ticket machines. The advantages of this system include very fast passenger boarding on the vessel (since the fare control queuing occurs outside the boarding apron), good revenue control through a barrier system, and control

[69] The Terminals of Falomo, Badore and Ikorodu have already been redeveloped. The terminals of Mile 2 and Ebute Ojo have already been contracted to be redeveloped under a concession agreement. Based on information available, we will conduct a gap analysis for these and factor in the remaining investment required for addressing these requirements. This will be provided in the Draft Report.

of passenger capacity (since the gates can count passengers per sailing and lock them when the limit is reached). The primary disadvantage if the high capital cost of equipment.

- **An automated ticketing system** will provide efficiencies in the throughput of passengers at the fare turnstile. To achieve the desired outcomes, a ticketing system utilizing contactless smart cards, similar to the Octopus card in Hong Kong and the EZ-Link card in Singapore is recommended.

We would recommend a barrier system with a combination of the following:

- Staffed ticket booths to issue single journey tickets and stored value passes;
- Ticket vending machines to issue single journey and renew/refill stored value passes;
- Option of smart cards, with potential linkage to an Automatic Fare Collection System (AFCS)[70]; and
- Online booking through website.

At all terminals, turnstiles should be installed to ensure that accurate passenger counts can be made for the crew's reporting requirements.

4.6.4 Intermodal Access

Intermodal connectivity is a key element in the design of the ferry system network, as cumbersome transitions to last mile transfers can detract from journey time savings accrued due to the ferry and also add to overall trip cost. The current and proposed options for facilitating passenger transfers at each of the ferry terminals is summarized in Table 4-10.

Table 4-10: Intermodal Access at Ferry Station

Station	Existing PT Options	Quality of Access Road/ Car Park	Proposed Additions to Existing Options
Falomo (new Developed Terminal)	▪ Falomo Bus stop is at a distance of 200 meters	▪ Alfred Rewane / Akin Adesola express way and Awolowo road (Dual carriageway roads and are in good condition) ▪ Car park – capacity yet to be ascertained	▪ Covered Walkway to the bus stop
Marina	▪ CMS Bus Station is at a distance of 300 meters ▪ Nearest LRT Station (distance of xx meters)?	▪ Access by road is via Marina road through Eko bridge or from Ikoyi on the opposite side	▪ As per LAMATA's study on Public Transport Interchanges[71], A covered walk way system has been designed to allow passengers have access to the ferry

[70] This may be considered in future for all PT modes within LMA.
[71] The study has identified 4 interchange stations including Mile 2 and MARINA.

Station	Existing PT Options	Quality of Access Road/ Car Park	Proposed Additions to Existing Options
		▪ Car park – capacity yet to be ascertained ▪	terminal area and also link the commercial area of the interchange. The other modes include Blue Line LRT and Red Line LRT, BRT and Mini buses.
Badore (East) – (Existing operational terminal operated by Tarzan Ferry)	▪ Informal means such as motorcylces and tricycles ▪ Badore bus stop no. 3 is at a distance of 850 meters	▪ Access to the site by road is clear, on Catholic Mission Street, off Badore road in Ajah. This is a dilapidated condition and needs recarpeting. (estimated length of 0.8 kms) ▪ Car Park with about 50 bays on grass lawn, not surfaced	▪ Shuttle service to Lekki Expressway
Badore (new terminal which is not operational)	▪ Badore Bus stop no. 5 (distance of about 50 meters)	▪ Direct Access through Badore Road ▪ Car Park with about 300 bays	▪ Shuttle service to Lekki Expressway
Ikorodu (new terminal)	▪ Ebute junction Bus stop (distance of about 250 meters)?	▪ Name of road (quality /condition) ▪ Car Park with 200 bays	▪ Covered Walkway to bus stop ▪
Mile 2	▪ Mile 2 Bus Stop is at a distance of 500 meters	▪ Bordering the Mile 2 station is the Apapa Oworonshoki/Lagos Badagry cloverleaf and the Masa bridge. Access to the Ferry station and the proposed bus terminus is limited when heading westbound on Lagos Badagry expressway, especially for public transport buses.	▪ As per LAMATA's study on Public Transport Interchanges[72], an access road is proposed to improve the efficiency of the interchange especially for public transport users and will provide connectivity to: ▪ BRT from Okokomaiko to CMS ▪ LRT Blue Line from Okokomaiko to Marina ▪ Feeder bus park proposed by LAMATA
Ijede	▪ Ijede bus stop (distance of 900 meters)	▪ Car Park with 50 bays, unsurfaced	▪ Shuttle service to bus stop and nearest LRT station

[72] The study has identified 4 interchange stations including Mile 2 and MARINA.

Station	Existing PT Options	Quality of Access Road/ Car Park	Proposed Additions to Existing Options
Liverpool	▪ Liverpool Bus Stop is at a distance of 150 meters	▪ Direct link road from Liverpool ferry terminal to Apapa port complex, Boundary, etc. ▪ Car Park with 30 bays	▪ Shuttle service to bus stop and nearest LRT station
Ijegun Egba	▪ Trade fair bus stop (distance of 200 meters)	▪ Access by road to it is from the Festac / Trade Fair Complex area and from Lagos – Badagry expressway ▪ Car Park with 40 bays	▪ Shuttle service to bus stop and nearest LRT station
Ebute Ojo (redeveloped terminal)	▪ Iyana Iba (distance of about 400 meters)	▪ Direct road link from the terminal to Iyana Iba down to Volkswagen Company and Alaba International Market ▪ Road from the facility at Iyana Iba also directly links Lagos – Badagry expressway ▪ Car Park with 40 bays	▪ Shuttle service to bus stop and nearest LRT station
Ebute Ero	▪ Ebute Ero bus stop (distance of about 300 meters)	▪ Dual carriageway access road from Ebute Ero community that links Marina ▪ Third Mainland Bridge and Obalende area are on the opposite side of the Ebute Ero link road to the ferry terminal ▪ Ebute Ero motor park available only about 300 meters away on the opposite side of the expressway	▪ Shuttle service to bus stop and nearest LRT station

It is proposed that intermodal connectivity between ferry terminals and the different modes of public transport should be enhanced by the provision of covered walkways or shuttle services between the terminals and nearest public transit nodes as the case maybe. The shuttle services can maybe done by medium capacity buses on specified routes to and from the ferry terminals.

4.6.5 Commercial Development options at Ferry Terminals

We recommend creation of additional space at ferry terminals to include open public spaces and commercial areas which will supplement farebox revenue. These may take one or more of the following forms and the specifics will differ based on the location of the ferry terminal.

- Open public spaces for cultural activities;
- Entertainment hubs such as cafes/restaurants;
- Advertising (billboards);
- Commercial/retail space where possible; and
- Naming rights for terminals.

These additional commercial developments are important as globally farebox revenue is generally not sufficient to cover the operational cost of ferry operators.

4.7 Water Infrastructure

In addition to waterside operations and terminal infrastructure, there is other shared infrastructure which are essential for the safe and efficient IWT operations, and should be under the jurisdiction of LASWA and/or MoWID. Their installation and O&M maybe outsourced under service level agreements or contracted to third parties. These are described below.

4.7.1 Vessel Traffic Management System (VTMS)

Traffic management services allow waterway authorities to facilitate safe navigation, to optimize the use of waterway infrastructure, respond to emergencies and to protect the environment. This includes local traffic management at Vessel Traffic Service (VTS) centers, navigational support (with vessel tracking), and lock and bridge management. The purpose of a Vessel Traffic Service (VTS) is to provide active monitoring and navigational advice for vessels in particularly confined and busy waterways. They encompass a wide range of techniques and capabilities aimed at preventing vessel collisions, ramming, and grounding in inland waterway navigation. They are also designed to expedite vessel movements, increase transportation system efficiency, and improve all-weather operating capability.

The VTS centre is established under the monitoring of a government body (in this case LASWA), and can also be used to provide direct communication to the supporting operational authorities such as NIMASA or the Nigerian Navy that can respond to emergencies and security threats. Such emergencies would be evaluated in the first instance by the VTS management and relayed for support to the appropriate operational authority to respond to either a vessel collision or accident, oil pollution spill, security threat involving craft on the river or any such occurrence which would threaten safety and security on the IW.

The cost for setting up of a Vessel Traffic Management System (VTMS) would vary depending on technology adopted and supplier, may range from USD 350,000 to USD 1 million. The cost also varies with the area of IW to be covered. We recommend that the need for such aids be studied in greater detail.

4.7.2 Channel management

4.7.2.1 Navigational aids

For the safe navigation of the fast passenger ferries on Lagos IWs, the need is to have operational open water navigation aids installed/maintained and jetty/bridge lights. The MoWID already has a plan to install buoys on major routes. A more comprehensive indicative list of navigation aids is presented in Appendix I.

In addition, navigation charts need to be prepared for all commercial routes.

The cost of the above (aids and charting) varies with the area of IW to be covered and could be upwards of USD 500,000 for marking navigation routes in IWs in the main lagoon areas traversing Lagos state. We recommend that the need for such aids be studied in greater detail.

4.7.2.2 Maintenance and Monitoring of Navigable Depth

MoWID has in place a plan to dredge 15 commercial routes to an average depth of 4 meters. These need to be extended for all commercial routes. In addition, periodic hydrographic surveys need to be undertaken and navigation charts updated as per findings.

4.7.2.3 Pollution Control and Water Quality Monitoring

Lagos State Environmental Protection Agency needs to take a pro-active role in curbing the problem of solid water pollution and seasonal water hyacinth. They may consider the use of skimmer boats for this purpose. We recommend that the need for such aids be studied in greater detail.

4.7.2.4 Emergency Rescue and Response

We understand that the Lagos State Emergency Management Agency (LASEMA) is preparing an Emergency & Rescue Services Programme to handle emergency situations. This can be well-supplemented by the VTMS (as recommended in Section 4.7.1above).

4.7.3 Capacity Building and Manpower

The majority of persons associated with the informal boat operations (off deck and deck activities) are not adequately educated and/or certified. While NIMASA prescribes manning requirements, as per IMO guidelines, and is a certification body, there is an urgent need for investment in capacity building and training of manpower to play various roles including boat captains, deck hands, engine officers, traffic management personnel, etc. This needs to be studied in further detail and infrastructure created to facilitate the same.

5 Conceptual Design of Ferry Terminals

5.1 Layouts

As per the design and requirements determined in Section 5.5, we prepared conceptual layouts for ferry terminals with two configurations for marine infrastructure to serve 100 seater capacity vessels:[73]

1. A terminals which has 6 berths and associated passenger concourse on ground floor of the terminal to service expected traffic.
2. A terminals which has 2 berths and associated passenger concourse on ground floor of the terminal to service expected traffic.

The commercial area is envisaged on the second floor of the terminal. The configuration can be scaled to suit the requirements of larger or smaller terminals.

The drawings are appended in Appendix K.

5.2 Consolidated Cost Estimates

5.2.1 Ferry Terminal Capital Expenditures

Upfront capital expenditures to develop the ferry terminals are presented in Table 5-1.

Table 5-1: Ferry Terminal Capital Expenditure Estimate (USD 000)

Terminal	Passenger Area	Commercial Area	Marine Infrastructure	Site Preparation, Road/Pedestrian Access, Civil Works and Lighting	Total
Falomo	Already Developed/Concessioned				
Marina	975	1,564	1,633	605	4,777
Badore	376	683	979	586	2,624
Ikorodu	376	683	979	586	2,624
Mile 2	Already Developed/Concessioned				
Oworonshoki	376	683	979	586	2,624
Ijede	376	683	653	488	2,200
Liverpool	376	683	653	488	2,200
Ijegun Egba	376	683	653	488	2,200
Ebute Ojo	Already Developed/Concessioned				
Ebute Oro	Already Developed/Concessioned				

Source: CPCS Estimate

[73] Adopting a long term outlook for ferry ridership

5.2.2 Land Acquisition Costs

Certain terminals will require land acquisition. Land area requirements and acquisition costs are summarized in the table below.

Table 5-2: Land Acquistion Costs (USD 000)

Terminal	Land to be Acquired (Ha)	Acquisition Cost per Ha (Naira 000 000)	Total Land Acquisition Cost (Naira 000 000)	Total Land Acquisition Cost (USD 000)[1]
Falomo	0.00	4,000	0	0
Marina	1.60	4,250	6,800	18,889
Badore	0.00	250	0	0
Ikorodu	0.00	350	0	0
Mile 2	0.00	175	0	0
Oworonshoki	1.23	675	831	2,308
Ijede	1.02	70	71	198
Liverpool	1.02	1,025	1,046	2,904
Ijegun Egba	0.75	1.25	1	3
Ebute Ojo	0.00	900.00	0	0
Ebute Oro	0.86	3,100.00	2,653	7,369

1. Assuming a 360 Naira/USD exchange rate
Source: CPCS Estimate

5.2.3 Ferry Terminal Operating Expenditures

Staff Costs

The breakdown of staff requirements per terminal and related costs are presented in the table below. Total terminal staff costs are estimated at USD48K per annum (2018 dollars).

Table 5-3: Ferry Terminal Staffing Expenditures (USD 000)

Staff per Terminal	Roles and Responsibilities	Staff Requirement	Indicative Annual Cost per Staff
Terminal Manager	Overall in-charge of Terminal. Supervision and Monitoring of terminal operations and staff. Grievance redressal.	1	12
Leasing Officer	In charge of managing lease areas for ticket sales, commercial activities, etc.	1	10
Passenger facilitation and traffic coordinator	In charge of passenger assistance and coordinating docking and scheduling with ferries	1	8
Terminal Support Staff	Mooring and unmooring of the ferries. Cleaning and maintenance of the terminal	2	5
Security Guard	Ensure safety and security at the terminal	2	4

Source: CPCS Estimate based on review of private proposals for terminal development/management in Nigeria

Operations and Maintenance (O&M) Costs

With respect to the ferry terminals, annual O&M costs are divided into (1) site O&M and (2) terminal O&M both of which are estimated at 10% of related upfront costs captured in Table 5-1.

Annual IT Costs

Annual IT costs per route are estimated at USD35.6K (2018 dollars) and include subscription fees regarding the IT server, website hosting, and upkeep of the customized ferry software.

Fuel Costs

Diesel fuel consumption costs (diesel and lubricant) from ferry operations were estimated at 220 Naira per litre (or USD0.61/liter based on a 220 USD/Naira exchange rate). This estimate comes from recent, similar work conducted by CPCS in Lagos' ferry sector[74].

Annual IT costs per route are estimated at USDD35.6K (2018 dollars) and include subscription fees regarding the IT server, website hosting, and upkeep of the customized ferry software.

Other Costs

Annual miscellaneous costs such as utilities, insurance etc. are estimated at 15% of all other ferry terminal operating expenses.

5.2.4 Waterside (Ferry Operations) Capital Expenditures

Ferry Acquistion Costs

Acquisition costs for ferries are presented in Table 4-7 and are presented again below.

Table 5-4: Illustrative Unit Cost for Waterside Operations

Ferry Specification Option	Description	Unit	50 seats	100 seats
Option One	Vessel Cost (Fast Ferry Aluminium Hull Catamaran) – Brand New	USD million/vessel	4.5	5
	Fuel Consumption (Marine Grade at 12 knots/hr)	ltrs/km	2.5	3.0
Option Two	Vessel Cost (Steel Displacement MonoHull) – Brand New	USD million/vessel	0.75	1.2
	Fuel Consumption (Marine Grade at 12 knots/hr)	ltrs/km	1.25	1.5
Option Three	Vessel Cost (Fast Ferry Aluminium Hull Catamaran) – Second Hand	USD million	2	3
	Fuel Consumption (Marine Grade at 12 knots/hr)	ltrs/km	2.5	3.0

Source: CPCS Estimate based on Industry Research

[74]Specifically, CPCS conducted an operating and financial due diligence of a private sector proposal to conduct passenger and cargo ferry operations in Lagos, Nigeria as part of CPCS' mandate with InfraCo Africa.

Upfront IT expenditures

Upfront IT costs for each route are estimated at USDD50.6K (2018 dollars) and include provisions for an IT server (hosted by a private provider outside LASWA) and a customized ferry system software.

5.2.5 Waterside (Ferry Operations) Operating Expenditures

Ferry Crew Costs

Annual ferry crew costs are presented in the table below.

Table 5-5: Illustrarive Crew and Other Costs or Waterside Operations

	Unit	50 seats	100 seats
Manpower[75] (Two Crew Supplement[76] per Vessel)	USD per annum/ Crew supplement	USD 60,000	USD 72,000
Captain	12,000	1	1
Deputy Captain	10,000	1	1
Engineer	5,000	1	1
Deck hand	3,000	1	3

Source: CPCS Estimate based on Industry Research

Administrative Staff Costs

Annual ferry operating administrative staff costs are summarized in the table below. Total administrative staff costs are estimated at USD68K per annum (2018 dollars).

Table 5-6: Ferry Operations Annual Administrative Staff Costs

	Indicative Annual Cost per Staff (USD)	Staff Requirement
Chief Operating Officer	20,000	1
Chief Information Officer	13,000	1
Director Finance	15,000	1
Support Staff (Bookkeeping, cleaning, fueling, terminal coordination)	5,000	4

Source: CPCS Estimate Based on Industry Research

Other Costs

Other costs such as spares, insurance and certifications are estimated at 15% of all other operating costs.

[75] Manning levels are defined by national regulations which are issued by NIMASA. We have requested for a copy of the relevant regulations. In the interim, we have assumed manning levels as per industry benchmarks.
[76] Each vessel will require two crew supplements as the total operating hours will be more than 8 hours.

6 Commercial, Financial and PPP Analysis

Key Messages

Economic Analysis

The key economic benefits for the LSWTP are estimated to be the following:

- Journey time savings;
- Employment benefits; and
- Increase in land values.

ENPV (USD '000)	EIRR
91,515	22.3%

Farebox Recovery

To inform the level of financial participation from both the public and private sectors to make the LSWTP viable, an important first step was to analyze the level of farebox recovery per route. All but one route (i.e. Badore – Ideje) had a farebox recovery rate of less than 100%.

Phasing PSP

Noting that the Badore – Ijede route is the only one that delivers a farebox recovery rate that covers both operating costs and vessel acquisition, we recommend that this line be selected for Phase I.

For this route, while the proposed tariff for ferry operations is sufficient to cover related ferry operating costs, the total revenues (including terminal revenues) are not sufficient to cover terminal operating costs and the capital investment (including terminals and vessels).

We view that at a minimum, the land acquisition and terminal development required in Phase I should be the responsibility of Lagos State. The total cost of this will be USD 4.4 million in NPV terms.

In Phase I, PSP would be in the form of procuring the private sector to operate and manage the route in the form of an O&M concession.

6.1 Introduction

The preceding chapters have outlined a concept for providing passenger ferry services in Lagos State. This section presents an analysis to determine the economic and financial viability of operating the ferry services, and to ultimately identify the best option to introduce private sector risk-sharing in the sector. The analysis is achieved with a financial appraisal model, developed solely to evaluate the ferry operation and terminal management services.

This section outlines our analysis, including the methodology adopted, results, and recommendations. The conclusions of the analysis will inform a practical PSP strategy and accompanying roadmap for deploying passenger transport on the routes proposed and illustratively summarized in the Figure 6-1.

The sector diagnostic review presented in Section 2 highlight the anticipated challenges of introducing private sector risk sharing into the sector. At a stakeholders roundtable[77] organized by the Lagos State Government and attended by both domestic and international investors, participants commented that the enabling environment for PSP in the waterways sector remained relatively weak.

Four overarching themes that were raised by participants at the roundtable, particularly when considering the; (1) the timing of and (2) the degree of risk transfer in waterways PSP were:

1. Lagos State has not harnessed (to any appreciable degree) the abundant body of water that is available for transportation. As a result, today, passenger ferry *services are nascent, fragmented and lack safety and reliability*. It is not uncommon for small ferry operators to cancel or delay scheduled trips in case of insufficient number of passengers. This impacts reliability of service which in turn influences passenger choice.

2. Related to the above theme is the *user apathy* that exists today in the sector. A significant portion of the general population does not consider the current waterway transport system safe for use. Reliability in service has also resulted in apathy.

3. *Insufficient regulations* coupled with varying commitments from enforcement groups makes the sector (as it stands today) difficult and unconducive for operators and potential investors.

4. Setting tariffs that balance 'ability to pay' with *recouping investment and operating costs cannot* be over-emphasized. Especially given the level of user apathy that exists today combined with a lack of reliable service, upward pressure on passenger tariffs across all routes in a manner that is aligned with world-class operations may be resisted.

From the private sector perspective, it is clear that significant progress remains to be made to develop an enabling environment conducive to private sector risk sharing. The message at the roundtable was that the expertise and the ingenuity of the private sector can be harnessed for some level of participation in the sector within the short to medium (5-10 years), as is evidenced by the presence of some private operators currently. For more appreciable risk transfer (e.g. Build-Operate-Transfer schemes that are 'at risk' in nature – that is, not guaranteed by LASG), sustainable interventions into the over the medium to long term, will be necessary to solidify the enabling environment.

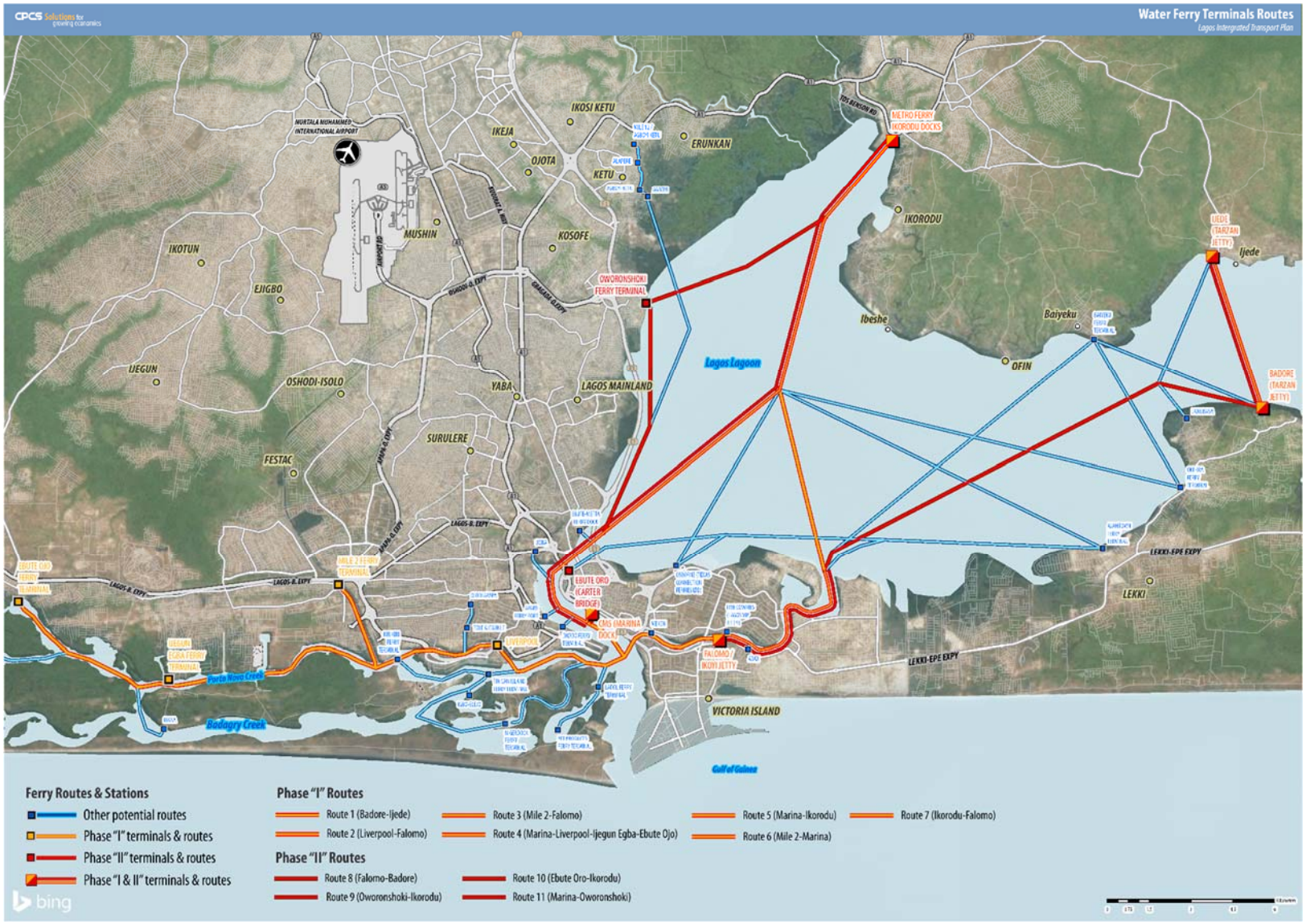
This understanding has served as a guide to our concept for passenger ferry services. While our financial and economic analysis examines all routes being contemplated by LASWA, we present an analytical framework that focuses:

- On routes that amplify the advantage of water transport over alternative modes. In the peculiar geography of Lagos State, journey time savings between water and road mode will identify the routes that best present the modal advantage. An early focus on such routes will showcase LASG commitment to **harnessing the abundant water resources**;

[77] Lagos State Water Transportation Investors Round Table that took place on July 27th, 2018

- On routes where ferry transport can be designed as a shuttle service, with minimal stops in-between, thus ensuring regularity and reliability of service. This regularity and reliability will **help reduce the current user apathy**;
- On less complex routes **where LASWA can develop its expertise and regulatory capacity**; and,
- On routes with significant journey time savings, thus **a higher potential to charge commercial or almost-commercial tariffs** sufficient to attract private sector interest.

Figure 6-1: Map of Proposed Route



6.1.1 Model structure

A discounted cash flow model developed in Microsoft Excel was used to conduct the valuation analysis in this section. The model took into consideration key assumptions that are discussed in the next section. The model is structured in a manner that allows for all routes proposed (see Figure 6-1) to be assessed as a whole, or individually. Furthermore, the model's outputs include quantifying estimates of the State's financial participation and resulting liabilities under the LSWTP. The State's financial participation is informed by risk and return benchmarks[78] of the private sector which are also captured in the discounted cash flow model.

6.2 Model Assumptions

This section discusses the key assumptions and costs that were used to develop the valuation analysis.

6.2.1 Key Model Assumptions

Table 6-1: Key Model Assumptions

Assumptions	Input
Model Currency	USD
Start Date	January 1, 2019
Construction Period[79]	1 year
Maximum Modelled Operating Period	18 years
Concession Period	19 years
Current Exchange Rate	360 Naira/USD
Operating Days per Year	295
US Inflation	2.00% per annum
Nigeria Inflation	12.00% per annum
Nigeria Corporate Tax Rate	30%

6.2.2 Ferry Vessel Costs

Three options for ferry vessel-types (as discussed in Section 4) are presented in Table 6-2, along with the capital costs. While all vehicle types were tested in the model, **the 100-seat capacity vessel under Option 2 was adopted for the financial and economic analysis purposes.**

Table 6-2: Vessel Specification Option Assumptions

Option	50 Seater Vessel Purchase Price (USD)	100 Seater Vessel Purchase Price (USD)	50 Seater Vessel Fuel Economy (ltr/km)	100 Seater Vessel Fuel Economy (ltr/km)	Depreciation (Years)
1	4,500,000	5,000,000	2.5	3.0	20
2	750,000	**1,200,000**	1.25	1.5	10
3	2,000,000	3,000,000	2.5	3.0	10

Source: CPCS Analysis

[78] These benchmarks are informed by market sounding as well as the Consulting Team's experience based on prior, similar mandates.

[79] Includes the procurement of vessels at the end of the construction period

It should be noted that ferry purchases are modelled as a one-time purchase (for the number of vessels required per route) which take place at the end of the infrastructure construction period. In addition, depending on the ferry option selected, ferry assets are renewed in the model once fully depreciated.

For illustrative purposes, Table 6-3 and Table 6-4 summarize the number of ferries that would be required to achieve a 15 minute and 30 minute headway during peak periods (7:00AM to 10:00AM and 4:30PM to 7:30PM). These proposed headways and related vessel requirements should be considered as long-term goals for the sector.

Table 6-3: Vessel Requirement per Route to Achieve 15 Minute Headway

Route	Operating Vessel Purchase Requirement	Redundant Vessel Purchase Requirement
Marina – Liverpool – Ijegun Egba – Ebute Ojo	12	2
Liverpool – Falomo	7	1
Marina – Ikorodu	12	2
Falomo – Badore	12	2
Badore – Ijede	5	1
Ikorudu – Falomo	12	2
Oworonshoki – Ikorodu	8	2
Marina – Oworonshoki	10	1
Mile 2 – Marina	11	2
Mile 2 - Falomo	12	2
Ebute Oro - Ikorodu	12	2

Source: CPCS Analysis

Table 6-4: Vessel Requirement per Route to Achieve 30 Minute Headway

Route	Operating Vessel Purchase Requirement	Redundant Vessel Purchase Requirement
Marina – Liverpool – Ijegun Egba – Ebute Ojo	6	1
Liverpool – Falomo	4	1
Marina – Ikorodu	6	1
Falomo – Badore	6	1
Badore – Ijede	3	1
Ikorudu – Falomo	6	1
Oworonshoki – Ikorodu	4	1
Marina – Oworonshoki	5	1
Mile 2 – Marina	6	1
Mile 2 - Falomo	6	1
Ebute Oro - Ikorodu	6	1

Source: CPCS Analysis

6.2.3 Working Capital Assumptions

Ferry service and terminal operating cost assumptions are discussed in detail in Section 4 and Section 5. Table 6-5 summarizes the operating cost assumptions reflected in the model.

Table 6-5: Operating Parameter and Cost Assumptions

Cost Assumption	Rate
Ferry Operations	
Accounts Receivable Turnover	30 days
Inventory Turnover	30 days
Accounts Payable Turnover	30 days
Terminal Operations	
Accounts Receivable Turnover	30 days
Inventory Turnover	30 days
Accounts Payable Turnover	30 days

Source: CPCS Experience and Industry Research

6.2.4 Vessel and Passenger Handling Charge

Where a route includes arriving to or departing from a ferry terminal that is already concessioned, it is assumed that the ferry operator would pay the terminal a vessel handling and passenger handling charge as summarized in Table 6-6.

Table 6-6: Vessel and Passenger Handling Charge for Terminals already under a Concession

Fee	Rate
Vessel Handling Fee	USD0.85 / vessel docking[1]
Passenger Handling Fee	USD0.50 / per passenger disembarked[2]

Source: NIWA Tariff Guide (2016 Edition). A per day vessel charge of N20,000 or berthing 21-30m vessels was used to derive vessel handling charges
Source: based on industry research and specifically, a review of ferry service tariff guides around the world

6.2.5 Financing Costs

Conducting a PSP valuation requires assumptions on financing parameters both from the perspective of the private and the public sector. These parameters and related assumptions are summarized in Table 6-7 and Table 6-8.

Table 6-7: Private Sector Financing Assumptions

Financing Parameter	Assumption	Commentary
6-month USD LIBOR Rate	2.75%	Based on a review of current 6-month LIBOR rates from the Federal Reserve Bank of St. Louis
Private Lending Spread on US Denominated debt	6-month USD LIBOR + 7.85%	The spread and tenor estimate is based on a review of confidential term sheets (as available) for Build-Operate-Transfer type transport projects in West Africa in the past ten years
Private Lending Tenor on US Denominated debt	15 years	
Private Lending Rate on Naira Denominated debt	23%	The Naira denominated lending rate is based on a review of the June 29, 2018 publication made by the Central Bank of Nigeria on lending rates obtainable in all Deposit Money Banks in Nigeria. The review is specific to lending rates in "Transportation and Storage"
Private Lending Tenor on Naira Denominated debt	7 years	This is based on feedback from the World Bank
Gearing Assumption	65% - 70%	The low-end estimate (65%) is assumed under a PPP structure whereby the private sector is

Financing Parameter	Assumption	Commentary
		engaged on a Build-Operate-Transfer type of basis, whether it is 'at-risk' or backed by Government Subsidy The high-end estimate (70%) is assumed under a PPP structure whereby the private sector is engaged on an O&M concession type of basis and thus, the private sector's upfront capital commitments are limited to items such as furniture, fixtures and equipment.
Private Sector Leveraged Hurdle Rate (Return on Equity Benchmark)	16% to 18%	The low-end estimate (16%) is assumed under a PPP structure whereby the private sector is engaged on an O&M concession type of basis and thus, the return on equity benchmarks do not include premiums related to large private capital outlays The high-end estimate (18%) is assumed under a PPP structure whereby the private sector is engaged on a Build-Operate-Transfer type of basis and thus, the return on equity benchmarks include premiums related to large private capital outlays
Private Sector Unlevered Hurdle Rate (Weighted Average Cost of Capital Benchmark)	10% - 11%	Derived based on above return on equity benchmark and gearing assumptions

Source: CPCS Experience, Market Consultations and Industry Research

Table 6-8: Public Sector Financing Assumptions

Financing Parameter	Assumption	Commentary
6-month USD LIBOR Rate	2.75%	Based on a review of current 6-month LIBOR rates from the Federal Reserve Bank of St. Louis
Public Lending Spread on US Denominated debt	6-month USD LIBOR + 1.50%	This is based on the IBRD Flexible Loan Pricing Basics note (Updated April 2018) and specifically, the fixed spread loan with an average repayment maturity of 18 to 20 years (see page 2).
Public Lending Tenor on US Denominated debt	20 years	
Public Lending Rate on Naira Denominated debt	Central Bank of Nigeria (CBN) Prime Lending Rate (16.6%) + 1.40% spread	The Public Lending Rate on Naira denominated debt is based on a review of the CBN's prime lending rate (as at September 2018). Added to this is a 1.40% concessional premium. Furthermore, it is assumed that such a concessional loan would be made available from the Federal or Lagos State Government.
Public Lending Tenor on Naira Denominated debt	7 years	This is based on feedback from the World Bank

Source: CPCS Experience, Market Consultations and Industry Research

6.2.5.1 Naira/USD Exchange Rate Forecast

While the modeled currency is USD, the currency for purchase of capital items is both Naira and USD (as illustrated in Table 6-9). A Naira/USD exchange rate forecast is required to account for exchange rate gains and losses as part of debt servicing. The exchange rate forecast assumption are given in Table 6-10.

Table 6-9: Acquisition Currency for Capital Outlay Items

Capital Outlay Item	Currency of Acquisition
Ferry Related	
Ferry Purchase including Pre-operating Expenses	USD
Fixtures, Furniture and Equipment	NGN
IT-Related	NGN
Terminal Related	
Terminal Infrastructure including Pre-operating Expenses	USD
Land Acquisition	NGN
Furniture, Fixtures and Equipment	NGN

Source: CPCS Estimate

Table 6-10: Naira/USD Exchange Rate Forecast

Year	Naira/USD Forecast (Naira per 1 USD)
2019	370
2020	385
2021 onward	390

Source: Trading Economics Nigerian Naira Forecast (reviewed on October 22, 2018)

6.2.6 Revenue from Ferry Operations

The estimation of the ferry tariff for a one-way trip per route is discussed in Appendix G and is summarized in Table 6-11. It must be noted that the base tariff levels is for the 2018 year.

Table 6-11: Ferry Tariff Per Route (One-way Trip)

Route	Tariff Rate for One-way Trip (2018 Naira)	Tariff Rate for One-way Trip (2018 USD)
Marina – Liverpool – Ijegun Egba – Ebute Ojo	2,622	7.28
Liverpool – Falomo	1,063	2.95
Marina – Ikorodu	1,044	2.90
Falomo – Badore	860	2.39
Badore – Ijede	1,862	5.17
Ikorudu – Falomo	451	1.25
Oworonshoki – Ikorodu	364	1.01
Marina – Oworonshoki	149	0.41
Mile 2 – Marina	255	0.71
Mile 2 - Falomo	595	1.65
Ebute Oro - Ikorodu	267	0.74

Source: CPCS Analysis

It is assumed that tariffs will increase 2% per annum, in-line with USD inflation. Furthermore, a 20% premium is added to tariffs on trips undertaken during peak-hours. A 20% discount is assumed on bulk ticket purchases (we have assumed that 5% of passengers by bulk tickets). Finally, it is assumed that ferry operators will generate revenues from marketing, Wi-Fi access on boats, etc. at 5% of tariff revenues. These estimates are based on CPCS' experience (more specifically in the Philippines and other Asian countries) in conducting feasibility studies for passenger ferry services.

6.2.7 Passengers Carried

Ferry capacity utilization estimates determine the number of passengers carried per year. For modeling purposes, it was assumed that a 100-seat capacity vessel would be used. Table 6-12 summarizes the ramp up to steady state capacity utilization across peak hour and off-peak hour trips and for both legs of a trip.

Table 6-12: Ferry Operations Ramp-up to Steady State Capacity Utilization

Operational Year	Peak Hour Departure Leg Capacity Utilization	Peak Hour Return Leg Capacity Utilization	Off-Peak Capacity Utilization (Departure and Return)
01-Jan-20	75%	20%	15%
01-Jan-21	80%	25%	20%
01-Jan-22	85%	30%	25%
01-Jan-23	90%	35%	30%
01-Jan-24 onward	90%	40%	30%

Source: CPCS Analysis

Based on Table 6-12, the number of passengers carried per annum (based on a 15 minute and 30 minute headway during peak hours) is given in Table 6-13. Note that because target headways for all routes are the same and we have adopted 100-seater capacity vessels for all routes, the number of passenger carried is also the same for each route.

As the number of passengers carried is tied to headway requirements which in turn, inform vessel requirements per route (see Table 6-3 and Table 6-4 above), the number of passengers carried in Table 6-13 should be viewed as a long-term target of the sector.

Table 6-13: Ridership per route (15 Minute Headway during Peak Hours)

	01-Jan-20	01-Jan-21	01-Jan-22	01-Jan-23	01-Jan-24 Onward
15 Minute Headways					
All Routes	170,040	214,440	258,850	303,240	338,640
30 Minute Headways					
All Routes	383,450	124,980	151,620	178,260	195,960

Source: CPCS Analysis

6.2.8 Revenue from Terminal Operations

Based on market consultations and industry research, there are two revenue streams attributable to terminal operations; (1) car parking revenues and (2) commercial development revenues. Each is discussed below:

6.2.8.1 Car Parking Revenues

For ferry terminals not already under a concession, it is assumed that terminal operators will charge USD1.00 per parking bay for full day parking. Additionally, it is assumed that 5% of ferry passengers will elect to park their cars at the terminal

6.2.8.2 Revenue from Commercial Development

Commercial development at the terminals may serve as a means for subsidizing ferry operations and should be further studied. At this stage of project preparation, the model assumes the following commercial development parameters per terminal, which are summarized in Table 6-14. Note that rental amounts are for the base year 2018.

Table 6-14: Ferry Terminal Commercial Development Assumptions

Ferry Terminal	Area for Commercial Development (m2)	Commercial Area Circulation Space (%)	Leasable Area for Commercial Development (m2)	Annual Rent per m2 (Naira)	Annual Rent Estimate (USD 000)
Falomo	5,000	20%	4,000	31,500	413
Marina	3,750	20%	3,000	25,000	246
Badore	2,500	20%	2,000	6,000	39
Ikorodu	2,500	20%	2,000	6,500	43
Mile 2	2,500	20%	2,000	6,000	39
Oworonshoki	2,500	20%	2,000	18,750	123
Ijede	1,015	20%	812	5,500	15
Liverpool	1,015	20%	812	17,500	47
Ijegun Egba	1,015	20%	812	5,500	15
Ebute Ojo	1,015	20%	812	5,500	15
Ebute Ero	1,015	20%	812	5,500	15

Source: CPCS Market Consultations

It is assumed that rental rates per m^2 will increase at 2% a year, in-line with USD inflation.

6.3 Economic Analysis

A high level economic assessment of the project was undertaken prior to the financial analysis. While the financial analysis focuses on the financial costs and revenues of the project (i.e. those which affect the project cash flow), the economic analysis focusses on the wider economic costs and benefits. These are non-financial benefits and many of them are not realized in cash terms. The economic appraisal was based on international best practice, using a standard approach normally applied by the World Bank and other multi-lateral institutions.

The economic appraisal consists of the following elements:

- Economic costs – capital and operating costs

- Economic benefits
- Economic assessment parameters – ENPV and EIRR

6.3.1 Social Discount Rate

The choice of an appropriate Social Discount Rate (SDR) for use in an economic analysis can be quite controversial, as it can have a significant impact on the results. Unlike the financial discount rate, which reflects the opportunity cost of capital, the economic discount rate (or social discount rate) should reflect how society values current costs and benefits versus future costs and benefits.

There are significant variations in public discount rate policies practiced by countries around the world, with developing countries in general applying higher SDRs (8%-15%) than developed countries (3%-7%). The divergence reflects differences in the perceived social opportunity cost of public funds across countries and in the extent to which the issue of intergenerational equity is taken into consideration in setting the SDR.

Up to 2015 the Nigerian economy grew at a steady rate of 6%-7% per annum. After the economic downturn in 2015, the GDP growth rates fell and are now expected to grow at around 2% per annum.However, economic appraisal of projects in developing countries are normally undertaken using a SDR of 12%, and hence this is the value we have used for this analysis.

6.3.2 Economic Costs

The financial costs consist of capital and operating costs. These have been adjusted to reflect their actual economic value (i.e. the social opportunity cost of the resources), rather than their market price. Markets often incorporate significant price distortions created, for example, by market barriers (e.g. tariffs or subsidies), social policies (e.g. minimum wages) or simply due to market imperfection, macroeconomic unbalances or rigidities (e.g. wage rigidities); these distortions have been removed where encountered. Financial estimates are transformed into economic values by applying appropriate conversion factors.

For the purpose of this high-level analysis, a uniform conversion factor of 0.9 has been applied to all financial costs (both capital and operating costs) to arrive at the economic costs.

6.3.3 Economic Benefits

The following economic (non-financial) benefits have been estimated for this project:

- Journey time savings;
- Employment benefits; and
- Increase in land values.

6.3.3.1 Journey Time Savings

The introduction of a ferry service will significantly reduce journey times for passengers along key corridors, as compared to land based modes. This is primarily due to the fact that they will not be affected by Lagos' severe road traffic congestion. Table 6-15 lists the estimated journey time savings (for a single journey) by ferry route.

Table 6-15: Travel Time Savings by Ferry Route

#	Routes	Navigation Distance	Road Distance	Journey Time using road transport	Journey Time using Ferry incl. transfers	Travel Time Savings	
		km	km	minutes	minutes	minutes	%
1	Liverpool – Igbo-Elejo	3	12.1	46[80]	23.11	22.89	49.76%
2	Marina – Liverpool – Ijegun Egba – Ebute Ojo	26.5			86.62		
2.1	Marina – Liverpool	7.25	17.6	101	34.59	66.41	65.75%
2.2	Liverpool – Ijegun Egba	12.75	15.6	116	49.46	66.54	57.36%
2.3	Ijegun Egba – Ebute Ojo	6.5	10.2	81	32.57	48.43	59.79%
3	Liverpool – Falomo	9.25	15.0	88	40.00	48.00	54.55%
4	Marina – Ikorodu	22.5	44.8	157	75.81	81.19	51.71%
5	Falomo – Badore	23.75	26.4	120	79.19	40.81	34.01%
6	Badore – Ijede	5.75	109.0	164	30.54	133.46	81.38%
7	Osborne – Ikorodu	17.5	36.7	141	62.30	78.70	55.82%
8	Ikorodu – Falomo	22.5	41.2	161	75.81	85.19	52.91%
9	Oworonshoki – Ikorodu	10.75	24.6	85	44.05	40.95	48.17%
10	Marina – Oworonshoki	13.5	16.1	51	51.49	-0.49	-0.95%
11	Mile 2 – Marina	15	12.4	78	55.54	22.46	28.79%
12	Mile 2 – Falomo	17	17.5	125	60.95	64.05	51.24%
13	Ebute Ero – Ikorodu	18.5	36.82	70	65.00	5.00	7.14%
						Average	**46.5%**

Our analysis has shown that using the ferry delivers an average journey time saving of around 46%, as compared to using land based transport. The Value of Time Study undertaken for LAMATA in 2015[81] estimated a Value of Time of N609 per hour per car passenger in the Lagos CBD. This has been updated to 2018 values. Multiplying the value of time with the total journey time saved by all passengers, gives us the annual value of journey time savings.

6.3.3.2 Employment Benefits

The project will generate two types of employment: one is that which will be directly required for the operation of ferry service and associated facilities; and the other which will be induced in the broader economy because of the various activities that will be effected by the investment in the sector.

[80] Igbo Elojo is on Snake Island. Journey time includes 35minutes travelled by road transport and 11minutes by ferry

[81] Value of Time and Transport Elasticity Study, Final Report, Leigh Fisher, for LAMATA, May 2015

A report by the African Development Bank on job creation in Nigeria[82] estimates an employment multiplier of 5.8 for the transport sector in Nigeria. This means that for every 1 job created in the transport sector, a further 4.8 jobs will be created in the wider economy.

A fully operational ferry service on the designated route is expected to create around 850-900 jobs in total, which will increase as the service expands. Applying the transport sector employment multiplier gives us an estimate of the total number of jobs created in the wider economy. Based on an average wage rate, we estimate the additional income generated in the economy due to these jobs, which is taken as an estimate of the total economic benefits generated by the project.

6.3.3.3 Increase in Land Value

In 2013, the New York City Economic Development Corporation (NYEDC) released its Citywide Ferry Study[83] which aimed to provide policymakers an increased understanding of the economic impacts of ferry services, among other things. The study analyzed over 50 sites, resulting from its commuter and leisure routes in all five (5) boroughs of the City. The study reported higher real estate values as a result of the ferry development. For Lagos, it has been assumed that there will be a 10% increase in real estate values for 50% of the area within 1/8th of a mile from each ferry terminal. This increase in land values was considered a benefit to the wider economy.

6.3.3.4 Other Benefits Considered

As part of the economic appraisal, other benefits were also considered including benefits from reduced vehicular emissions and reduced road accidents. To estimate these benefits, an estimate has to be made of passengers shifting from other modes to ferries. However, as outlined in Section 3.1, no demand modelling was undertaken, as it was assumed that if the services were provided, the demand would be met. As no estimates were made of mode shift and generated demand, it has not been possible to estimate the benefits from emissions and accident reductions.

6.3.4 Economic Assessment

Based on the economic costs and benefits, and applying a 12% SDR, the economic appraisal results are presented in Table 6-16. These have been estimated by route, for each of the ferry purchase Option 2 (Table 6-2).

Table 6-16: Economic Appraisal Results

Route	ENPV (USD '000s)	EIRR
Marina – Liverpool – Ijegun Egba – Ebute Ojo	49,368	30.8%
Liverpool – Falomo	10,277	26.5%
Marina – Ikorodu	47,096	32.8%
Falomo – Badore	-10,943	-4.0%
Badore – Ijede	13,813	32.1%

[82] The Challenge of Job Creation in Nigeria, Africa Economic Brief, African Development Bank, June 2015

[83] https://www.nycedc.com/sites/default/files/filemanager/Resources/Studies/2013_Citywide_Ferry_Study/Citywide_Ferry_Study_-_Final_Report.pdf

Route	ENPV (USD '000s)	EIRR
Ikorudu – Falomo	3,843	16.4%
Oworonshoki – Ikorodu	-12,279	2.4%
Marina – Oworonshoki	31,208	30.1%
Mile 2 – Marina	26,165	25.3%
Mile 2 - Falomo	5,013	19.3%
Ebute Oro - Ikorodu	-6,155	3.8%
All Routes Combined	**87,220**	**21.5%**

The economic appraisal shows that taken together, all routes are economically viable, as they deliver EIRR of over 21% and an ENPV of over US$87 million. This is primarily driven by journey time savings and increases in land value. However, certain individual routes including Falomo-Badore, Oworonshoki – Ikorodu and Ebute Oro - Ikorudu are not economically viable.

6.4 Financial Analysis

6.4.1 Farebox Recovery

To inform the level of financial participation from both the public and private sectors to make the LSWTP viable, an important first step is to analyze the level of farebox recovery per route. Farebox recovery looks at how much of passenger ferry tariff (i.e. passenger fares) and other revenues[84] cover ferry operating costs (crew costs, administrative personnel, fuel consumption, etc.). Farebox recovery does not take into consideration vessel acquisition and other capital items. Furthermore, as noted in Section 6.2.7, the number of passengers carried per day is fixed (i.e., the same) across all proposed routes given that headways are fixed to 15-minutes during peak hours and 60-minutes during off-peak hours and that a 100-seater vessel capacity is assumed for operations. Therefore, the main driver of farebox recovery is the size of the one-way tariff per route[85].

The level of farebox recovery per route informs the following:

1. If the farebox recovery is less than 100%: The level of operational subsidies that may be required to be paid by Lagos State to the operators (which is typical to passenger ferry operations internationally). Note that though operational subsidies may be required, there are still mechanisms that incentivize high operational efficiency to optimize subsidies and ensure value-for-money. For example, based on a certain level of service that is determined in the bidding stage, operational subsidies can be capped at a certain amount thereby incentivizing the operator to provide services within the cap. Any cost savings that are generated can be shared between the public sector and the private

[84] In the case of this analysis, other revenue streams include marketing, Wi-Fi access on boats, etc. See section 6.2.6 for more information.

[85] We have calculated the one-way tariff for each route individually by analyzing the travel time saving of using ferry services (for that particular route) relative to current road transport (measured by relative distance travelled). Based on the time savings, the additional fare passengers are willing to pay for faster ferry services (relative to road) have been estimated based on the long run fare and time elasticities of demand. Details are in Appendix G of the report

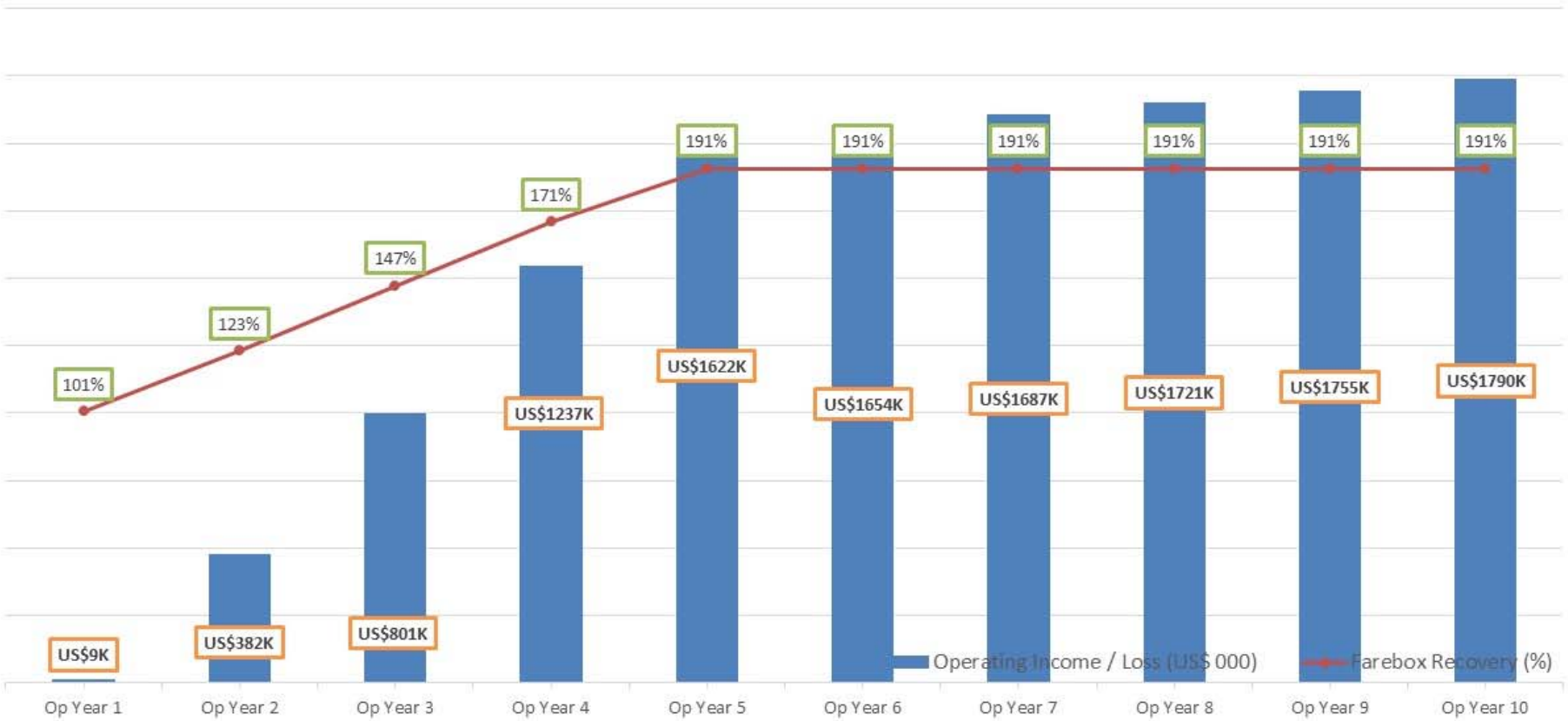
operator. Similarly, costs over and above the cap would fully be borne by the private operator.

2. If the farebox recover is greater than 100%:

    A. The potential for (1) the private operator to pay a concession fees to Lagos State, and/or (2) the private operator to pay for part of its capital outlays (e.g. purchase of ferry vehicles). When farebox recovery is greater than 100%, this may also create the incentive for a private operator to maximize income at the expense of service. For example, a private operator may elect not to provide service during off-peak hours because ridership is not sufficient to offset operating costs. In such cases, fines or penalties can be placed in PPP contracts to ensure service levels are maintained. However, it should be noted that effective oversight and enforcement would be required (along with objective methods of data collection) on the part of the authorities to make penalty mechanisms viable.

Figure 6-2 to Figure 6-12 provide a summary of farebox recovery for each of the 11 routes, assuming a 10-year operating period, 100-seater vessel capacity and target headway of 15-minutes.

Figure 6-2: Farebox Recovery for the Route - Marina – Liverpool – Ijegun Egba – Ebute Ojo

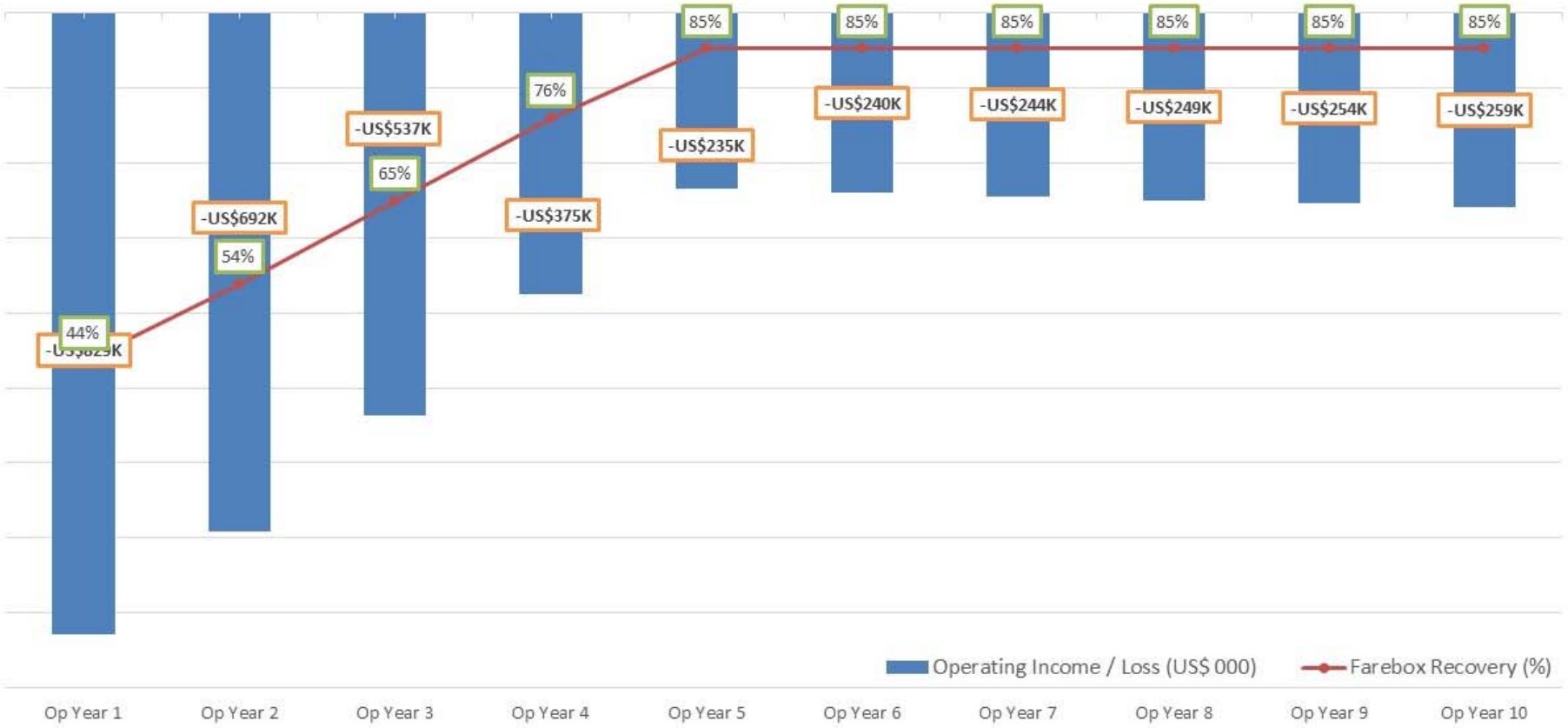


Source: CPCS Analysis

Figure 6-3: Farebox Recovery for the Route - Liverpool – Falomo

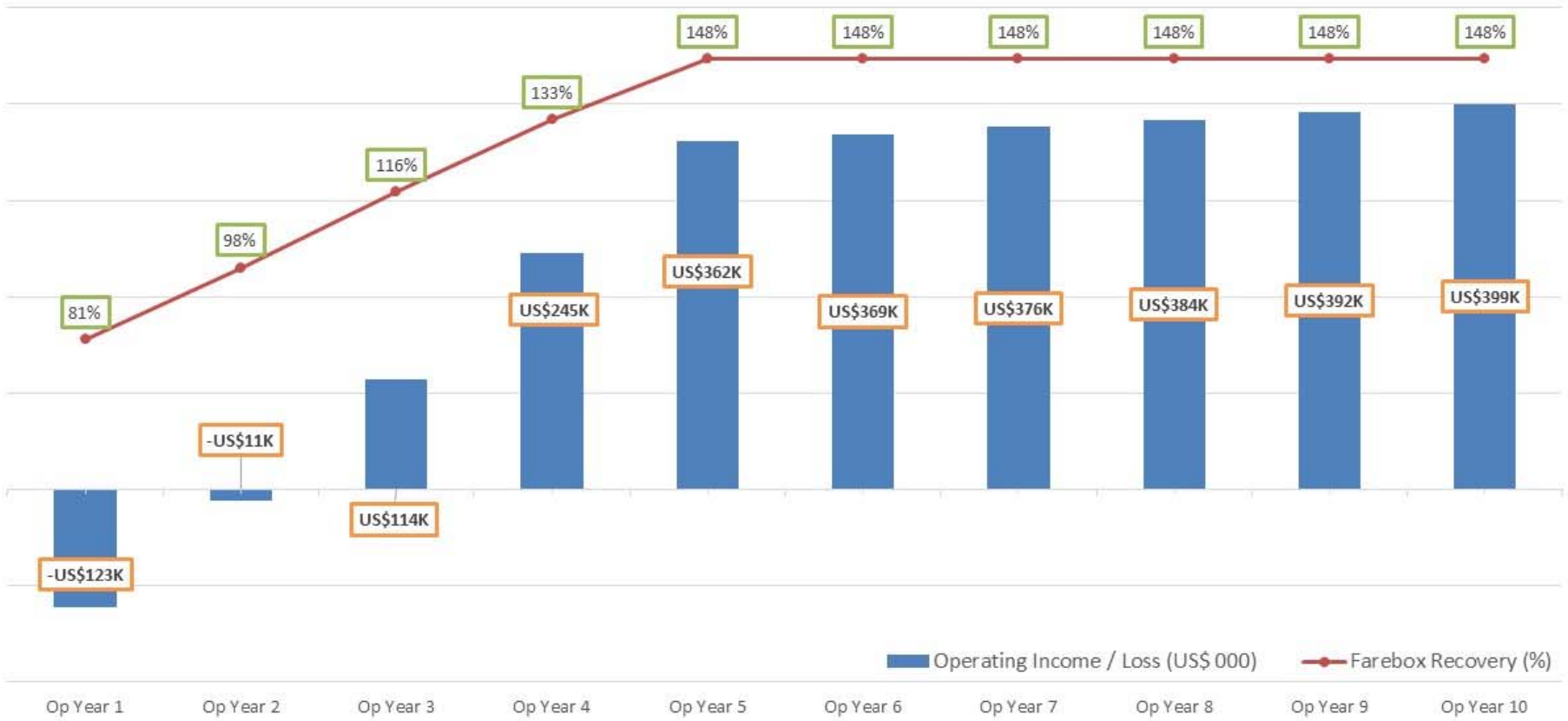
Source: CPCS Analysis

Figure 6-4: Farebox Recovery for the Route - Marina – Ikorodu



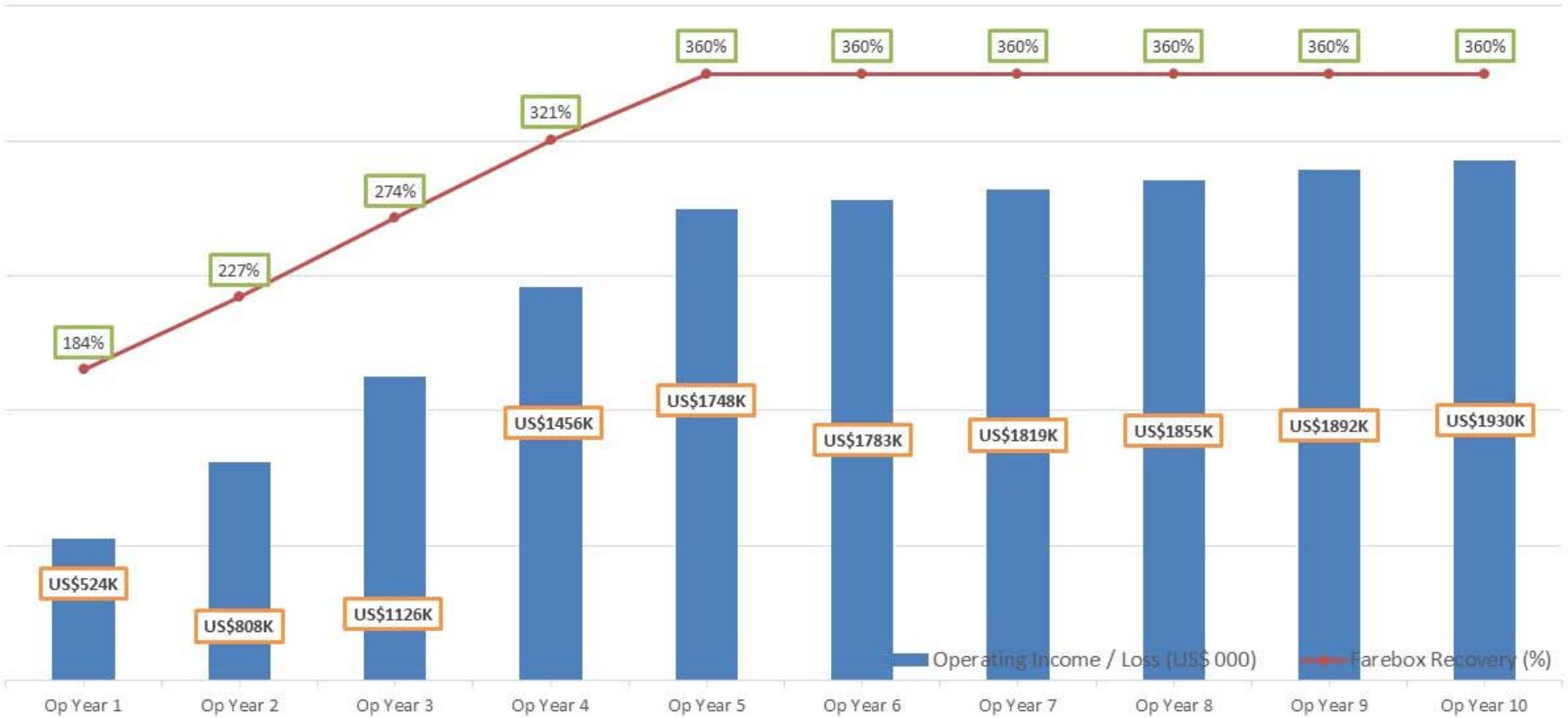
Source: CPCS Analysis

Figure 6-5: Farebox Recovery for the Route – Falomo - Badore



Source: CPCS Analysis

Figure 6-6: Farebox Recovery for the Route –Badore - Ideje

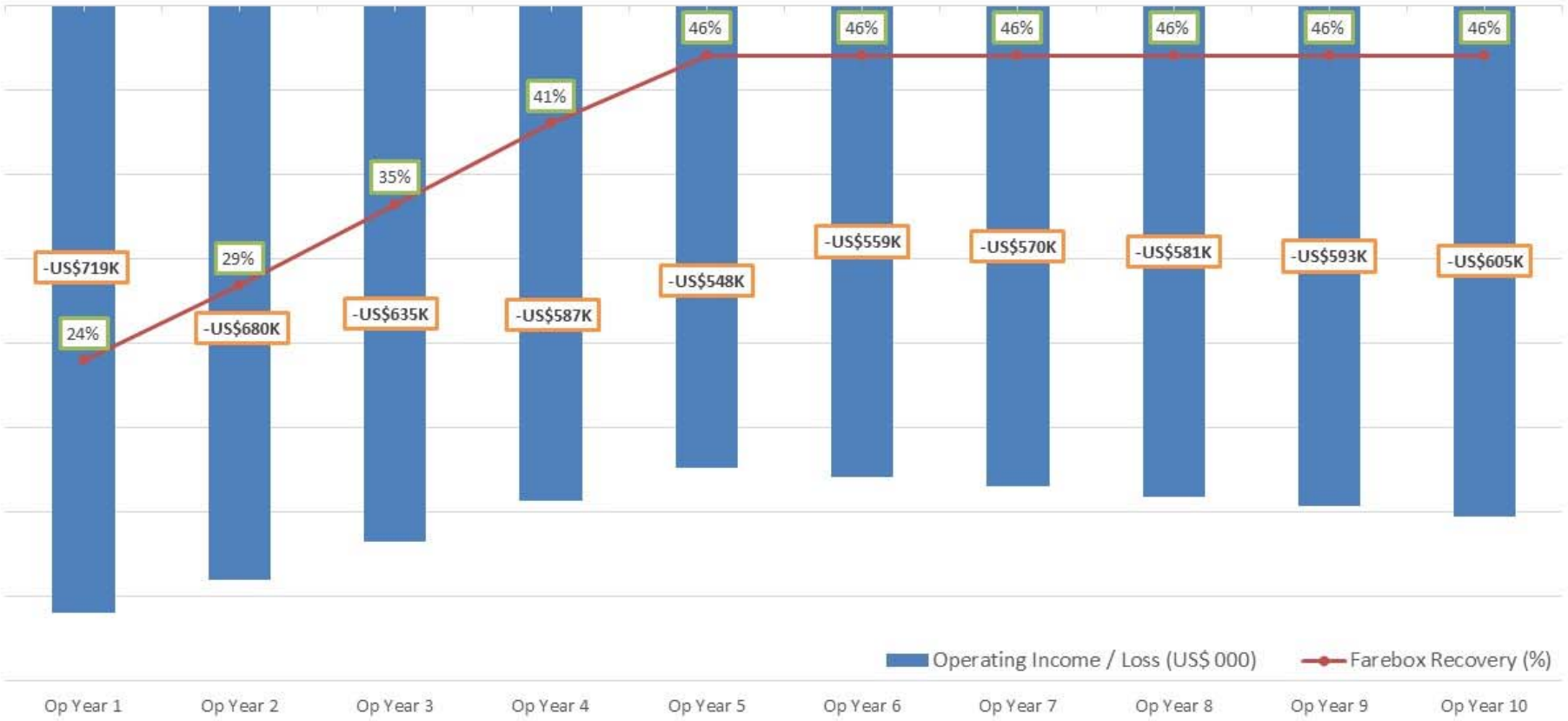


Source: CPCS Analysis

Figure 6-7: Farebox Recovery for the Route – Ikorudu – Falomo

Source: CPCS Analysis

Figure 6-8: Farebox Recovery for the Route – Oworonshoki – Ikorodu



Source: CPCS Analysis

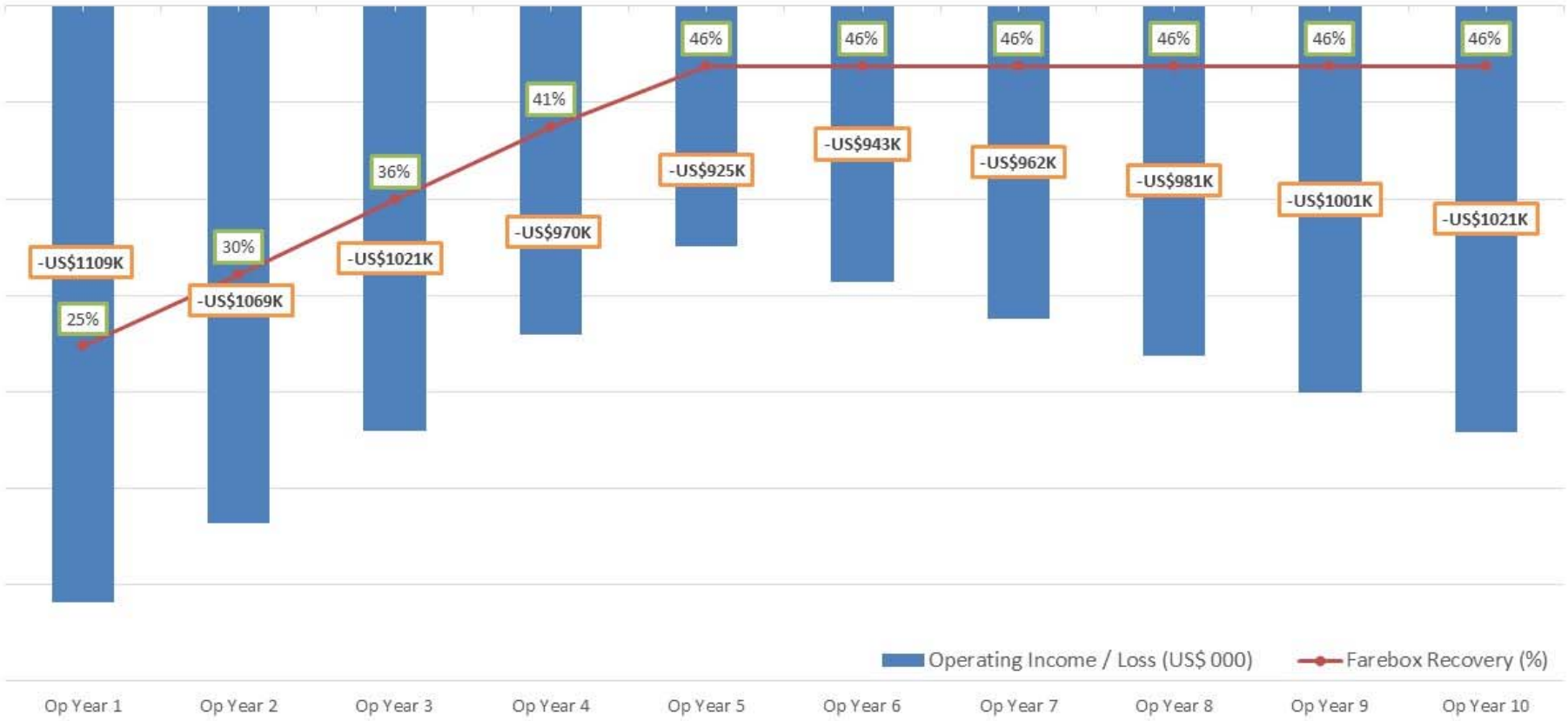
Figure 6-9: Farebox Recovery for the Route – Marina – Oworonshoki

Source: CPCS Analysis

Figure 6-10: Farebox Recovery for the Route – Mile 2 – Marina

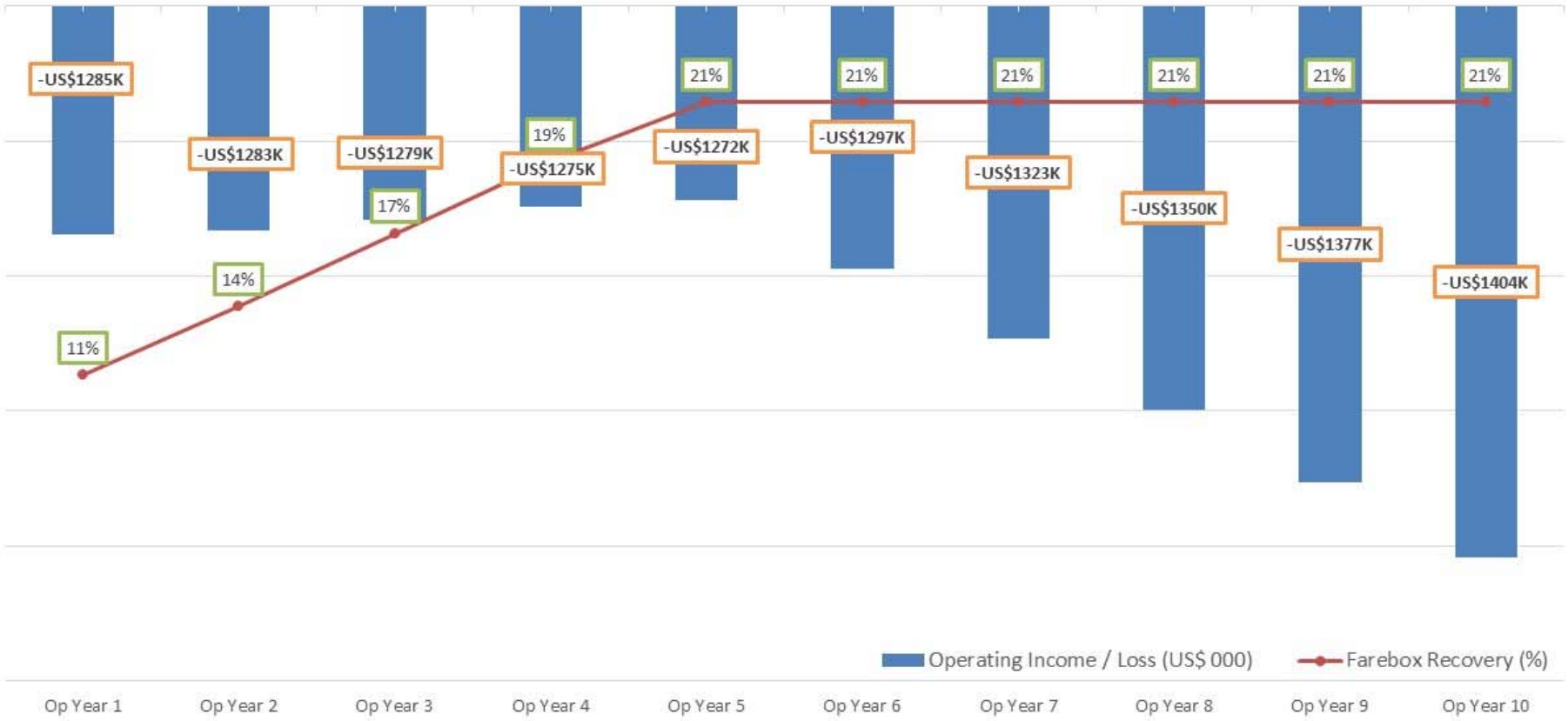
Source: CPCS Analysis

Figure 6-11: Farebox Recovery for the Route - Mile 2 - Falomo



Source: CPCS Analysis

Figure 6-12: Farebox Recovery for the Route - Ebute Oro - Ikorodu



Source: CPCS Analysis

Table 6-17: Steady State Vessel Capacity Utilization Farebox Recovery Rate per Route

Route	Farebox Recovery %	Proposed Sequencing
Marina – Liverpool – Ijegun Egba – Ebute Ojo	**191%**	**Phase II**
Liverpool – Falomo	**136%**	**Phase II**
Marina – Ikorodu	**85%**	**Not Considered***
Falomo – Badore	**148%**	**Phase II**
Badore – Ijede	**360%**	**Phase I**
Ikorudu – Falomo	**33%**	**Not Considered***
Oworonshoki – Ikorodu	**46%**	**Not Considered***
Marina – Oworonshoki	**16%**	**Not Considered***
Mile 2 – Marina	**23%**	**Not Considered***
Mile 2 - Falomo	**46%**	**Not Considered***
Ebute Oro - Ikorodu	**21%**	**Not Considered***

*Routes designated at "Not Considered" should not be prioritized in the short-to-medium term.
Source: CPCS Analysis

Table 6-17 summarizes the farebox recovery rate per route. The four routes in **green font** generate a farebox recovery rate that is higher than 100% (i.e., tariff revenues cover operating costs). All other routes would require financial support (i.e. operational subsidy) from the Government at this stage of the sector's development in order to make them viable. Intuitively, these results make sense based on how passenger tariffs were derived per route (details in Appendix G). The tariff per route is based on the travel time savings from using the ferry service as compared to ground transport. The Badore – Ijede route is 109km by road but only 6km by waterways. This large difference in distance results in significant time savings when travelling by water transport. These time savings enables the ferry operator to charge a significant premium on fates on this route – estimated at N1,862 relative to the ground transport tariff of N1,050.

Based on these results, we have also proposed a more appropriate sequence (than that proposed by a multi-criteria analysis) for the development of the routes if PSP and financial self-sustainability is a core component of the decision-making process. It is the sequence retained for our recommendations.

6.4.1.1 Tariff Sensitivity

Table 6-18 provides an estimate of the tariff required per route in order to deliver a 100% farebox recovery following the ramp up period and once a steady state vessel capacity utilization is achieved (i.e. year five of operations).

The key to setting an appropriate tariff is getting a balance between 'ability to pay' and the need to recovering capital and operating costs. Currently, given the nascent nature of the water

transport sector in Lagos, and the user apathy due to lack of a reliable service, the appetite perhaps is not there for passengers to pay premium fares. A more mature sector with a reliable service may be able to sustain significant tariff increases in the long term. For those routes that generate a farebox recovery that is greater than 100%, there is scope to reduce tariffs and hence, some routes in the table below exhibit a decrease in the tariff in order to achieve a 100% farebox recovery. The flexibility to reduce tariffs while generating a farebox recovery that is at least 100% is important because in a nascent market, reducing tariffs in order to attract ridership may be necessary.

Table 6-18: Tariff that Delivers 100% Farebox Recovery per Route

Route	Stated Tariff (Naira)	Tariff that makes Farebox Recovery = 100% (Naira)	Percentage Increase/Decrease
Marina – Liverpool – Ijegun Egba – Ebute Ojo	2,622	1,374	-47.6%
Liverpool – Falomo	1,063	783	-26.3%
Marina – Ikorodu	1,044	1,225	17.3%
Falomo – Badore	860	581	-32.4%
Badore – Ijede	1,862	518	-72.2%
Ikorudu – Falomo	451	1,380	206.0%
Oworonshoki – Ikorodu	364	785	115.7%
Marina – Oworonshoki	149	954	540.6%
Mile 2 – Marina	255	1,126	341.7%
Mile 2 - Falomo	595	1,306	119.5%
Ebute Oro - Ikorodu	267	1,245	366.4%

Source: CPCS Analysis

6.5 Developing a Strategy to Harness PSP

6.5.1 Project Sequencing – Phase I

This section covers our proposed approach to jump-starting the development and operationalization of LASG passenger ferry service. The approach focuses on the **selection of one route in Phase I** towards developing a 'proof of concept' for passenger ferry services. Phase I is aimed at achieving the following objectives in the sector:

1. In the short term, to build a track record including ridership and tariff levels as well as the potential for other commercial opportunities (e.g., commercial developments at terminals and/or freight ferry services) to cross-subsidize passenger ferry operations (especially for those routes where farebox recovery is significantly below 100% per Table 6-17)

2. In the medium-to-long term, to leverage the track record and lessons learnt in Phase I in order to more readily transfer risk in the development and operationalization of remaining routes with PSP (e.g., through Build-Operate-Transfer schemes that are 'at-risk' or with Government guarantees).

To arrive at the preferred route that forms Phase I, the following routes were short-listed for further analysis. Short-listing was based on the criteria that a given route should have a farebox recovery rate that is greater than 100% (see Table 6-17):

1. Marina – Liverpool – Ijegun Egba – Ebute Ojo
2. Liverpool – Falomo
3. Falomo – Badore
4. Badore – Ijede

Since all the above routes exhibit a farebox recovery rate that is greater than 100%, the following conclusions can be made:

1. As the farebox recovery is greater than 100% for those four routes, this does away with the need for the Government to provide operational subsidies; and
2. Per Table 6-18, there is scope for the tariffs associated with the four routes to be revised downward while still achieving a farebox recovery of at least 100%. This provides flexibility in setting tariffs that can balance users' 'ability to pay' with operational cost recovery. This flexibility does not exist for the other lines.

6.5.2 Unlevered Financial Analysis

Prior to arriving at a framework for selecting the preferred route for Phase I (out of the four short-listed in the previous section), it is first useful to analyze the financial viability of each of the short-listed routes as whole (i.e., in terms of ferry acquisition and operations as well as terminal development and operations). This will help determine the form of financial structuring required in Phase I:

1. Government's upfront subsidy and recurring financial participation in the project;
2. Commercial debt and;
3. Duration of the PSP.

This type of analysis, referred to as an unlevered financial analysis, tests if cash flows (internally generated) for each of the short-listed routes are sufficient to provide a reasonable level of return on the capital investment required to implement and maintain the selected route in Phase I.

What constitutes a reasonable level of return depends on who is making the investment (in this case, Government or the private sector) and if the return thresholds meet objective investment criteria and standards. For the purposes of this analysis, the return threshold is set at 10% (in US Dollar terms).

The goal of this analysis is ultimately to derive the project cash flows over the forecast period. The cash flows are calculated using a buildup approach, based on the following steps:

1. Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA) is calculated for each year of the forecast period;

2. Earnings before Interest and Taxes (EBIT) is calculated by deducting depreciation from each year's operating profit or loss;
3. Utilizing the EBIT figure, corporate taxes are calculated for each year in the forecast period. The total of corporate taxes are summed in order to reduce EBITDA commensurately for each period;
4. Changes in Working Capital are added back to EBITDA;
5. Capital Investment is deducted from EBITDA;
6. The Terminal value[86] (only applies for the final year of the forecast period) is added back to the respective EBITDA figure; and
7. A yearly cash flow figure is derived based on the above steps.

Table 6-19 and Table 6-20 provide summaries of total capital outlays required for each of the short-listed routes, including ferry terminal development costs and ferry vehicle purchase costs. For the unlevered analysis, a 10-year operating period, 100-seater vessel capacity and target headway of 15-minutes are assumed.

[86] The Terminal Value represents all cash flows that occur so far into the future (i.e. following the project period) that it would not be practical to forecast them. For the purposes of this analysis, the Terminal Value represents the value of the project at the end of the project period and is estimated as the net book value of assets.

Table 6-19: Land Acquisition and Terminal Development Costing Summary (2018 prices)

Route	Land Acquisition (USD 000)	Land Acquisition (NGN 000)	Terminal Development including Equipment and Pre-Operating Expenses (USD 000)	Terminal Development (NGN 000)	Total Cost (USD 000)	Total Cost (NGN 000)
Marina – Liverpool – Ijegun Egba – Ebute Ojo	21,796	7,846,560	10,096	3,634,560	31,892	11,481,120
Liverpool – Falomo	2,904	1,045,440	2,421	871,560	5,325	1,917,000
Falomo – Badore	0	0	2,887	1,039,320	2,887	1,039,320
Badore – Ijede	198	71,400	5,308	1,910,880	5,506	1,982,160

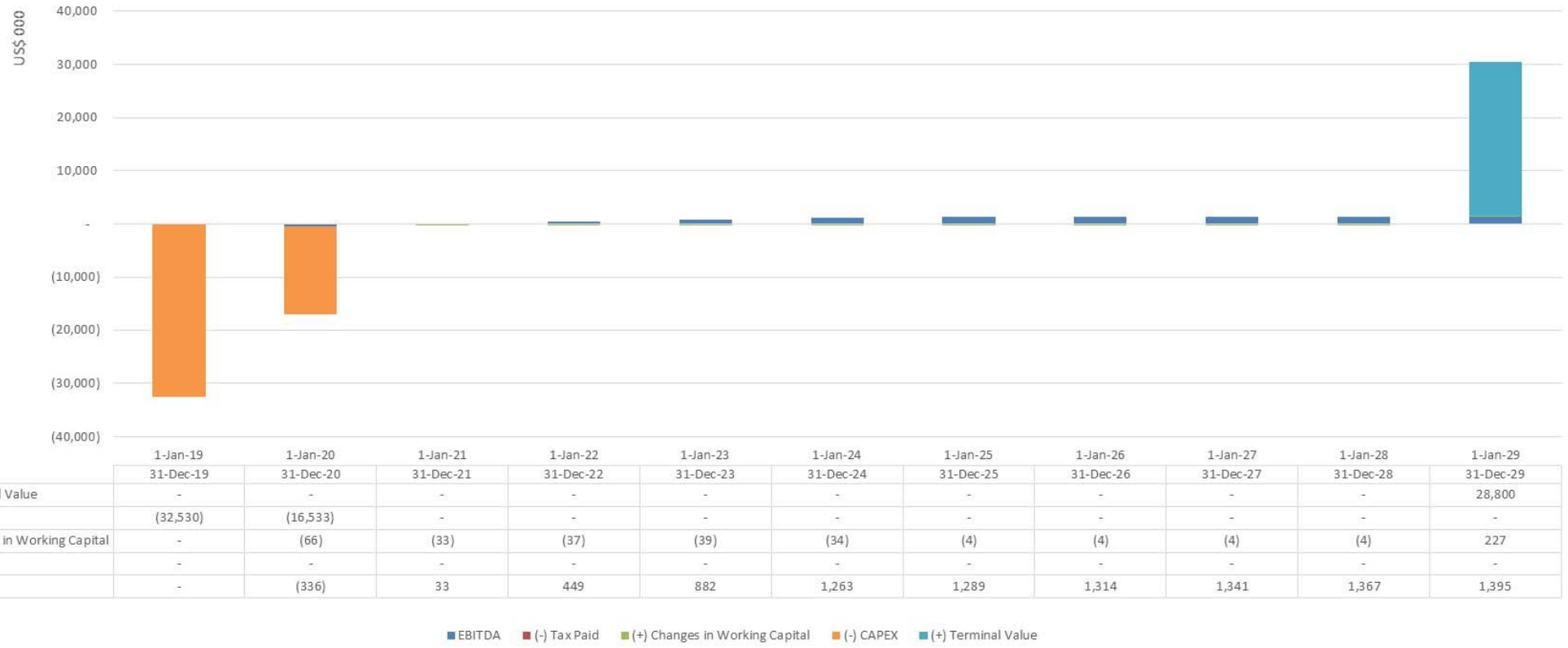
Source: CPCS

Table 6-20: Ferry Purchase Capital Costing Summary (2018 prices)

Route	Number of Vessels Required to Achieve 15-minute Headway	100-seat Capacity Vessels including Pre-operating Expenses (USD 000)	100-seat Capacity Vessels including Pre-operating Expenses (Naira 000 per vessel)	Ferry IT Equipment (USD 000)	Ferry IT Equipment (Naira 000)	Ferry Equipment (USD 000)	Ferry Equipment (Naira 000)
Marina – Liverpool – Ijegun Egba – Ebute Ojo	12	15,120	5,443,200	50.6	18,216	720	259,200
Liverpool – Falomo	7	8,820	3,175,200	50.6	18,216	420	151,200
Falomo – Badore	12	15,120	5,443,200	50.6	18,216	720	259,200
Badore – Ijede	5	6,300	2,268,000	50.6	18,216	300	108,000

Source: CPCS

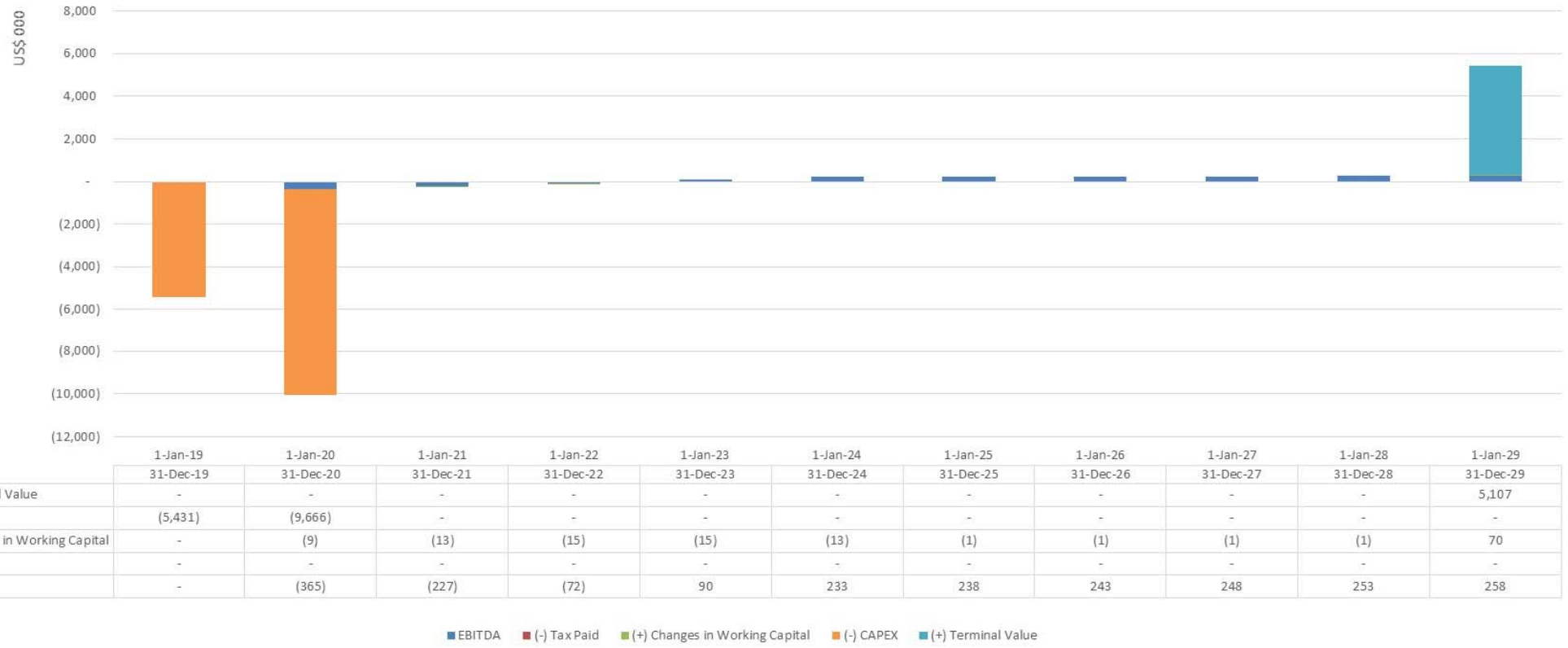
Figure 6-13: Unlevered Cashflow Profile of Marina – Liverpool – Ijegun Egba – Ebute Ojo Route



	1-Jan-19	1-Jan-20	1-Jan-21	1-Jan-22	1-Jan-23	1-Jan-24	1-Jan-25	1-Jan-26	1-Jan-27	1-Jan-28	1-Jan-29
	31-Dec-19	31-Dec-20	31-Dec-21	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26	31-Dec-27	31-Dec-28	31-Dec-29
(+) Terminal Value	-	-	-	-	-	-	-	-	-	-	28,800
(-) CAPEX	(32,530)	(16,533)	-	-	-	-	-	-	-	-	-
(+) Changes in Working Capital	-	(66)	(33)	(37)	(39)	(34)	(4)	(4)	(4)	(4)	227
(-) Tax Paid	-	-	-	-	-	-	-	-	-	-	-
EBITDA	-	(336)	33	449	882	1,263	1,289	1,314	1,341	1,367	1,395

Source: CPCS

Figure 6-14: Unlevered Cashflow Profile of Liverpool – Falomo Route



	1-Jan-19	1-Jan-20	1-Jan-21	1-Jan-22	1-Jan-23	1-Jan-24	1-Jan-25	1-Jan-26	1-Jan-27	1-Jan-28	1-Jan-29
	31-Dec-19	31-Dec-20	31-Dec-21	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26	31-Dec-27	31-Dec-28	31-Dec-29
(+) Terminal Value	-	-	-	-	-	-	-	-	-	-	5,107
(-) CAPEX	(5,431)	(9,666)	-	-	-	-	-	-	-	-	-
(+) Changes in Working Capital	-	(9)	(13)	(15)	(15)	(13)	(1)	(1)	(1)	(1)	70
(-) Tax Paid	-	-	-	-	-	-	-	-	-	-	-
EBITDA	-	(365)	(227)	(72)	90	233	238	243	248	253	258

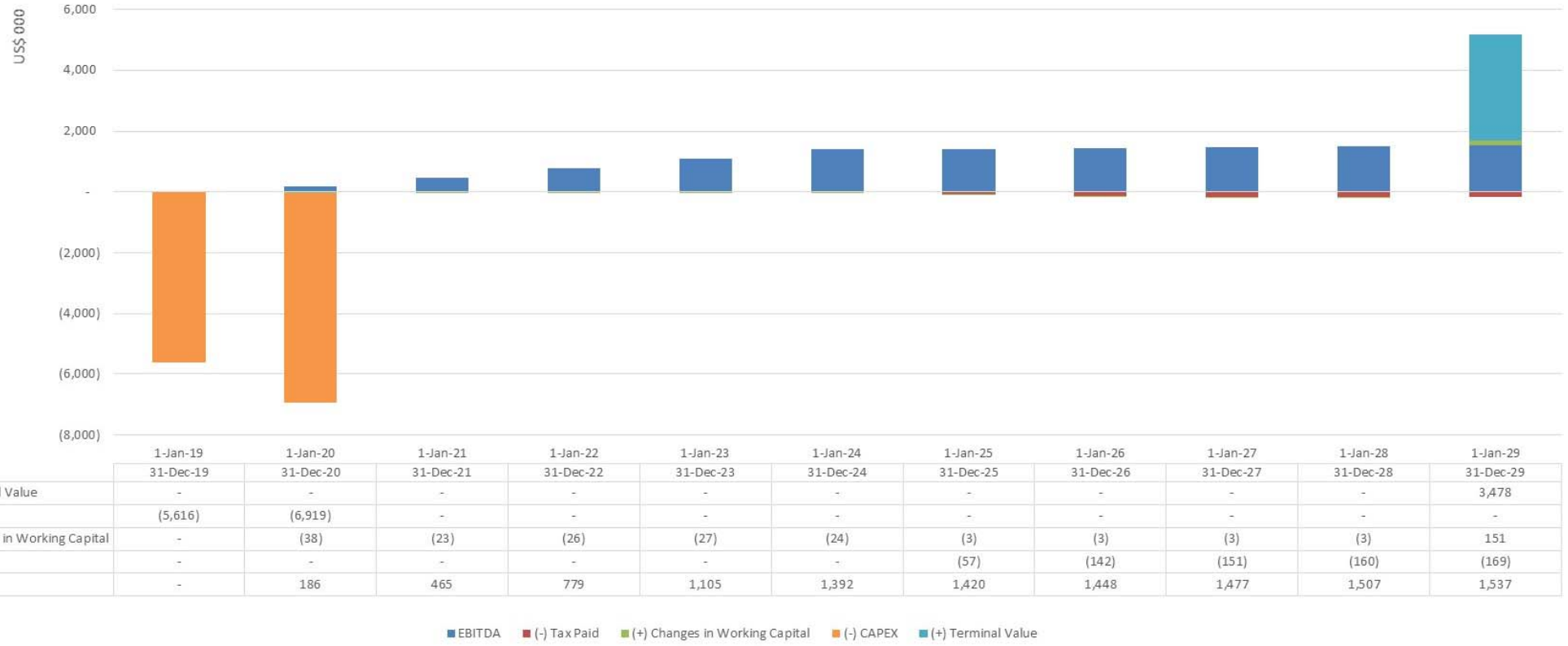
Source: CPCS

Figure 6-15: Unlevered Cashflow Profile of Falomo – Badore Route

	31-Dec-19	31-Dec-20	31-Dec-21	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26	31-Dec-27	31-Dec-28	31-Dec-29
(+) Terminal Value	-	-	-	-	-	-	-	-	-	-	3,059
(-) CAPEX	(2,945)	(16,533)	-	-	-	-	-	-	-	-	-
(+) Changes in Working Capital	-	(60)	(12)	(13)	(14)	(12)	(2)	(2)	(2)	(2)	120
(-) Tax Paid	-	-	-	-	-	-	-	-	-	-	-
EBITDA	-	(297)	(188)	(65)	64	178	182	185	189	193	196

Source: CPCS

Figure 6-16: Unlevered Cashflow Profile of Badore – Ijede Route



	31-Dec-19	31-Dec-20	31-Dec-21	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26	31-Dec-27	31-Dec-28	31-Dec-29
(+) Terminal Value	-	-	-	-	-	-	-	-	-	-	3,478
(-) CAPEX	(5,616)	(6,919)	-	-	-	-	-	-	-	-	-
(+) Changes in Working Capital	-	(38)	(23)	(26)	(27)	(24)	(3)	(3)	(3)	(3)	151
(-) Tax Paid	-	-	-	-	-	-	(57)	(142)	(151)	(160)	(169)
EBITDA	-	186	465	779	1,105	1,392	1,420	1,448	1,477	1,507	1,537

Source: CPCS

Figure 6-13 to Figure 6-16 provide the unlevered cash flow profile of each of the four short-listed routes from the previous section. Table 6-21 presents the net present value (discounted at 10%) of each of the short-listed routes.

Table 6-21: Net Present Value Summary of Short-listed Routes

Short-listed Route	NPV (US 000)
Marina – Liverpool – Ijegun Egba – Ebute Ojo	(29,040)
Liverpool – Falomo	(10,963)
Falomo – Badore	(15,202)
Badore – Ijede	(4,276)

Source: CPCS

While the proposed tariff for ferry operations is sufficient to cover related ferry operating costs for the short-listed routes, the profitability of ferry operations is eroded due to the significant upfront capital costs required for land acquisition, terminal infrastructure and ferry vessels, as well as operating losses at the terminals that service the routes.

6.5.3 Key Conclusions from Unlevered Analysis

Based on the results in Table 6-21, we view that at a minimum, land acquisition and terminal development should be the responsibility of Lagos State in Phase I. Furthermore, a management contract for both the terminals that service the selected route in Phase I should be considered. Consideration should be given to placing mechanisms in the management contract that incentivize the manager to (1) source and establish revenue streams (e.g., advertising and commercial development) and (2) maximize these revenue streams. Once revenue streams at the terminal materialize and there is a sufficient track record, more 'at-risk' terminal development with private sector participation can be considered in Phase II.

6.6 Route Selection in Phase I

The economic analysis clearly demonstrates that ferry services deliver a positive EIRR, and hence provides a justification for public investment in the sector. However, our unlevered financial analysis clearly demonstrates that operating cash flows (EBITDA) are not sufficient to cover capital investment, thereby needing public investment. This section concludes the selection of the preferred route for Phase I based on the short-listed routes presented above.

With Government's investment on the terminal side known based on the key conclusions in the unlevered financial analysis, the selection of the preferred route now aims to minimize any further investment from Government.

Towards minimizing any further investment from Government in Phase I, the approach to determining the preferred route first assumes that the private sector will be responsible for ferry acquisition for each of the short-listed routes. From there, the level of subsidy that may be

required to ensure viability, and specifically, to achieve the private sector's assumed equity hurdle rate (18% in the case where ferries are acquired by the private sector) is estimated. The route that produces the lowest subsidy becomes the preferred route.

Table 6-22: Summary of Farebox Recovery and Gap Funding for Short-listed Routes

Short-listed Route	Farebox Recovery	Present Value of Gap Funding that Achieves a Private Sector Equity Hurdle Rate of 18% (USD 000)
Marina – Liverpool – Ijegun Egba – Ebute Ojo	191%	**8,112**
Liverpool – Falomo	136%	**6,755**
Falomo – Badore	148%	**11,714**
Badore – Ijede	360%	**-948**

Source: CPCS

Table 6-22 summarizes the present value of gap funding that is required per short-listed route in order to achieve the private sector's equity hurdle rate. For interest, the farebox recovery calculated previously is also presented again. Note that except for the Badore-Ijede line, ferry operating income is not sufficient to cover the upfront cost of vessel acquisition and provide an equity rate of return that is 18%.

In the case of the Badore – Ijede route, revenues (based on the ferry tariff calculated in Appendix G) not only cover operating and vessel acquisition, but also provide a return that is greater than 18%. Thus, there is scope for concession fees to be paid to Government for this particular route. However, the payment of concession fees should be considered as a long term objective given the level of maturity that is required of the sector.

6.6.1 Key Conclusions Ferry Subsidy Analysis

In order to minimize the Government's financial contribution in Phase I (beyond what is already required in terms of terminal development and operations), the **Badore – Ijede route should be selected**.

6.6.2 Phase I Analysis

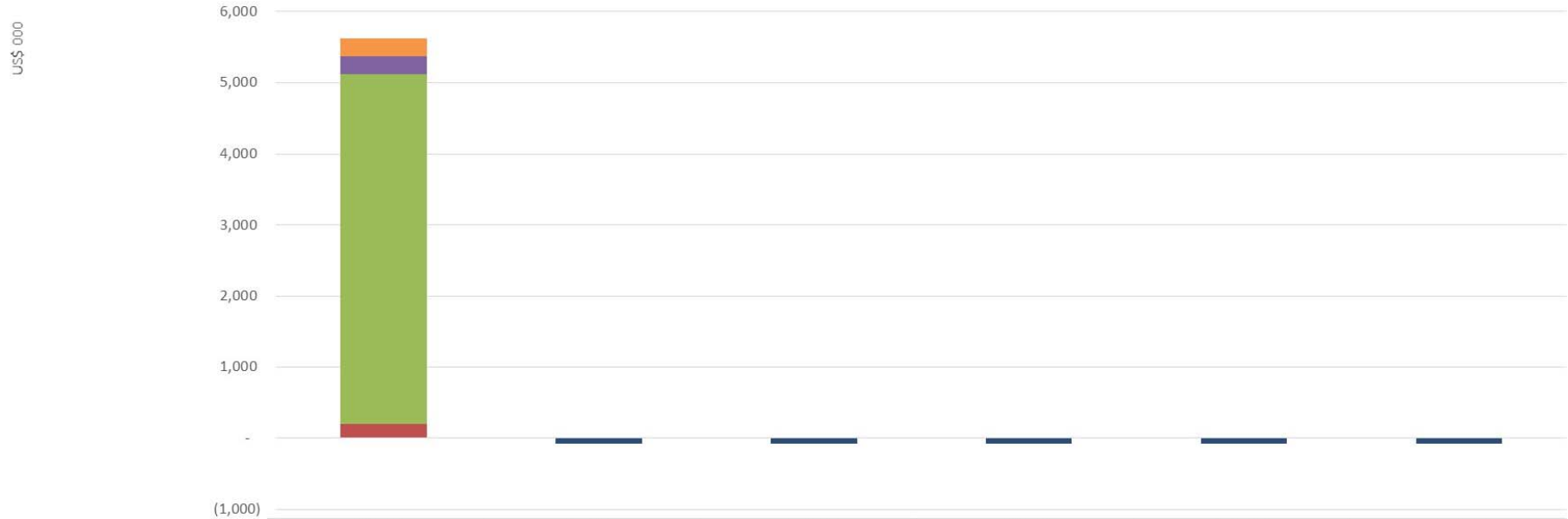
In Phase I, we recommend that a private operator be engaged on an O&M concession basis, and be responsible for vessel acquisition and operations while also taking demand risk. We recommend a contract duration of five years and to set the floor for ferry acquisition (responsibility of the private sector) to at least two 100-seater capacity vessels[87]. A minimum is set so as to achieve at least a head-way of 30 minutes for the Badore – Ideje route.

[87] Noting that the demand for ferry services still remains largely uncertain, we would recommend not imposing a floor for vessel acquisition beyond two, 100-seater ferries. However, bidding documents can leave it open to the bidders to suggest the ideal number of ferries with those bidders suggesting more than two ferries scoring higher in a bid evaluation relative to bidders that only propose the minimum ferry requirement.

Figure 6-18 summarizes Government's total financial outlays in Phase I (namely land acquisition and terminal development). Our analysis suggests that a concession fee may be payable to the Government during the five year operating period. However, we also note that it only takes a 1.4% reduction in the tariff for yearly concession fees to become zero. In the interest of attracting ridership, collecting concession fees should not be an objective in Phase I.

At the end of the five-year contract period, we reckon that a contract extension could be provided should Phase I be deemed successful. As our analysis does not assume the Government taking ownership of the vessels following the five year contract duration (which would require compensating the private operator should an extension not be granted or accepted) we recommend affording the private sector flexibility in continued ferry ownership following the contract period (though this can certainly be negotiated). The rationale for this flexibility is to allow the private operator to recoup some of its upfront vessel acquisition costs by selling the ferries following the five-year contract period should an extension not materialize.

Figure 6-17: Government's Total Financial Outlays in Phase I



	31-Dec-19	31-Dec-20	31-Dec-21	31-Dec-22	31-Dec-23	31-Dec-24
Annual Viability Gap Funding (Concession Fee)	-	(78)	(78)	(78)	(78)	(78)
Pre-Operating Expenses	246	-	-	-	-	-
IT Infrastructure	-	-	-	-	-	-
Furniture, Fixtures and Equipment	246	-	-	-	-	-
Terminal Infrastructure	4,922	-	-	-	-	-
Land Acquisition	202	-	-	-	-	-
Ferry Purchase	-	-	-	-	-	-

6.6.3 Phase II

Phase II should see the operationalization of the remaining routes that exhibited a farebox recovery rate of more than 100%. They are:

1. Marina – Liverpool – Ijegun Egba – Ebute Ojo
2. Liverpool – Falomo
3. Falomo – Badore

It should be noted that Phase II does not necessarily have to commence following the five-year Phase I period. Rather, it should commence once the following principles are achieved in Phase I towards regularizing the sector:

1. Favourable public awareness to the sector and reversal of current user apathy (i.e., potential users see the value in ferry services based on safety, regularity and reliability) ; and
2. A positive track record with respect to the demand for ferry services in Phase I so as to attract private sector participation in Phase II.

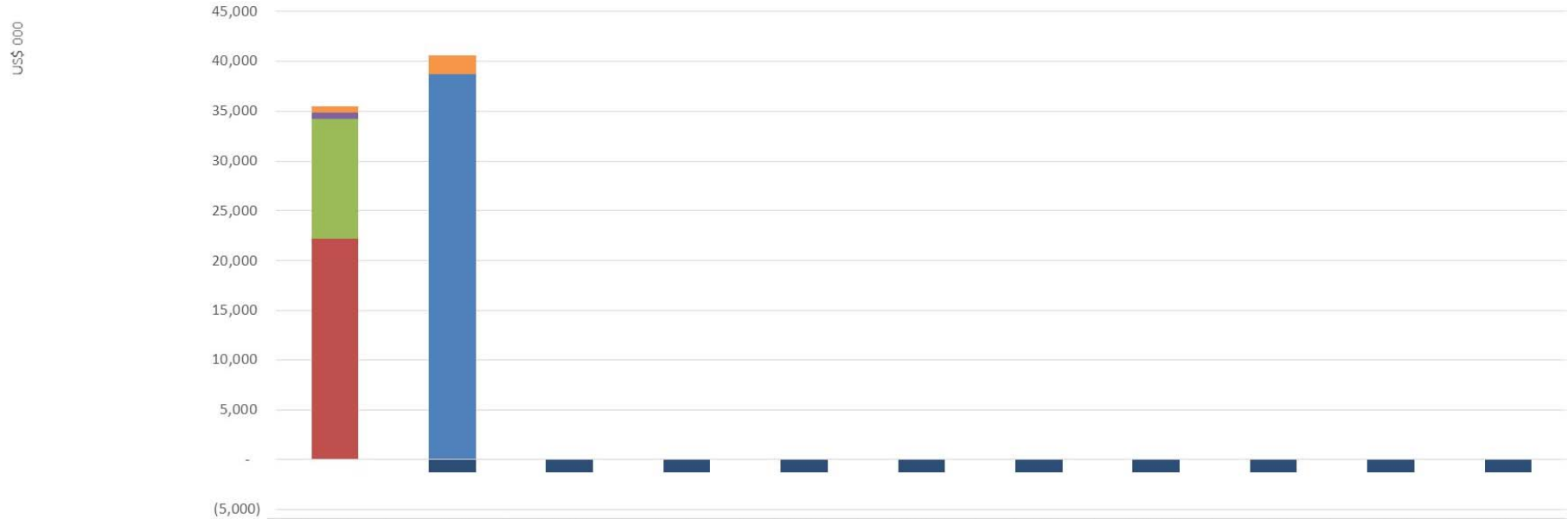
As mentioned in Section 6.6, though the Badore-Ijde route has passenger tariffs that can sustain vessel acquisition, the same cannot be said for the remaining three routes based on the tariff estimates per Appendix G. Thus, vessel acquisition, in addition to land acquisition and terminal development would remain with Government. Both the terminals and vessel operations would then be concessioned to the private sector on a long term basis, with the private sector taking demand risk[88].

The number of vessels to be required per route would depend on demand at the time Phase II is implemented. However, vessel acquisition could be phased towards achieving the long term headway targets of 15 minutes during peak periods with vessels that have a 100-seat capacity.

Figure 6-18 and Figure 6-19 summarize the Government's outlays in Phase II assuming a long term headway target of 15-minutes during peak periods with vessels that have a 100-seat capacity (Table 6-20 summarizes the number of vessels required per route to achieve this long-term target). Assuming a 10-year operating period, there is scope for Government to collect concession fees in order to offset upfront capital costs. This is reflected in Figure 6-18 and Figure 6-19 as negative numbers as they are cash inflows to Government.

[88] The private sector's ability to take on demand risk with respect to terminal management would be ascertained based on related outcomes in Phase I as it relates to managing the terminals at Badore and Idje.

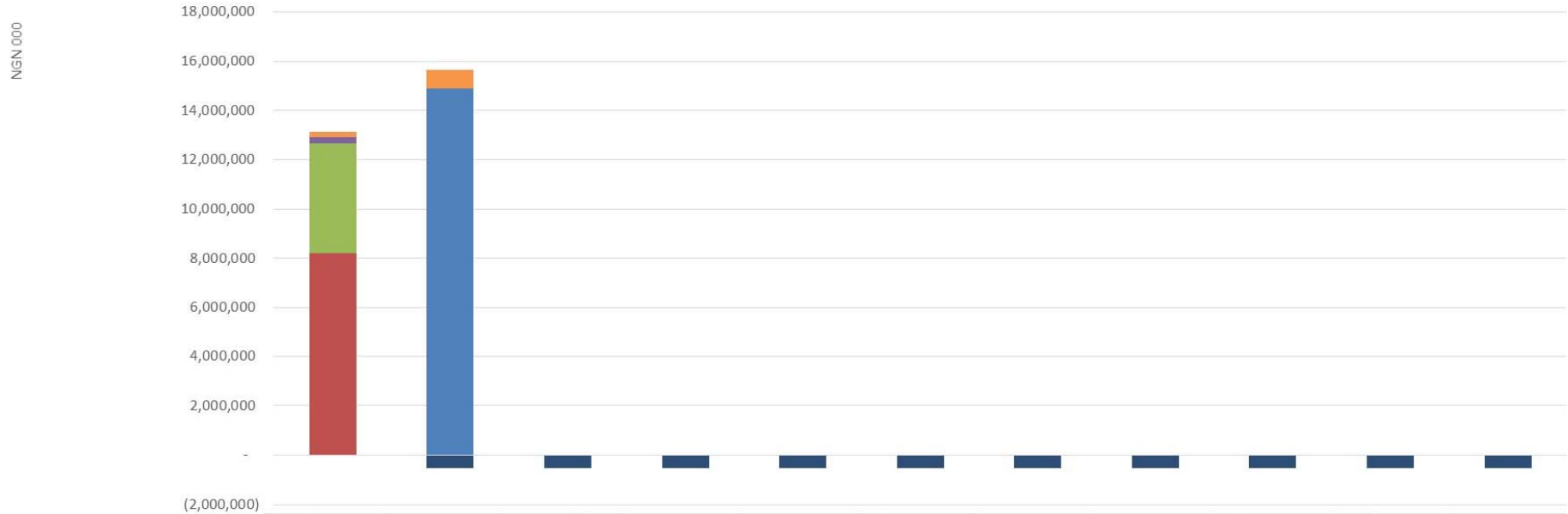
Figure 6-18: Government's Total Financial Outlays in Phase II (US$ 000)



	31-Dec-19	31-Dec-20	31-Dec-21	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26	31-Dec-27	31-Dec-28	31-Dec-29
Annual Viability Gap Funding (Concession Fee)	-	(1,303)	(1,303)	(1,303)	(1,303)	(1,303)	(1,303)	(1,303)	(1,303)	(1,303)	(1,303)
Pre-Operating Expenses	602	1,935	-	-	-	-	-	-	-	-	-
IT Infrastructure	-	-	-	-	-	-	-	-	-	-	-
Furniture, Fixtures and Equipment	602	-	-	-	-	-	-	-	-	-	-
Terminal Infrastructure	12,039	-	-	-	-	-	-	-	-	-	-
Land Acquisition	22,232	-	-	-	-	-	-	-	-	-	-
Ferry Purchase	-	38,703	-	-	-	-	-	-	-	-	-

Source: CPCS

Figure 6-19: Government's Total Financial Outlays in Phase II (NGN 000)



	31-Dec-19	31-Dec-20	31-Dec-21	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26	31-Dec-27	31-Dec-28	31-Dec-29
Annual Viability Gap Funding (Concession Fee)	-	(501,657)	(508,172)	(508,172)	(508,172)	(508,172)	(508,172)	(508,172)	(508,172)	(508,172)	(508,172)
Pre-Operating Expenses	222,728	745,030	-	-	-	-	-	-	-	-	-
IT Infrastructure	-	-	-	-	-	-	-	-	-	-	-
Furniture, Fixtures and Equipment	222,728	-	-	-	-	-	-	-	-	-	-
Terminal Infrastructure	4,454,555	-	-	-	-	-	-	-	-	-	-
Land Acquisition	8,225,676	-	-	-	-	-	-	-	-	-	-
Ferry Lease Payment	-	14,900,609	-	-	-	-	-	-	-	-	-

Source: CPCS

6.7 Next Steps Towards Implementing Phase I

The next step for the development of that route under a PSP are to establish the conditions for an O&M concession (5 years, renewable) on the Badore-Ijede route in Phase I. Actions required, beyond the legal and institutional issues identified in the accompanying report, are as follows:

- Conduct detailed and targeted market sounding to confirm private sector interest (and degree of risk transfer) for the identified route in Phase I. Receive targeted feedback on vessel specifications, service levels, etc.
- Finalize preliminary design and estimates for terminals (and vessels, as required);
- Secure public funding for capital investments (terminals and, potentially, vessels[89]);
- Prepare tender documents for an O&M concessionaire assuming demand risks. KPI would focus primarily on frequency, reliability and safety of service. Bidders' business plans would indicate their proposed requirements and assumptions for modifications to terminals based on initial specifications in the tender document.

Once the infrastructure and service is in place in Phase I, developing the other routes identified in Phase II would become easier. In particular, certainty around the requirement for an operational availability payment would be better defined and the model for both terminal and vessel operations could be adjusted to expose the private sector to more or less risk.

6.8 Options for Ferry Freight Transport

Transporting freight traffic presents an opportunity for Government to subsidize passenger services on the less commercially viable routes. Presently in Lagos, the majority of the freight traffic originates out of the Lagos and Tin Can Island ports complex. Traffic that is anchored[90] to the Lagos region has a final destination clustered around the port area (e.g. bulk salt and sugar for refineries, clinker for cement and wheat for the various flour mills, etc.). Other freight traffic traveling outside of Lagos uses the main freight corridors (LAKAJI and Lagos – East) out of the State. An estimated 10,000+ trucks travel out of Lagos each day on one of these corridors.[91] Inland water transport for freight traffic could be introduced in two phases, with the initial phase (deployed within the short term) focused on the readily available traffic for capture. In the longer term, where freight transport on Lagos waterways is proven, a more sophisticated service can be deployed. The two phases of are described below.

In the short to medium term, freight ferry operators could help decongest the ports of Apapa and Tin Can and also reduce congestion on Lagos' roads by transporting a portion of cargo leaving the ports for destinations outside of Lagos by the waterways. Due to the ongoing conflict between Lagos State and NIWA with respect to which organization has jurisdictional authority over inland waterways transport in Lagos, any discussion about access to terminals belong to the Nigerian Ports Authority (a Federal Government agency also under the same parent Ministry

89

We understand Lagos State Government has procured 7 vessels for LAGFerry operations. One of these vessels could be dedicated to the Badore-Ijede Phase I PSP if the private sector cannot support ship acquisition.

90 This is traffic arriving in Lagos and being used by industry/consumers within the LMA

91 See Section 3.6 for discussion

as NIWA) will need to involve the Lagos State Governor. Nevertheless, we envision a scenario where Lagos State and the Federal Government could agree to specific quotas of traffic to be transported under LASWA jurisdiction. Traffic would be shipped from the Lagos ports to a central junction for destinations outside of Lagos.

This quota of traffic could be distributed among freight ferry operators with royalties or concession fees paid to LASG, for further transfer to passenger ferry services operators. Since most of the freight traffic traveling out of the port is using one of two corridors that diverge within the vicinity of Ikorodu, we envision a freight route between the Lagos ports area and the Ikorodu docks. It will not be necessary for freight ferry operators to tranship the cargo at terminals as this is likely to increase the CAPEX requirements to provide storage and cargo handling services. Rather ferry operators would provide the shuttle service between the Lagos ports' terminals and the Ikorodu docks. Each eligible operator would transport the volume of cargo subject to a quota. Such a standardized service would allow operators to earn additional revenue without incurring significant capital costs, thus enabling them to generate some margins to cover any revenue shortfalls on the passenger service.

In the medium to long term, when freight transport on the waterways has been proven and LASWA has improved its capacity to regulate passenger and freight transport[92], it will be possible to introduce freight transport service within the LMA. This service could target freight traffic leaving the ports and destined for industrial areas in and around Lagos, including Mile 2, Apapa and the industrial zones in Lagos, including Snake Island, Niger Docks and LADOL. For these services, ferry operators could provide additional storage and cargo handling services (e.g. deconsolidation of bulk traffic and re-packaging into small parcels) requiring infrastructure and equipment at ferry terminals. Intra-State freight water transport services could be introduced on a competitive basis. Ferry operators would be asked to bid competitive for licenses allowing them to solicit freight business from cargo owners, terminal operators and other third party logistics providers (3PLs).

The proposed approaches are summarized in Table 6-23.

Table 6-23: Proposed Approaches to Freight

Short Term	Long Term
1. Lagos State Government negotiate quota for freight transport between Ports and Ikorodu docks/terminal 2. LASWA identifies passenger ferry routes that can be cross-subsidized with freight operations to a to cover OPEX costs (use farebox recovery as screening criteria) 3. LASWA licenses such operators to provide freight services between the Ports and Ikorodu 4. Multiple operators can provide standardized service on the same route, allowing LASWA (and NIWA) to monitor performance	1. Ferry operators submit business plans and proposals for LAWSA licence to operate/provide freight transport services on specific routes 2. LASWA selects strongest business plans and issue operators licenses to provide freight services on chosen routes 3. LASWA monitors and regulates performance of operators in line with submitted business plans

[92] This will also be when the dispute between LASWA and NIWA is resolved

6.9 Risk Analysis

In the long term, after the successful implementation of Phase I, the Government should look to develop a more meaningful form of PSP, where more risk is transferred to the private sector under some sort of BOT arrangement. Table 6-24 highlights the key risks on the Inland Water projects and the potential risk allocation assuming some form of BOT type of arrangement between the private sector and Government.

Table 6-24: Risk Matrix

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
1	**Design Risk**					
1.1	Failure to adequately specify the employer's requirements	Employer's requirements not accurately translated into Tender Documents	*			No
1.2	Continuing development of design/design work not being completed on time	The detail of the design should be developed within an agreed framework and timetable. Failure to do so may lead to additional design and construction costs.		*		Yes, through Contract
1.3	Change in design requirements by the Government and(or) the ferry operator	The Government and(or) the ferry operator may require changes to the design, leading to additional design costs			*	
1.4	Failure to build to brief	Misinterpretation of design or failure to build to specification during construction could lead to additional design and construction costs		*		Yes, through the Contract, careful development of the project brief and ongoing liaison between the Government's agent, Operator's agent and the Contractor's designer will help remove the possibility of misinterpretation of the construction requirements
1.5	Governments' concession programme (Political expediency)	The speed of the Governments' programme leading to design inadequacies if Contractors are required to undertake the completion of the works within a timescale that is unreasonable or shortened	*			This can be eliminated through adequate allocation of time and avoidance of delay at the initial stages and consideration of the use of Early Contractor Involvement (ECI)
1.6	Inaccurate traffic forecasts	Inaccurate traffic forecasts may result in an inaccurate design/resourcing/operating plan	*			The Annual Availability payments will insulate the operator of traffic fluctuations, but will be linked to performance standards

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
1.7	Inadequate liaison with stakeholders	Inadequate liaison may lead to third party requirements or accommodation works being omitted from the employer's requirements			*	Yes, through the contract
1.8	Service objectives not met	Objectives set forth by the service may not be met at satisfactory levels	*			No, but can minimise through careful development of service proposals
1.9	Data availability	Information coming from the Government and their other key stakeholders might be slow		*		Make early contact with all parties; Be prepared to adjust presentation to address shortcomings
1.10	Tender Capacity	There may be lack of tender capacity, or collusion between tenders which may cause an annulment of the tender and time delays in the tender process	*			No
1.11	Construction Costs	Cost estimates to be based on preliminary design which would not be adequate		*		Conduct peer reviews or independent engineer reviews
1.12	Substandard design	The design may have shortfalls in terms of adequate engineering principles and its addressing of problem areas with cost effective engineering solutions		*		Conduct peer reviews or independent engineer reviews
2	**Construction and Development Risks**					
2.1	Incorrect time estimate	The time taken to complete the construction phase may be different from the estimated one		*		Yes, ensure estimate is reasonable and control through the Contract
2.2	Delay in gaining access to the site	A delay in gaining access to the site may delay the entire project (land Acquisition planning & effective implementation)	*			No, but can be minimised through project management

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
2.3	Access to land not available for construction	Access to land for verification surveys or construction of the permanent works may not be available to the whole of the site by the Contract starting date and the water quality improvement measures and dredging may not be completed by the commencement of operations			*	No, but can be minimised through careful forward planning
2.4	Poor coordination with other works	Interference from other third party works may lead to a delay in starting some elements of the permanent works			*	No, but can be minimise through project management and careful liaison
2.5	"Compensation events"	An event of this kind may delay or impede the performance of the contract and cause additional expense			*	No, but can be minimise through Contract and project management
2.6	Force Majeure	In the event of Force Majeure, additional costs will be incurred	*			No
2.7	Contractor Default	In the case of contractor default, additional costs may be incurred in appointing a replacement, and may cause delay		*		Yes, through Contract compensation to the Employer can be defined
2.8	Poor project management	There may be a risk that poor project management will lead to additional costs			*	No but can minimise through careful selection of project management
2.9	Contractor/sub-contractor industrial action	Industrial action may cause the project to be delayed as well as incurring additional management costs			*	No, but can minimise through careful election of reputable contractor and could seek to recover any costs incurred
2.10	Key subcontractor becomes bankrupt	Bankruptcy of a key contractor may lead to a delay until a replacement sub-contractor can be appointed		*		Costs associated with appointing a replacement will be borne by the principal EPC Contractor; Delay damages will be

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
						repaid to the Employer in the event of the works overrunning the allocated time
2.11	Abnormal weather conditions	Excessive periods of inclement weather are normally considered to be compensation events			*	The risk can be transferred with onerous Conditions of Contract but this may lead to higher than anticipated tender prices; Can seek Insurance against such conditions
2.12	Availability of ferry design meeting minimum specifications and other material supply difficulties	There may be difficulties in obtaining customized design or proprietary materials		*		Minimum Specifications to be proposed in generic terms so as to enable both customized design of vessel and off-the-shelf designs to be used
2.13	Material lead times	Estimated lead times on long-lead items may be underestimated		*		No, but may be minimised through careful planning
2.14	Interface between waterside and landside development and operations	Availability and timely delivery of waterside and landside infrastructure, vessels and equipment may not be possible		*		No, but may be minimised through careful planning
2.15	Substandard construction methods	The contractor may use substandard methods of construction which may compromise delivery and quality of project		*		No but may be minimised through careful monitoring
3	**Health and Safety Risk**					
3.1	Contractor does not adhere to current regulations	The Contractor may breach current Health and Safety legislation or accepted codes of practice		*		No, but could impose penalties and charges to the Contractor
3.2	Changes to regulations	Legislation or accepted codes of practice may change during contract period	*			No, but within control of Government

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
3.3	Responsibility for maintaining on-site security	Theft and/or damage to equipment and materials may lead to unforeseen costs in terms of replacing items, and delay		*		
3.4	Responsibility for maintaining site safety	The Construction, Design and Management Regulations and Occupational Safety Health and Safety at Work regulations must be complied with		*		
4	**Environmental**					
4.1	Mitigation does not match environmental objectives	Suggested mitigation measures to alleviate environmental impact of the proposals may not adequately protect the environment as intended and hence may need to be amended leading to time and cost implications			*	No, but can be minimised through careful planning of mitigation measures
4.2	Contamination of water	Accidental contamination of the water may lead to delay in the works during construction or due to leakage of fuel during operations			*	The risk can be transferred with Conditions of Contract; Can seek Insurance against such conditions
5	**Public Inquiry**					
5.1	Number of objections greater than anticipated	Dealing with a greater than anticipated number of objections may lead to additional management costs and delay	*			No
5.2	Protester action	Protester action against the scheme may incur additional costs, such as security costs			*	Yes, can be transferred through the Contract

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
6	**Finance**					
6.1	Failure to obtain adequate funding	Failure to obtain adequate funding may lead to indefinite delay (no financial close)		*		
6.2	Target cost exceeds budget (Budget to include optimism bias)	Tender prices may exceed the pre-tender estimate and allocated budget		*		
6.3	Change in volumes and controlled charges/fares	Traffic shortfalls and price control limit actual revenues.	*			Covered under the availability payments and performance regime in the contract
6.4	Currency / Foreign exchange	Unforeseen fluctuations in currency may change budget costs dramatically		*		
7	**Legislation**					
7.1	Legislative/regulatory change	A change in non-specific legislation/regulations taking effect during the construction phase, leading to a change in the requirements and variations in cost	*			No, but control rests with Government
7.2	Changes in taxation	Changes in taxation may affect the cost of the project			*	No, but control rests with Government
7.3	Changes in the rate of Value Added Tax (VAT) or VAT legislation	Changes in the rate of VAT or VAT legislation may increase the cost of the project	*			No, but control rests with Government
8	**Performance Risks**					
8.1	Latent defects in new build	Latent defects to the new build, which require repair, may become apparent		*		Yes, can be transferred through the Contract

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
8.2	Change in specification initiated by both Government and Operator	There is a chance that, during the construction phase of the project, the Government and the Operator will require changes to the specification			*	No, but can minimise through careful project management and internal coordination
8.3	Maintenance Risk	The risk of not maintaining the assets to the appropriate standards and specifications for the life of the project. Increased maintenance costs due to increased volumes. Incorrect estimates and cost overruns.		*		Contract reporting & monitoring. Performance Bond may be called upon to rectify maintenance shortfalls particularly towards the end of the contract period.
8.4	Meeting hand back requirements	The risk of not maintaining the concession assets, operations, staffing etc. in line with the transfer back requirements at the end of the contract		*		Sound monitoring & control of contract performance by the authority. Performance Bond may be called upon to rectify maintenance shortfalls particularly towards the end of the contract period
9	**Termination Cost Risks**					
9.1	Termination due to default by Government	The risk that the Government defaults, leading to contract termination and compensation for the private sector	*			No
9.2	Default by external funding sources	The risk that the external funding defaults and the project is not completed		*		Yes, through Contract
9.3	Termination due to default by the ferry operator	The risk that the operator defaults and step in rights are exercised by the financiers, but they are unsuccessful, leading to contract termination		*		Government could recover costs for default but would incur additional costs associated with appointing another operator
10	**Technology and Obsolescence Risks**					

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
10.1	Technological change	Technical changes that require Government and Operator to revise their output specifications			*	No
11	**Land Risks**					
11.1	Cost of land	Land costs could be greater than expected	*			No
11.2	Protracted Land Acquisition process	Compulsory purchase/Negotiations/Compensation process delays project and prevents timely financial close	*			No
12	**Statutory Undertaker Risk**					
12.1	Unforeseen STAT's apparatus	The possibility exists that statutory utilities apparatus may be found that will require diversionary works or changes to the design	*			Yes, can be transferred with onerous Conditions of Contract but this may lead to higher than anticipated tender prices
13	**Other project risks**					
13.1	Delayed planning approval	A delay in receiving planning permission may have broader cost implications for the project, as well as the loss of potential savings			*	No, but can be minimised through coordination with different agencies
13.2	Inadequate Resources	Human resources or allocated time may be inadequate for satisfactory project management		*		
13.3	Critical staff appointment / competencies / certification	Difficulty in obtaining the required number of critical staff for efficient operations, and/or inadequate certification obtained		*		

No	Risk Heading	Definition	Public Sector	Private Sector	Shared	Ability to Transfer Risk
13.4	Insufficient project capacity	Possible fatalities or interruptions in operations, or damage to assets			*	No, but can be minimised through internal co-ordination
14	**Political Risk**					
14.1	Political risk	The risk of Government intervention, discrimination, seizure or expropriation of the project. Public sector budgeting.	*			The Contracting Authority typically bears responsibility for political events outside the Private Partner's control.

6.10 Conclusions

This section has presented an economic and financial analysis of a proposal for ferry transport services. The economic analysis clearly demonstrates that for all routes combined, the ferry services are economically viable, and hence there is a justification for public investment in the sector. Our initial financial analysis shows that four of the proposed 11 routes have a farebox recovery that is greater than 100%. Out of these four routes, the Badore – Ideje route is the only one with a farebox recovery rate that is high enough to potentially cover ferry acquisition costs.

Hence it is recommended that the Badore – Ideje route be taken forward and form Phase I of regularizing the State's passenger ferry sesctor. Our financial analysis shows that while the revenue on this route is sufficient to cover the cost of at least two ferry vessels, revenues are not sufficient to cover the capital investment required for the terminal infrastructure. Hence there is a need for LASG to invest in the project. It is recommended that the LASG invests in the land acquisition and terminal infrastructure, the total cost of which is US$5.5 million.

Table 6-25: Public and Private Sector Responsibilities in Phase I

Public Sector	Private Sector

Financial Responsibilities
• Acquire the necessary land at Ideje (US$198K, 71M Naira)
• Procure terminals at both Badore and Ideje (US$5.3M, 1.9B Naira)
• Develop inter-modal access and transfers (last mile connectivity) at Badore (amount to be established separately)[1]
• Engage private sector in a contract to manage the terminals through an open tender. Include incentives to source and maximize revenue streams (~US$345K per annum, ~124M Naira per annum)[2]
• For vessel operations, operational subsidies are not expected
• Assume responsibility for channel management (maintenance dredging, maintenance of aids to navigation and jetties)
Process Responsibilities
• Conducted focused market sounding towards confirming private sector interest (and degree of risk transfer) to operate the route. Also, receive targeted feedback on terminal requirements, vessel specifications, service levels, etc.
• Tender ferry operations on an O&M concession basis
  • Tender documentation should clearly describe minimum service levels
  • Vessel acquisition to remain the responsibility of the private sector
  • Include incentive mechanisms in tender documents and concession agreement towards achieving high operational efficiencies
• Ensure adequate data collection in Phase I towards achieving the following objectives:
	Financial Responsibilities
	• Private operator to acquire at least two 100-seater capacity vessels (US$2.4M, 864M Naira)
	• Maintain adequate working capital to finance operations and maintenance of water transport service
	• Collect tariff revenues to cover route-wise operating expenditures plus a reasonable rate of return (route-wise average operating expenditures over a five-year period are estimated at US$645K per annum or 232M Naira per annum)
	Process Responsibilities
	• In the tendering phase, main responsibilities are (for evaluation purposes):
	  • Clearly describe business plan towards achieving minimum service levels.
	  • Clearly describe vessel specifications and method for acquisition (financing, leasing, etc.)
	  • Propose a viable tariff structure that balances cost recovery with attracting ridership.
	  • Present a staffing plan that clearly shows localization of key personnel for operating and managing the transport service
	• Operate the route based on agreed minimum service levels
	• Work with relevant authorities towards the development of an integrated ticketing system for public transport services (perhaps starting with ferry and feeder services)
	• Full cooperation with relevant authorities regarding data collection and submission

- Provide insights into Phase II route expansion with evidence-based rationale for risk-transfer to the private sector for both terminal and vessel operations
- Objectively enforcing incentive mechanisms (e.g., gain sharing and pain sharing) in the ferry O&M concession
- Work with O&M concessionaires for long term development of integrated ticketing system for public transport services (perhaps starting with ferry and feeder routes)

- Monitor and enforce the O&M concession contract

1. There is a bus stop at Ijede, but signage may be necessary. There is currently little connectivity at Ijede
2. This estimate is based on covering average operating losses at both terminals over a five-year period. Average operating losses are net of average revenues from vessel and passenger handling charges, car park revenues and commercial leases. This amount could be reduced if the terminals are new and maintenance expenses in the first few years are kept to a minimum.

Table 6-26: Public and Private Sector Responsibilities in Phase II

Public Sector	Private Sector
Monetary Responsibilities • Acquire the necessary land at Marina, Liverpool and Ijegun Egba[1] (US$22.2M, 8.2B Naira) • Develop terminals at Marina, Ijegun Egba and Liverpool[2] (US$12M, 4.5B Naira) • Develop inter-modal access and transfers (last mile connectivity) at terminal locations (amount to be established separately) • Engage private sector in a contract to manage the terminals through an open tender. Include incentives to source and maximize revenue streams[3] (annual costing to be determined based on outcomes of Phase I and specifically, accurate and reliable sourcing of terminal revenues) • Procure vessels for Phase II (US$38M, 14.9B Naira)[4,5] • For vessel operations, operational subsidies are not expected	**Monetary Responsibilities** • Collect tariff revenues to cover route-wise operating expenditures plus a reasonable rate of return (route-wise average operating expenditures over a ten-year period are estimated at US$3.4M per annum or 1.2B Naira per annum) • Maintain adequate working capital to finance operations and maintenance of transport services • Remit a concession fee to Government for the use of vessels to operate the routes in Phase II (US$1.3M per annum or 468M Naira per annum)[6] **Process Responsibilities** • In the tendering phase, main responsibilities are (for evaluation purposes): • Clearly describe business plan towards achieving minimum service levels.

Public Sector	Private Sector

• Assume responsibility for channel management (maintenance dredging, maintenance of aids to navigation and jetties)
Process Responsibilities
• Tender ferry operations on an O&M concession basis
  • Tender documentation should clearly describe minimum service levels
  • Include incentive mechanisms in tender documents and concession agreement towards achieving high operational efficiencies
• Ensure adequate data collection so as to provide insights into further route expansion and for enforcing incentive mechanisms in the concession contracts
• Monitor and enforce the O&M concession contract
	• Propose a viable tariff structure that balances cost recovery with attracting ridership.
	• Present a staffing plan that clearly shows localization of key personnel for operating and managing the transport service
	• Operate the route based on agreed minimum service levels
	• Full cooperation with relevant authorities regarding data collection and submission

1. Land already acquired for terminals at Falamo and Ebute Ojo
2. Terminals already developed at Falamo and Ebute Ojo. Terminal at Badore to be developed in Phase I
3. There may be scope to shift terminal construction risk and revenue risk to the private sector. This would be determined based on outcomes of Phase I
4. A total of 31 100-seater vessels would be required to achieve headways of 15 minutes. The number of vessels to be procured may be adjusted based on a better understanding of demand (to be determined in Phase I) and desired service levels
5. There may be scope to shift vessel acquisition to the private sector (to be determined based on developing a track record in Phase I to better understand demand and tariff affordability)
6. If vessel acquisition is shifted to the private sector in Phase II, concession fees owed to the Government would likely be eliminated

7 Recommendations on Way Forward

Our recommended way forward is based on Two Phases:

The following routes are recommended for each Phase, based on the financial analysis.

Route recommended for Phase I:

1. Badore – Ijede

Routes recommended for Phase II:

2. Falomo – Badore
3. Liverpool – Falomo
4. Marina – Liverpool – Ijegun Egba – Ebute Ojo

7.1 Phase I: Badore-Ijede Route

We recommend that the first step of any PSP strategy in the water transport sector should focus on the **Badore-Ijede route**. An O&M concessionaire could, in our view, take-up the revenue risk for vessel operations as well as cover the cost of the ferry vessels. Concession fees, or contribution to terminal development, would however likely be minimal.

This is particularly true given that demand risks are not trivial – the tariff proposed, based on the analysis of alternatives, remains high, and establishing the reliability and quality of the service could take a few months to a year.

The next step for the development of that route under PSP is to establish the conditions for an O&M concession (5 years, renewable) on the Badore-Ijede route in Phase I. The length of the concession could potentially be extended if the financial balance of the project is not met. Another option would be to leave the ownership of the vessel with the private sector at the end of the concession period, thus significantly reducing their risks as the asset could then be repositioned and/or resold. Such details would be defined during the transaction process.

Under such a scheme, the Government would be expected to cover land acquisition costs (estimated at US$198K or 71.4 million Naira) as well as the cost of both terminals (estimated at We US$5.3 million or 1.9 billion naira) as well as ensure their operations and maintenance.

The next step for the development of that route under a PSP are to establish the conditions for an O&M concession (5 years, renewable) on the Badore-Ijede route in Phase I. Actions required, beyond the legal and institutional issues identified in the accompanying report, are as follows:

- Conduct detailed and targeted market sounding to confirm private sector interest (and degree of risk transfer) for the identified route in Phase I. Receive targeted feedback on vessel specifications, service levels, etc.
- Finalize preliminary design and estimates for terminals (and vessels, as required);

- Secure public funding for capital investments (terminals and, potentially, vessels[93]);
- Prepare tender documents for an O&M concessionaire assuming demand risks. KPI would focus primarily on frequency, reliability and safety of service. Bidders' business plans would indicate their proposed requirements and assumptions for modifications to terminals based on initial specifications in the tender document.

Once the infrastructure and service is in place in Phase I, developing the other routes identified in Phase II would become easier. In particular, certainty around the requirement for an operational availability payment would be better defined and the model for both terminal and vessel operations could be adjusted to expose the private sector to more or less risk.

7.2 Phase II: Building the Network

It must be emphasized that if Phase I does not produce the desired financial results, moving to other routes is unlikely to improve the situation. Indeed, while some other routes can cover their operational costs, none can cover both operational costs and ship acquisition costs under current assumptions.

Phase I should inform the next steps in terms of ferry development based on the following findings:

- What is the tariff elasticity of the service between peak and off-peak periods?
- To what extent can the service be sold as a premium service, especially when compared to existing jetty-based boat options?
- Is the private sector optimizing the service in such a way as to improve the viability of other lines?

Last Mile Connectivity

Apart from the enhanced transit experience on ferries, seamless last mile connectivity for passengers to enable transfers to other public transport or private vehicle options is a key consideration. **This requires cohesive action by various agencies including LAMATA and LASWA to work together towards ensuring a seamless passenger transfer experience.**

Only 25% of the terminals for which data was provided, had access to some sort of organized public transport. At jetties visited by the team, we observed that the access roads to ferry terminals were in urgent need of repair and could also benefit from better signage. No interchange facilities to transfer to other public transport was available at the ferry terminals visited. Inter-modal transfers are an important element for all public transport systems, but more so in case of IWT as the terminals tend to be located away from major arterial roads. Safe walkways and transits provided at jetties would enhance the passenger experience and build patronage for the ferry service. This will require close coordination between agencies such as LASWA and LAMATA to provide seamless connectivity

93 We understand Lagos State Government has procured 7 vessels for LAGFerry operations. One of these vessels could be dedicated to the Badore-Ijede Phase I PSP if the private sector cannot support ship acquisition.

- Are the KPIs included in the contracts appropriate to achieve public sector objectives? Do they hamper the flexibility of the private sector unduly, affecting the financial balance of the project?

Based on this, a reassessment of the viability of routes in Phase II could be undertaken, and the appropriate model for PSP chosen. The key question for most routes would be to decide which party is tasked with vessel acquisition. At that stage, the question of vertically integrating terminal and ship operations should also be reassessed, based on the costs faced by LASG for terminal operations and maintenance.

Unless Phase I proves particularly successful, LASG should expect a need for some public investment to cover terminals, but also at least partial vessel acquisition.

Appendix A: List of Stakeholders consulted

S.No.	Name of Agency	Name of Person met	Date
1.	Lagos Metropolitan Area Transport Authority (LAMATA)	1. Abiodun Dabiri, MD, LAMATA 2. Frederic Oladeinde, Director, Corporate and Investment Planning 3. Desmond Amiegbebhor 4. Olasunlami Okusaga 5. Seun Sonoki 6. Atobatele Abidemi 7. Femi Faymbo 8. Omolara Kareem, GIS Specialist	January 15, 2018
2.	Lagos State Waterways Authority (LASWA)	1. Emmanuel Oluwadamilola, MD LASWA 2. Falase Pekun, Secretary 3. Alade Solare 4. Famiyan Ibrahim	January 16, 2018
3.	Office of Overseas Affairs and Investment (Lagos Global)	1. Dr. Kayode Oguntimehin, Permanent Secretary 2. Yinka Lawal, SA Foreign Affairs	January 18, 2018
4.	Ministry of Waterfront Infrastructure Development (MoWID)	1. Engr. R. O. Balogun 2. Abiola A.I 3. Engr. O.A. Akinyele	January 18, 2018
5.	Planet Projects	1. Biodun Otunola, MD/CEO 2. Sola Adepoju, Assistant Project Director 3. Ifeoluwa Afolayan, Assistant Project Director 4. Demola Olawepo, Assistant Project Director	January 18, 2018
6.	Tarzan Marine Enterprise Ltd.	1. Ganiyu Balogun, MD/CEO	January 19, 2018
7.	Seacoach Ferry Service	1. Alaka Bolaji A., General Manager	January 19, 2018
8.	Federal Ministry of Power, Works and Housing	1. Fashola Babalola, Hon. Minister and some other top offcials in the Ministry	January 22, 2018
9.	Federal Ministry of Transport	1. Sabiu Zakari, Permanent Secretary 2. Anthonia A. Ekpa, Director, Road Transport & Mass Transit Administration 3. Sani Umar Galadanchi, Director Maritime Services 4. Alfred Agaba Abah, Deputy Director, Road Transport Administration 5. Gloria K. Ahmed, Deputy Director, Road Transport Administration 6. Okuboere S. Mukah, Assistant Director, Mass Transit Administration	January 23, 2018
10.	Federal Ministry of Finance	1. Ahmed Aliyu, Director, Directorate of International Economic Relations (DIER) 2. Abdulfatah Abdulsalam, Assistant Director, Infrastructure 3. Vivian Nwosu, Assistant Director, Policy	January 23, 2018

S.No.	Name of Agency	Name of Person met	Date
		4. Adesoji Kayode, Senior Admin Officer, Infrastructure	
11.	Office of the Vice President	1. Kolade Sofola, Senior Technical Adviser, TATI 2. Imeh Okon, Senior Special Adviser to President on Infrastructure, TATI 3. Dayo Alao, Senior Technical Adviser, TATI 4. Emmanuel Onwudi, Senior Technical Adviser, TATI	January 23, 2018
12.	National Inland Waterways Authority (NIWA)	1. Mu'azu J. Sambo – General Manager, Lagos 2. Engr. Sarat Lara Braimah – Head of Marine Unit 3. Telema Abbiba Obi 4. Hajia Aisha Eri – Head, Research Planning & Environment	February 12, 2018
13.	LASEPA	1. Engr. D. Antonov, General Manager 2. T. Adeboden, Director (R&D) 3. M. M. Abdul Waseem, Director 4. Omshosho, E. O., CS (CMU) 5. Lewis, G. Adeyami, Lab Services 6. Olaniyan, Michael O., Compliance 7. Amoda OA, Lab Services	February 13, 2018
14.	MOWID	1. Dr. Samuel Babatunde Adejare - Commissioner 2. Engr. Adeniyi O. Abdul - Permanent Secretary	February 13, 2018
15.	Lagos State Ferry Company	1. Kalejaiye Adeboye Paul (Chairman/CEO) 2. Sola Orimoloye (Investment/Business Development Manager	June 29, 2018

Appendix B: List of Secondary Data/reports reviewed

S.No.	Name of Document or Data Reference/Author/Year	Agency/Source
1.	Consultancy Services for the Extension of the Strategic Transport Master Plan (STMP) and Strategic Travel Demand Model (STDM) to Cover the Mega City Region, ALG and Europraxis, December 2014	LAMATA
2.	Development of Bus Route Network for Lagos State - Final Report, integrated transport planning, Ibis Transport Consultants & AEC, April, 2015	LAMATA
3.	Value of Time and Transport Elasticity Study for the Mega City Region - Final Report, Leigh Fischer, May 2015	LAMATA
4.	Study for Development of Public Transport Interchanges, LAMATA, 2018	LAMATA
5.	Lagos Non-Motorized Transport (NMT) policy, 2017	LAMATA
6.	Lagos Mass Transit Alternatives Study, Systra, 2014	LAMATA
7.	Lagos State Transport Statistics, Lagos Bureau of Statistics, 2016	Secondary Research
8.	Lagos State Statistics, Lagos Bureau of Statistics, 2016	Secondary Research
9.	Feasibility Studies for the Development of Ferry Services in the LMA, Royal Haskoning, 2008	LAMATA/LASWA
10.	List of Commercial Routes, LASWA	LASWA
11.	Ferry Ridership Data, compiled by LASWA, 2017	LASWA
12.	Ferry Ridership Data, compiled by NIWA, 2017	NIWA
13.	Status of Ferry Terminals, LASWA	LASWA
14.	Accident Casualty Record 2014 – 2017	LASWA
15.	Standard Agreement with Ferry Operators (tenure 3 years)	LASWA
16.	Concession Agreement with M/s Sifax for redevelopment of ferry terminal at Ebute Ejo, November 2017	LASWA/MoWID
17.	Data on Boat Operators, LASWA	LASWA
18.	Data on Water Operations, LASWA	LASWA
19.	Lagos Investor's Guide, Lagos Global, 2015	Lagos Global/ Online
20.	Existing status of navigation aids installed or proposed to be installed, MoWID	MoWID
21.	Information on dredging programme, MoWID	MoWID

S.No.	Documents specific for Legal Review	Source
1.	Lagos State Transport Sector Reform Law of 2018	Online + LASWA
2.	Lagos State Urban and Regional Planning and Development Law 2010	Online
3.	Lagos State Development Plan 2012- 2025	Online
4.	Lagos State Public Private Partnership Law 2011	Online
5.	PPP Manual for Lagos State	Online
6.	Lagos State Public Procurement Law 2011	Online

S.No.	Documents specific for Legal Review	Source
7.	Lagos State Waterfront Infrastructure Development Law 2009	Online
8.	Nigerian Maritime Administration and Safety Agency (NIMASA) Act 2007	Online
9.	Coastal and Inland Shipping (Cabotage) Act 2003	Online
10.	Lagos State Environmental Protection Agency Law 1996	Online
11.	National Inland Waterways Authority Act	Online
12.	Sifax Agreement for Ferry Terminal Concession at Ebute Ojo	LASWA
13.	Grant OF Approval to operate Ferry Services in Lagos State issued to Ekofan Investment Limited with Ref No. LASWA/MD/FOL/VOL.1/8 dated January 5, 2018	LASWA
14.	CTC of Judgment of the Court OF Appeal in LASWA & Ors. Vs. NIWA & Ors. CA/L/886/2014	NIWA
15.	NIWA Tariff (Revised Edition 2016)	NIWA
16.	Approval for Seacoach Ferries to operate CMS – Apapa ferry route	NIWA
17.	Permit to construct a jetty at Banana Island	NIWA
18.	NIWA Operational Certificate	NIWA
19.	NIWA Operators Permit	NIWA
20.	NIWA Survey Inspection Certificate	NIWA
21.	Data on number of passengers on Lagos waterways (December 2017)	NIWA
22.	Nigerian Ports Authority Act 1999	Online
23.	Land Use Act 1978	Online
24.	Lagos State Safety Commission Law	Online
25.	Lagos State Arbitration Law 2009	Online
26.	Lagos Court of Arbitration Law 2009	Online
27.	Arbitration & Conciliation Act	Online

Appendix C: Questionnaire Template used for the survey

B	Ferry Passenger survey	
1	Name of Ferry Terminal	Origin:_____ and Destination:_____
2	Gender	Male: _____ or Female:_____
3	Occupation (Choose One)	
		Student
		Employed/Worker
		Unemployed
		Businessman/Self-employed
		Professional/Executive
		Government employee
		Others _____
4	Monthly Income (Naira per month)	
		Less than 20,000
		Naira 20,100 - 30,0000
		Naira 30,100 - 45,0000
		Naira 45,100 - 60,0000
		Naira 60,100 - 750000
		Naira 75,100 - 100,000
		Naira 101,000 - 150,000
		Naira 151,000 - 200,000
		Naira 201,000 - 250,000
		Naira 251,000 - 300,000
		Naira 301,000 - 350,000
		Naira 351,000 - 400,000
		Naira 401,000 - 450,000
		Naira 451,000 - 500,000
		Above Naira 501,000
5	Trip Purpose	
		To or from School/College
		To or from Work/Office / Business

B	Ferry Passenger survey	
		Shopping / Leisure/Tourism
		Personal Emergency or one-off trip
		Others _____
6	Trip Origin (Area)	
7	Trip Destination (Area)	
8	Number of transfers (before and after): 1 or 2 or 3 or 4 and above	
9	Cost of transfers (before and after): Naira per trip	
10	Cost of ferry (Naira per trip):	
11	Do you require Park and Ride facility: Yes or No	
	If Yes, for what kind of vehicle:	
	Car	
	Motorcycle	

Appendix D: MoWID Dredging and Nav Aids Programme

The following table describes the ongoing dredging programme and installation of navigation aids.

S.No.	Route Description	Length of Channel/ Length to be dredged (Km)	Average depth to be achieved (meters)	No. of Buoys proposed to be installed	Status
1	Ijede – Badore	6/6	4.0	24	Project approved in 2017 and it is on-going.
2	Baiyeku – Ajah	7/7	4.0	28	Project approved in 2017 and it is on-going.
3	Ebute Ojo – Marina	25/10	4.0	100	Project approved in 2017 and it is on-going.
4	Ijede – Marina	29/16	4.0	116	Project approved in 2017 and it is on-going.
5	Ikorodu – Falomo	23/17	4.0	92	To commence in 2018
6	Mile 2 – Marina	18/6	4.0	72	To commence in 2018
7	Badore to Five Cowries Creeks	25/8	4.0	100	Yet to be approved
8	Ebute Ojo to Irewe	10/4.5	4.0	40	Yet to be approved
9	Oworonsoki to Five Cowries Creeks	17.8/8	4.0	72	Yet to be approved
10	Agboyi- Ketu to Oworonsoki	28/5	4.0	112	Yet to be approved
11	Ikorodu to Oworonsoki/ Ilaje	11/5	4.0	44	Yet to be approved
12	Mile 12 to Agboyi Ketu	3/3	4.0	12	Yet to be approved
13	Ajah to Five Cowries to Marina/ CMS	24/7.5	4.0	96	Yet to be approved
14	Oworonsoki to Ebute- Ero	8/5	4.0	32	Yet to be approved
15	Baiyeku to Langbasa	4.6/4.6	4.0	18	Yet to be approved

Appendix E: Illustrative List of Navigational Aids

List of navigational aids:

- Lateral aids to navigation, used for well-defined channels to indicate the primary channel routes. These aids show the sides of a navigable channel, mark junctions and forks or splits in the channel, indicate the safe side to pass a hazard to navigation, and mark the safe centerline on wide bodies of water;
- Preferred-Channel navigation aids, beacons and buoys that have horizontal bands of both red and green mark the junction of navigable channels. The top-most color indicates the direction of the preferred, or primary, channel;
- Non-lateral navigation aids are the on-the-water versions of the informational, regulatory, and warning signs encountered on the seaway;
- Synchronised lead lighting to highlight the main recommended channel track for high speed passenger craft;
- Bridge navigation pair marks used to indicate safe passage for vessels entering a shallow or dangerous channel, separated in distance and elevation, so that when they are lined up vertically, with one behind the other, they provide a bearing;
- Safe Water Marks, navigation aids used to mark fairways, mid-channels, and offshore approach points that have unobstructed water on all sides;
- Isolated Danger Marks, these navigation aids indicate an isolated danger that may be passed on all sides;
- Range Dayboards, these navigation aids are usually shore-mounted, come in pairs to help the vessel operator maintain a straight and safe course within a navigable channel. Each member of the pair is separated from the next in distance and elevation, with the one in front shorter than the one behind it. When the two appear to be vertically stacked, the vessel is on the range line;
- Information and Regulatory Marks, these orange-and-white navigation aids are used to alert vessel operators to various warnings and regulations; and
- Uniform lighting of jetties along the rivers with fixed blue lights to make it easier for captains to identify the structures at night or in failing light.

Appendix F: Criteria for ferry route selection and prioritization

The detailed parameters and basis for scoring are given below.

Scoring Factor	Max Score	Basis for scoring
I. Potential Demand		
Traffic Estimates	25	20-25: High Potential; 11-19: Medium Potential; <10 low potential
Existing / Proposed Competing projects	15	15: No competing projects; 10: Few Proposed Projects (1-2) 5: Several Existing and Proposed projects (More than 2)
Subtotal Potential Demand	**40**	
II. Time Savings Benefit Analysis (refer Appendix B)	20	20: Positive by more than 50% 10: Positive/Comparable 0: Negative
Subtotal Time Savings	**20**	
III. Navigational Constraints		
Ease of navigation	10	10: Easy to Navigate/ Route already Dredged 5: Siltation, Low Depth, which makes navigation difficult or slow/ Dredging planned 0: Presence of Obstructions such as fishpens
Subtotal, Navigational Constraints	**10**	
IV. Intermodal Access for Passengers		
Road access	5	5: Good; 3: Moderate; 0: Poor
Parking area	5	5: Good; 3: Moderate; 0: Poor
Availability of other Public Transport (PT)	5	5: Access within 500 meter; 3: Access within 1 km; 0: Access to nearest PT mode more than 1 km away
Pedestrian Convenience	5	5: Well lit, paved; 3: Moderate; 0: Poor
Subtotal, Multimodal Access	**20**	
V. Terminal Infrastructure		
Ferry terminal	5	5: Existing terminal can be refurbished 3: Terminal to be redeveloped at existing site 0: Site for new terminal to be acquired
Ease of acquiring right of way	5	5: Owned by LASG, minimum displacement 3: Owned by Private with moderate displacement 0: Owned by Private with High displacement
Subtotal, Terminal Infrastructure	**10**	
Total Score	**100**	

Appendix G: Time Savings Analysis for IWT routes

#	Routes	Navigation Distance	Road Distance	Journey Time using road transport	Journey Time using Ferry incl. transfers	Travel Time Savings	Demand Increase	Potential Fare Increase	Cost of Alternative Mode	Potential base price for ferry Service
		km	km	minutes	minutes	minutes	%	%	%	Naira	Naira
1	Liverpool – Igbo-Elejo	3	12.1	46[94]	23.11	22.89	49.76%	28.37%	47.28%	600	884
2	Marina – Liverpool – Ijegun Egba – Ebute Ojo	26.5		101	86.62						
2.1	Marina – Liverpool	7.25	17.6	116	34.59	66.41	65.75%	37.48%	62.46%	800	1300
2.2	Liverpool – Ijegun Egba	12.75	15.6	81	49.46	66.54	57.36%	32.70%	54.49%	450	695
2.3	Ijegun Egba – Ebute Ojo	6.5	10.2	88	32.57	48.43	59.79%	34.08%	56.80%	400	627
3	Liverpool – Falomo	9.25	15.0	157	40.00	48.00	54.55%	31.09%	51.82%	700	1063
4	Marina – Ikorodu	22.5	44.8	120	75.81	81.19	51.71%	29.48%	49.13%	250	1044
5	Falomo – Badore	23.75	26.4	164	79.19	40.81	34.01%	19.39%	32.31%	650	860
6	Badore – Ijede	5.75	109.0	141	30.54	133.46	81.38%	46.39%	77.31%	1050	1862
7	Osborne – Ikorodu	17.5	36.7	161	62.30	78.70	55.82%	31.82%	53.03%	300	459
8	Ikorodu – Falomo	22.5	41.2	85	75.81	85.19	52.91%	30.16%	50.27%	300	451
9	Oworonshoki – Ikorodu	10.75	24.6	51	44.05	40.95	48.17%	27.46%	45.76%	250	364
10	Marina – Oworonshoki	13.5	16.1	78	51.49	-0.49	-0.95%	-0.54%	-0.91%	150	149
11	Mile 2 – Marina	15	12.4	125	55.54	22.46	28.79%	16.41%	27.35%	200	255
12	Mile 2 – Falomo	17	17.5	70	60.95	64.05	51.24%	29.21%	48.68%	400	595
13	Ebute Ero – Ikorodu	18.5	36.82	101	65.00	5.00	7.14%	4.07%	6.79%	250	267
						Average	**46.5%**		**44.17%**		

[94] Igbo Elojo is on Snake Island. Journey time includes 35minutes travelled by road transport and 11minutes by ferry

Assumptions:

1. To compute ferry trip time, an average cruise speed of 12knots per hour has been assumed.
2. A time of 15 minutes per ferry trip has been added for first and last mile transfers.
3. The time computation for alternative PT mode takes into account idle time due to road congestion and traffic jams.
4. Potential Demand Increase because of Journey Time savings computed based on long run time elasticity of demand viz 0.57[95].
5. Potential Fare Increase (over cost of alternative modes) computed based on long run fare elasticity of demand viz 0.6[96]
6. Passengers on Routes 2, 11 and 12 can use the Blue Line for certain sections of their trips varying between 37% to 62% of their total trip-length. Except in case of Marina – Liverpool stretch of Route 2, the Time Savings would still accrue.

[95] Value of Time and Transport Elasticity Study for the Mega City Region - Final Report, Leigh Fischer, May 2015
[96] *Ibid.*

Appendix H: Navigational and Operational Constraints

The information is based on the detailed hydrographic survey outputs in the Report on Feasibility Studies for the Development of Ferry Services in the Lagos Metropolitan Area.

7.2.1.1 Marine Conditions

- Tides – ranging from 1.0m in the entrance to the Lagoon to 0.5m further inside

  Waves – ranging from a significant wave height (Hs) from some 0.3m to 0.6m on the Lagoon; occasionally higher waves can be encountered during short period of strong winds.

- Currents – generally low with velocities less then 0.5kn (or 0.25m/s) to 1kn (or 0.5m/s). However, stronger currents can be experienced in the western entrance to the Five Cowry Creek

- Wind – generally mild with wind speeds well under 20kn (some 10m/s). Occasionally, stronger winds above 20kn can be encountered.

- Visibility – Good, but during heavy rain storms in the wet season visibility may be (somewhat) reduced. Fog is prevalent during the months of January-March and December in the morning hours (before sun rise) and dissipates around 7am.

7.2.1.2 Height of bridges

S.No.	Bridge Name	Safe Passage Heights (at high tide)
1	3rd Mainland Bridge	10.9 m
2	Carter Bridge	8.9 m
3	Eko Bridge	8.5 m
4	Five-Cowry Bridge (Mekwen)	3.8 m
5	Falomo Bridge	4.2 m
6	Liverpool Bridge	8.0 m
7	Mile 2 Bridge	4.2 m
8	Amuwo / Festac	4.5 m
9	Coconut Bridge (Tin Can Island)	8.8 m
10	Oke Afa Bridge	4.9 m

Source: Royal Haskoning Report on Feasibility Studies for the Development of Ferry Services in the Lagos Metropolitan Area, 2008

Appendix I: Examples of Government aided ferry systems

Provided below are examples of ferry systems across the world which rely on some form of subsidy or payment support from government.

Nature of Subsidies, International Comparators Functioning as Road Links

Route	Operator	Subsidization
Manitowoc - Ludington	SS Badger (Lake Michigan Carferry Service)	Lake Michigan Car Ferry operates the single ferry line. Does not appear to be subsidized. Has been involved in a row with a competitor, the Lake Michigan Express, which received government-backed loan guarantees upon commencing operation in the early 2000s. In 2010 Lake Michigan Carferry applied for stimulus funding to cover the cost of converting to diesel power following an EPA order to stop dumping coal ash into the lake[1]. However, the application was rejected.
Picton - Wellington	Bluebridge (Strait Shipping)	Strait Shipping operates a single ferry line (passenger services branded as Bluebridge). Does not appear to be subsidized. Competes with the Interislander, a ferry service owned by the state rail operator KiwiRail. This latter service was not selected as a competitor because of its significantly faster speed. However, for context, in 2014 its operating expenditure was 25% higher than own-source revenues[2], implying 20% subsidies.
Gedser - Rostock	Scandlines	Scandlines operates three routes across the Baltic Sea. In 2014 the EU Commission rejected anti-competitiveness accusations from Scandlines regarding subsidies and tax benefits to the Fehmarn Belt bridge, which will form a fixed link from Germany to the Danish island of Lolland (providing direct road and rail access to Copenhagen) when it opens in 2021. This link would compete directly with Scandlines's Rødby-Puttgarden route and possibly also Gedser-Rostock.

[1] Milwaukee Journal Sentinel, *Lake Michigan ferry fracas heats up over stimulus application.* Aug 25, 2010
[2] KiwiRail, *2014 Annual Report.*

Route	Operator	Subsidization
		Scandlines does not appear to receive regular state subsidies, although it did receive TEN-T funding to retrofit vessels with exhaust scrubbers[3].
Sassnitz - Trelleborg	Stena Line	Stena AB has one of the largest ferry networks in Europe, as well as a drilling business among other subsidiaries. Stena Line receives subsidies equal to all social security costs and income taxes payable on behalf of employees, for Swedish-flagged vessels employed in international shipping activities. In 2013 the total for ferry operations for Stena Line (including subsidiaries) was SEK 345 million[4], which is 3% of revenues. It is not clear if other subsidies are received.
Dieppe - Newhaven	DFDS Seaways	DFDS has one of the largest ferry networks in Europe, including three English Channel routes. In early 2015, DFDS closed a fourth, the Portsmouth-Le Havre service, citing overcapacity in the English Channel market and falling freight volumes. DFDS took over operation of the Dieppe-Newhaven line from French shipping company LD Lines in 2013, and has continued receiving around € 14 million per year of subsidies from France's Conseil Général de Seine-Maritime. The council launched a new tender in 2014 but there were no winning bids, and DFDS is continuing operations for another year through 2015[5].

Source: CPCS analysis. See relevant footnotes for additional sources

Nature of Subsidies, International Comparators Functioning as Island Routes

Route	Operator	Subsidization
Rohuküla - Heltermaa	Väinamere Liinid (Tuule Laevad)	In 2014, the Estonian government agreed to pay subsidies in the amount of EUR 15.2 million to Väinamere Liinid, the operator of ferry services to Estonia's largest islands (and part of Tuule Laevad)[6]. In late 2014 it was announced the state-owned Port of Tallinn was the winning bidder for a new ten-year contract to operate these ferry services, starting October 2016. The anticipated subsidy over the ten years is 200 million euros, a savings of 60 million compared to the offer by Väinamere Liinid[7].

[3] Scandlines Press Release, *Scandlines receives prestigious Shippax Award*. May 5, 2014
[4] Stena Line AB, *Financial Report, 2013*
[5] Lloyd's Loading List, *MyFerryLink's sole bid for Dieppe-Newhaven service rejected*. February 17, 2014.
[6] Saarte Hääl, *Riik toetab Väinamere laevaliiklust 15,2 miljoni euroga.* September 25, 2013.
[7] Postimees, *Estonian state owned port co wins ferry operator tender.* October 14, 2014.

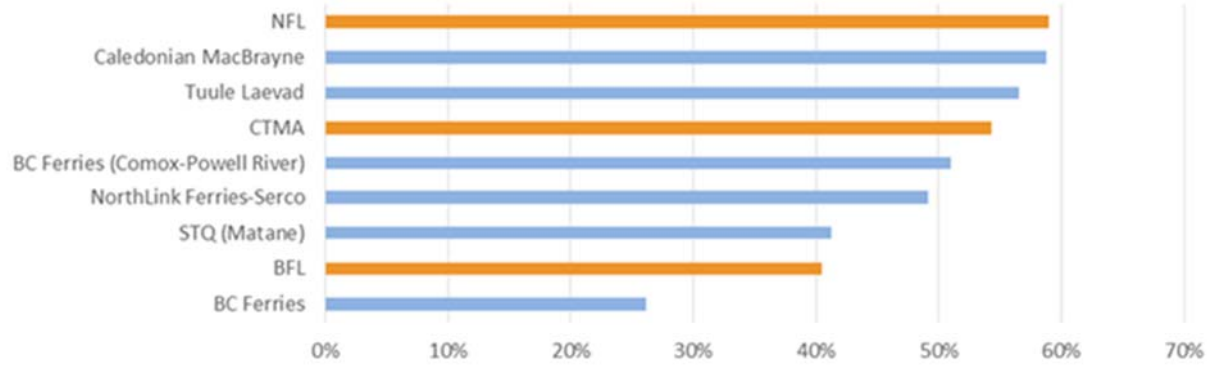
Route	Operator	Subsidization
Eckerö - Grisslehamn	Eckerö Linjen (Rederiaktie-bolaget Eckerö)	Rederiaktiebolaget Eckerö has a number of subsidiaries, including Eckerö Linjen (with services to the Åland Islands), and Eckerö Line (operating between Tallinn and Helsinki). According to its annual report, Eckerö Linjen receives SEK 19 million of state aid to offset seafarers' taxes and social security contributions[8]. However, labour costs are only around one third of own-source revenues; it is not clear to what extent subsidiaries receive additional government subsidies to offset labour costs.
Scrabster - Stromness	NorthLink Ferries (Serco)	NorthLink provides "lifeline" services to Scotland's Northern Isles of Orkney and Shetney. NorthLink's 2012 annual report indicates an annual grant of £ 43 million from the Scottish government, including a £ 2.7 million clawback for efficiencies leading to excess profit[9]. This implies a subsidy level of 61%. In 2012, a 6-year bid to operate NorthLink was won by Serco, a British outsourcing company. Serco's annual reports provide no information about NorthLink's performance, but a yearly statistical review by Transport Scotland indicates NorthLink's subsidy level dropped to 49% in 2013, with own-source revenues having risen and subsidies declined[10].
Uig - Tarbert	Caledonian MacBrayne (CalMac Ferries Ltd.)	CalMac provides "lifeline" access to most of the major islands on Scotland's west coast. CalMac's 2014 annual report lists an annual grant of £ 89 million, including a GBP 1.9 million clawback for efficiencies leading to excess profit. CalMac is a subsidiary of David McBrayne Ltd., a holding company owned by the Scottish Government.
Isle of Man - Heysham	Isle of Man Steam Packet Co. Ltd. – IOMSPCo.	Steam Packet provides access to the Isle of Man. Notably, the ferries to Belfast, Dublin, and Liverpool are all fast ferries, unlike the Heysham ferry. IOMSPCo. is presently owned by Portuguese bank Banco Espirito Santo and is not subsidized: rather, it has a user agreement with the local government guaranteeing a service monopoly in exchange for certain service and frequency levels and price raise caps. The present agreement expires in 2020 with an option to extend to 2026. Citing low airline fares among other factors, the company is looking to

[8] Rederiaktiebolage Eckerö, *Årsredovisning 2013.*
[9] NorthLink Ferries Limited, *Directors' Report & Financial Statements for the Year Ended 31 March 2012.*
[10] Transport Scotland, *Scottish Transport Statistics No 33 2014 Edition, Chapter 9: Water Transport in Scotland*

Route	Operator	Subsidization
		renegotiate parts of the agreement in exchange for committing GBP 50 million in new vessel and infrastructure investment[11].
Killini - Porros	Kefalonian Lines	Kefalonian Lines provides ferry service to the western (i.e. Ionian) islands of Zakynthos, Cephalonia, and Ithaca. Little information is readily available about the ownership structure and subsidy level.
Dénia - Sant Antoni	Baleària (Baleària Eurolíneas Marítimas S.A.)	Baleària provides access to the Balearic Islands (including Mallorca, Menorca and Ibiza) – mostly by fast ferry – as well as a service to Morocco across the Strait of Gibraltar. Baleària as well as its competitors were fined in 2011 by the Spanish National Competition Commission for anticompetitive practices[12]. In early 2015, Baleària indicated their interest in acquiring their major competitor on the Balearic routes, Trasmediterránea[13]. However, their annual statements do not give indications as to any subsidies.

Source: CPCS analysis. See relevant footnotes for additional sources

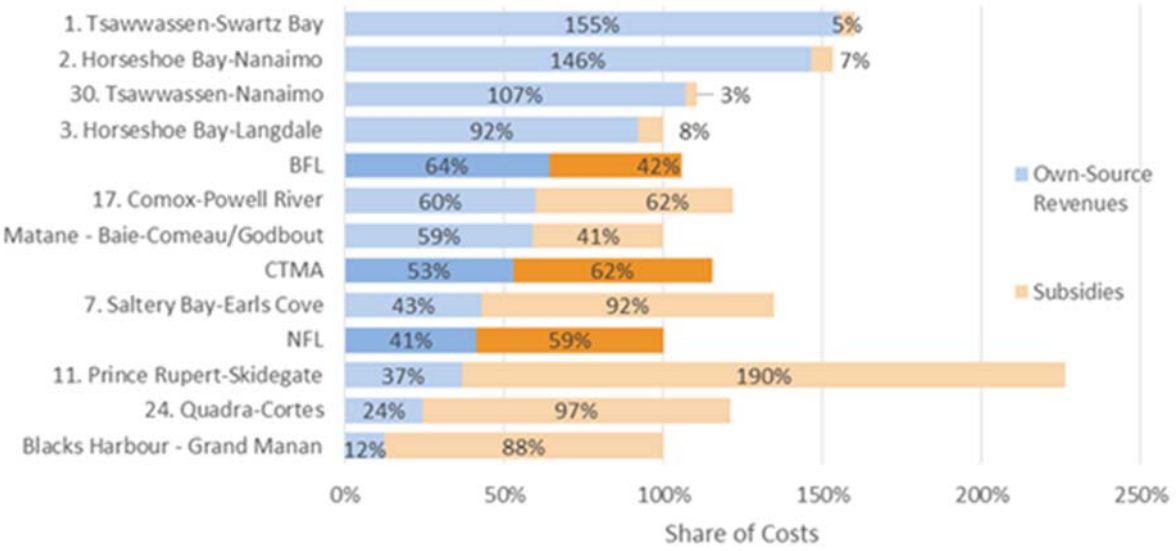
Subsidies as a Percentage of Total Revenues



Source: CPCS analysis.

[11] IOM Today, *Steam Packet commits to £50m investment as negotiations start*. March 21, 2014.
[12] El Mundo, *La CNC multa a Balearia, Europa Ferrys y Förde por participar en un cártel.* November 11, 2011.
[13] Menorca – Local, *Baleària negocia para adquirir la Trasmediterránea,* February 5, 2015.

Example of a Route Level Analysis of Operating Cost Recovery and External Subsidies of ferry routes in North America, 2013-2014



Source: CPCS analysis

Appendix J: Market Sounding audience

S.No.	Industry Association or Investor	Contact Person	Telephone	Email	Nationality of Stakeholder
1.	LASG Company - Lagos State Ferry Company	Mr. Sola Orimoloye, Investment/Business Development Manager	08023081454	Folashade Kalesanwo-folashadek@yahoo.com	Nigerian
2.	LASG Department – Ministry of Waterfront Infrastructure Development (MOWID)	1. Engr. R. O. Balogun 2. Abiola A.I 3. Engr. O.A. Akinyele	08033078199 08093101311 08037133723	rasheedbalogun@yahoo.com;	Nigerian
3.	National Inland Waterways Authority (NIWAI	1. Mu'azu J. Sambo – General Manager, Lagos 2. Engr. Sarat Lara Braimah – Head of Marine Unit 3. Telema Abbiba Obi 4. Hajia Aisha Eri – Head, Research Planning & Environment	07039589067	Niwa_lag@yahoo.com; saratdglogistics@yahoo.com; telabbiba@yahoo.com; ayi_eri@yahoo.com	Nigerian
4.	Association of Tourist Boat Operators (ATBOWATON) Lagos State Chapter	High Chief Wellington Akingbulu	08064179059	No email available	Nigerian
5.	Sifax Group (Current concessionaire for Ebute Ojo Ferry Terminal)	Ibrahim Olugbade	08033271535	ibolugbade@yahoo.com	Nigerian
6.	Crownsworth Marines Development Company Limited (Current concessionaire for Mile 2 Ferry Terminal)	Adeyinka	08054765898	igho@crownsworthmarine.com	Nigerian
7.	Tarzan Marine Enterprise Ltd.	Ganiyu Balogun, Managing Director	08033038511,	Tarzanbalogun@yahoo.com	Nigerian

S.No.	Industry Association or Investor	Contact Person	Telephone	Email	Nationality of Stakeholder
			08077656060, 08064986385		
8.	Seacoach Ferry Service	Alaka Bolaji, General Manager	08030871559	Seacoachferry1@gmail.com	Nigerian
9.	Metro Ferry Marine Services Limited		07029611026, 014619636		Nigerian
10.	Texas Connection Ferries	Afeez Lazeef	08163912461	afeez.lateef@texasconnectionferries.com	Nigerian
11.	Metropolitan Waterways Nigeria (Passenger Boat Services)	Engr Onikoyi	08033258582, 09051248740	metropolitanwaterways@gmail.com	Nigerian
12.	Lagos Jetty (VIP jetty)	aina.vincent@inagbegrandresorts.com	08170885261 08170885223		Nigerian
13.	Daddo Terminal		1 4600595, 1 460 0346		Nigerian
14.	Crystal Petserv Limited		0704 523 4200		Nigerian
15.	Vicoloni And Percee Limited		08065344562		Nigerian

Appendix K: Ferry Terminal Layouts