

The Second Data Collection Survey
on
Mass Rapid Transit
in
the Federal Republic of Nigeria

Final Report

November 2014

Japan International Cooperation Agency (JICA)

Japan International Consultants for Transportation Co., Ltd.

Yachiyo Engineering Co., Ltd.
Chuo Fukken Consultants Co., Ltd.
Mitsubishi Research Institute, Inc.

AFD
JR
14-016

The Second Data Collection Survey
on
Mass Rapid Transit
in
the Federal Republic of Nigeria

Final Report

November 2014

Japan International Cooperation Agency (JICA)

Japan International Consultants for Transportation Co., Ltd.

Yachiyo Engineering Co., Ltd.

Chuo Fukken Consultants Co., Ltd.

Mitsubishi Research Institute, Inc.



Federal Republic of Nigeria



Source: Japan Railway Technical Service, "World Railways Today"

Basic Data of the Federal Republic of Nigeria

Source : Ministry of Foreign Affairs "Regional Affairs"

- Area: 0.92 million km² (approximately 2.5 times the area of Japan)
- Population: 173.60 million (2013, UNFPA)
- Capital: Abuja
- Ethnic groups: Hausa, Yoruba, Ibo, etc.
- Languages: English (official), Ethnic languages
- Religion: Islam (north area), Christians (south east area), Local religion (whole area)
- Main industries: crude oil, natural gas, and agriculture
- GNI: 522.6 billion USD (2013, World Bank)
- GNI per capita: 2,760 USD (2013, World Bank)
- Real economic growth rate: 7.0% (2013, World Bank)
- Inflation rate 9.9% (2013, Bureau of Statistics)
- Unemployment rate: 23.9% (2011, Bureau of Statistics)
- Total trade amounts (2012, Central bank of Nigeria)
 - (1) Exports: 96 billion USD
 - (2) Imports: 58.3 billion USD
- Main trading items
 - (1) Exports: crude oil, natural gas, mineral product
 - (2) Imports: machine, electric equipment, transport equipment
- Main trading partners (2013, EIU)
 - (1) Exports: India, USA, Brazil
 - (2) Imports: USA, China, India
- Currency: Naira 1 USD=160 Naira (as of Sep. 2014)
1 Naira=0.65yen (as of Sep. 2014)
- Japanese aid (aggregates as of FY 2012)
 - (1) Loan assistance: 78.312 billion yen
 - (2) Grant aid: 47.45 billion yen
 - (3) Technical assistance: 15.318 billion yen
- Main donor (2011) (million USD, net disbursement) (OECD/DAC)
 - (1) USA (409.23), (2)UK (298.86), (3) Japan (38.52), (4) Canada (28.20), (5) German (21.78)

Planned Lines in Lagos Metropolitan Area (LRT: 6 lines, Monorail: 1 line)

Line	Section	Length (km)	Target year for development	
LRT	Blue Line	TBS~Okokomaiko	29	2017
	Red Line	Marina~Agbado	29	2017
		Agbado~Ifo (extension)	23	2032
	Green Line	Marina~Ajah	22	2022
		Ajah~Lekki Airport + FTZ (extension)	62	2032
	Purple Line	Ojo~Redeem	48	2022
		Redeem~Sagamu (extension)	32	2022
Yellow Line	Ota~Iddo	34	2032	
Brown Line	Mile 12~Marina	19	2032	
Monorail	Victoria Monorail	Lagos Island~Victoria Island	24	2022



The Second Data Collection Survey on Mass Rapid Transit
in the Federal Republic of Nigeria
Contents

Summary	S-1
Chapter 1 Background and Overview of Study	
1.1 Current State and Issues of Lagos State in the Federal Republic of Nigeria	1-1
1.2 Objectives of Study	1-1
1.3 Survey Area	1-1
1.4 Concerned Entities in Nigeria	1-2
1.5 Members of this study	1-3
Chapter 2 Socio-economic Indicators of the Federal Republic of Nigeria	
2.1 Basic Information	2-1
2.2 Policies and Systems	2-5
2.3 Overview of Lagos State	2-5
2.4 Overview of Transport Sector	2-7
Chapter 3 Current State of the Railway Sector in Nigeria and Issues	
3.1 Overview of the Railway Sector in Nigeria	3-1
3.2 Status and Issues of Railway Transport	3-2
3.3 Status of Development Plan and Issues	3-4
3.4 Current State of Legislation and Issues	3-7
3.5 Technical Level	3-8
3.6 Current State and Issues of Railway-related Industries (Private Sector and Supporting Industries)	3-14
Chapter 4 Investment Plans for the Nigerian Railway Sector	
4.1 Financial Analyses of the Federal and State Governments, Investment Plans	4-1
4.2 Decision-making Mechanism of the Railway Sector	4-6
4.3 Prospect of Funding for the Railway Development Plan	4-10
4.4 Analyzing the Activities of Other Donors (Countries, Organizations)	4-13
4.5 Feasibility of Co-financing with Other Donors	4-20
4.6 Socio-economic and Environmental Impact of the Current Investment Plans	4-22
Chapter 5 Status of the Transport Sector in Lagos State and Issues	
5.1 Overview of Urban Transport	5-1
5.2 Current State of Urban Transport and Issues	5-4
5.3 Review of Measures for Mitigating Congestion in Lagos City	5-10

5.4	Collection of Information and Analysis of Demand for Urban Railway	5-17
 Chapter 6 Review and Selection of Route Options for Assistance		
6.1	Verify the Priorities of the Lagos State Government for the Planned Lines for Development and the Progress of the Projects	6-1
6.2	Feasibility of Participation by Japanese Companies	6-10
6.3	Review the Possible Undesirable Effects on Nature and Society	6-15
6.4	Using Evaluation Indicators to Analyze Target Lines and Selecting Lines for Assistance	6-30
 Chapter 7 Understanding and Analyzing the Current State for Japanese Companies to Participate in Project		
7.1	Situation in Nigeria and Lagos State	7-1
7.2	Design, Construction and Production Stage	7-3
7.3	O&M Stage	7-6
 Chapter 8 Hosting of Workshops and Seminar in Nigeria		
8.1	First Workshop	8-1
8.2	Second Workshop.....	8-3
8.3	Seminar	8-6
 Chapter 9 Recommendations and Challenges		
9.1	Recommendations to Japanese Companies for Participating in Urban Railway Projects in Nigeria	9-1
9.2	Main Focus of the Preliminary Study.....	9-1
9.3	Challenges for Future Review	9-3

List of Figures

Figure 2-1	Changes in Nominal GDP	2-2
Figure 2-2	Changes in Per-capita Nominal GDP	2-2
Figure 2-3	GDP Ratios by Sector (2013)	2-3
Figure 2-4	Changes in Export Amount.....	2-4
Figure 2-5	Changes in Import Amount	2-4
Figure 2-6	GDP Ratios by Sector (2010)	2-6
Figure 2-7	Unemployment Rates in Nigeria and Lagos State	2-6
Figure 2-8	Shares of Passenger and Freight	2-7
Figure 2-9	Modal Share in Lagos Metropolitan Area (Except walking)	2-8
Figure 2-10	Road Lengths by Road Classification	2-9
Figure 2-11	Changes in Road Length in Lagos and Abuja	2-9
Figure 2-12	Secular Changes in Car Ownership.....	2-10
Figure 2-13	Numbers of Newly Registered Automobiles and Motorcycles (Lagos State)	2-10
Figure 2-14	Changes in Traffic Accidents and Number of Casualties (Nigeria as a whole)	2-11
Figure 2-15	Changes in the Number of Traffic Accidents and Number of Casualties (Lagos State)	2-11
Figure 2-16	Changes in Passenger Transport by Railway	2-12
Figure 2-17	Changes in Freight Transport by Railway	2-12
Figure 2-18	Changes in the Number of Railway Accidents by Cause	2-13
Figure 2-19	Changes in the Number of BRT (BLUE) Users	2-14
Figure 2-20	Changes in the Number of BRT (LAGUBUS) Users	2-14
Figure 3-1	NRC Route Map	3-1
Figure 3-2	Changes in Passenger Transport Volume.....	3-2
Figure 3-3	Changes in Freight Transport Volume	3-3
Figure 3-4	Freight cars made in Japan (1975).....	3-9
Figure 3-5	Passenger cars at Lagos Station.....	3-9
Figure 3-6	New DMU made in China	3-9
Figure 3-7	Signaling Facilities.....	3-10
Figure 3-8	Communication Equipment	3-10
Figure 3-9	Track Structure	3-11
Figure 3-10	Ballast of Uneven Sizes.....	3-11
Figure 3-11	Damaged Rail.....	3-12
Figure 3-12	Track with Insufficient Ballast.....	3-12
Figure 3-13	Aging Train	3-12
Figure 3-14	Railway Timetable for the City (Lagos Station)	3-13

Figure 3-15	Machines in a Workshop	3-14
Figure 3-16	Condition inside the Workshop	3-14
Figure 3-17	Civil Engineering Section (Road Intersection).....	3-15
Figure 3-18	Concrete Duct	3-15
Figure 3-19	Panoramic View of Viaduct.....	3-16
Figure 3-20	Bottom Surface of the Girder	3-16
Figure 3-21	Panoramic View of Viaduct.....	3-16
Figure 3-22	Work Site of CCECC	3-16
Figure 3-23	Image of Completed Station	3-17
Figure 3-24	Roof of Platform under Construction.....	3-17
Figure 4-1	Changes in Cumulative Public Debt Amount of Nigeria and GDP Ratio	4-2
Figure 4-2	Changes in the Repayment Amount of Public Debt	4-2
Figure 4-3	Investment by Sector in Nigeria.....	4-3
Figure 4-4	Changes in Lagos State Government Budget and Revenue Breakdown	4-3
Figure 4-5	Investment in Lagos State by Sector	4-4
Figure 4-6	Project Schemes for Railway Projects in Nigeria	4-6
Figure 4-7	Standard Decision-making Process for the Realization of a Railway Project.....	4-9
Figure 4-8	Procedures for Monitoring and Evaluation	4-22
Figure 4-9	Reduction in the Travel Time of Public Transport.....	4-24
Figure 5-1	Comparison of Areas in the 2009 Master Plan and the 2013 Revised Master Plan	5-2
Figure 5-2	Expansion of the Lagos Metropolitan Area	5-3
Figure 5-3	Population Distribution of the Lagos Metropolitan Area.....	5-3
Figure 5-4	Third Mainland Bridge	5-4
Figure 5-5	Local Road on Lagos Island	5-4
Figure 5-6	Minibus.....	5-5
Figure 5-7	BRT	5-5
Figure 5-8	Congestion in Lagos Metropolitan Area	5-6
Figure 5-9	Travel Speeds in Lagos Metropolitan Area (morning rush hours).....	5-7
Figure 5-10	Transport Volume of Lagos Metropolitan Area by Screen Line (6 a.m.– 10 p.m.)	5-7
Figure 5-11	Causes of Congestion in Lagos Metropolitan Area.....	5-8
Figure 5-12	Minibus Stop and Boarding and Alighting on the Road	5-9
Figure 5-13	Roundabout on the Main Road.....	5-9
Figure 5-14	Distribution of Trip Distances in Lagos Metropolitan Area	5-9

Figure 5-15	CO ₂ Emissions in Nigeria (unit: kiloton)	5-10
Figure 5-16	Central Commercial Area on Lagos Island.....	5-10
Figure 5-17	Newly Developed Area in Lekki	5-10
Figure 5-18	Projects in the Revised Master Plan (Long-term Plan: 2032).....	5-12
Figure 5-19	Public Transportation Plan in the Revised Master Plan (Long-term Plan: 2032)	5-14
Figure 5-20	Road Condition in the District	5-16
Figure 5-21	Minibus Stop along the Main Road.....	5-16
Figure 5-22	Parallel Sections of LRT and BRT	5-17
Figure 5-23	Example of a Monorail Section	5-17
Figure 6-1	Planned Lines in Lagos State	6-1
Figure 6-2	Route Map of the Blue Line	6-2
Figure 6-3	State of Construction (Elevated Track)	6-3
Figure 6-4	State of Construction (Ground Level)	6-3
Figure 6-5	Route Map of the Red Line.....	6-4
Figure 6-6	Route Map of the Green Line	6-5
Figure 6-7	Route Map of the Purple Line	6-6
Figure 6-8	Route Map of the Yellow Line	6-7
Figure 6-9	Route Map of the Brown Line	6-8
Figure 6-10	Route Map of the Victoria Monorail.....	6-9
Figure 6-11	Transport Capacity by Transportation Mode	6-11
Figure 6-12	AGT rolling stock	6-11
Figure 6-13	AGT Curved Structure	6-11
Figure 6-14	AGT Structure Inside Road.....	6-11
Figure 6-15	AGT Track Structure.....	6-12
Figure 6-16	Platform Screen Door	6-12
Figure 6-17	Overview of Slab Track Structure	6-12
Figure 6-18	Japanese EMU (1)	6-13
Figure 6-19	Japanese EMU (2)	6-13
Figure 6-20	ATP Facility (1)	6-14
Figure 6-21	ATP Facility (2)	6-14
Figure 6-22	Organization Chart of the Federal Ministry of Environment for Environmental Impact Assessment	6-16
Figure 6-23	EIA Process in Nigeria.....	6-17
Figure 6-24	Alaba Station Vicinities	6-19
Figure 6-25	A Street Vendor on the Side of the Road (Near Planned Site for Victoria Island Line).....	6-27
Figure 6-26	Street Vendors on the Side of the Road (Near Planned Site for the Green Line).....	6-27

Figure 6-27	Nature Reserves in Lagos State.....	6-28
Figure 6-28	Scenes along the Green Line (Vegetation)	6-29
Figure 6-29	Lagos Lagoon (Marshland).....	6-29
Figure 7-1	Condition of Ebute Elefu and vicinities.....	7-2
Figure 7-2	Condition of Marina (CMS) and vicinities	7-2
Figure 7-3	Road that has Sufficient Space for Monorail (Ring Road (south coast) on Lagos Island).....	7-4
Figure 7-4	Road that requires works to build the Monorail (Ahmadu Bello Way on Victoria Island).....	7-4
Figure 7-5	Road that requires works to build the Monorail (Awolowo Road on Lagos Island)	7-4
Figure 7-6	Vicinity of the Planned Line (Near Marina (CMS) on Victoria Island)...	7-4
Figure 7-7	Interior of an NRC Suburban Train	7-7
Figure 7-8	A Street near a Blue Line Station.....	7-7
Figure 8-1	Scenes from the First Workshop.....	8-1
Figure 8-2	Scenes from Second Workshop	8-3
Figure 8-3	Scenes from the Seminar	8-7

List of Tables

Table 1-1	Concerned Entities in Nigeria.....	1-2
Table 1-2	Site Visiting for Proposed Routes of Urban Railway	1-2
Table 1-3	Member List of Study Team	1-3
Table 2-1	Trading Partners in 2012.....	2-3
Table 3-1	Intercity Railway Service (2013).....	3-2
Table 3-2	Urban Railway Service (2013).....	3-3
Table 3-3	Freight Transport (2013)	3-3
Table 3-4	Development Plan in Various Phases	3-4
Table 3-5	Rehabilitation Plans for Existing Railway Lines	3-5
Table 3-6	Lines for Which Feasibility Studies Have Been Completed or Planned	3-6
Table 3-6	Rolling Stock Owned by NRC	3-8
Table 3-8	Federal Ministry of Transport's budget amount for the railway sector ...	3-13
Table 4-1	Financial Situation of the Federal Government	4-1
Table 4-2	Standard Value of Public Debt Burden according to DSA.....	4-1
Table 4-3	Changes in Cumulative Public Debt of Nigeria and GDP Ratios	4-2
Table 4-4	Examples of Funding for Railway Construction Projects in Nigeria	4-5
Table 4-5	Laws and Regulations for Approving Projects using External Loans	4-6
Table 4-6	Requirements for the Approval of an External Loan	4-7
Table 4-7	Considerations for External Loans by the State Government and Project Entity	4-8
Table 4-8	Investment Scale of Transport Infrastructure in the Lagos State Revised Master Plan.....	4-10
Table 4-9	Scale of Infrastructure Investment of Various Lines in the LRT Project.	4-10
Table 4-10	Annual Budgets of LAMATA in Recent Years.....	4-11
Table 4-11	Potential Funding Sources for the Railway Development Plan	4-12
Table 4-12	Railway Projects with Chinese Involvement	4-15
Table 4-13	Involvement of Overseas Companies in the LAMATA Projects Currently Underway	4-17
Table 4-14	Assistance Policies of Other Donors for Nigeria	4-20
Table 4-15	Major Points of Assessment (Contents).....	4-23
Table 4-16	Major Contents of the Prior Assessment of LRT Projects	4-23
Table 4-17	Increase in Travel Speed of Private Vehicles	4-24
Table 4-18	Reduction in the Emissions of Greenhouse Gases	4-25

Table 5-1	Proposed Items in the “Revised Master Plan”	5-1
Table 5-2	Issues of the Urban Plans and Transportation Plans of the Lagos Metropolitan Area	5-3
Table 5-3	Comparison of Lagos and Metropolitan Areas in Asia	5-5
Table 5-4	Estimate of Future Transport Volume according to the Revised Master Plan (Do-minimum vehicle kilometers)	5-8
Table 5-5	Goal by Phase, Urban Development, and Related Measures of the Revised Master Plan	5-11
Table 5-6	Public Transportation Plan (BRT) in the Revised Master Plan	5-13
Table 5-7	Public Transportation Plan in the Revised Master Plan (LRT, Monorail, and Cable Car)	5-13
Table 5-8	Timing for Developing the BRT in the Revised Master Plan	5-14
Table 5-9	Timing for Developing LRT, Monorail, and Cable Car in the Revised Master Plan	5-15
Table 5-10	Population along Various Lines (within 500 m of the line)	5-18
Table 5-11	Demand Forecast of LRT, Monorail, and Cable Car in the Revised Master Plan	5-19
Table 5-12	Demand Forecast Results (LRT) of the Revised Master Plan	5-20
Table 5-13	Demand Forecast Results (Cable Car and Monorail) of the Revised Master Plan	5-20
Table 6-1	Target Years for the Development of Various Lines in the Revised Master Plan	6-1
Table 6-2	Construction Plan of the Blue Line	6-3
Table 6-3	Examples of AGT Lines in Japan	6-10
Table 6-4	Comparing the Performance of AGT and Monorail	6-12
Table 6-5	Environmental and Social Effects from the Implementation of the Project	6-20
Table 6-6	Observation and Assessment of the Various Lines from the Perspective of Environmental and Social Considerations	6-25
Table 6-7	Protected Areas in Lagos State	6-28
Table 6-8	Analyzing the Project Costs of the Planned LRT Lines	6-30
Table 6-9	Setting Unit Prices for the Review of Project Costs	6-32
Table 6-10	Analyzing the Project Cost of the Victoria Island Line	6-32
Table 6-11	Natural Conditions along the Planned Lines	6-33
Table 6-12	Social Conditions along the Planned Lines	6-34
Table 6-13	Other Risks related to the Planned Lines	6-34
Table 6-14	Applicable Japanese Technologies to the Selected Line	6-35
Table 6-15	Assessment of the Six LRT Lines and the Victoria Island Line	6-36

Table 8-1	Overview of First Workshop	8-1
Table 8-2	Overview of Second Workshop	8-3
Table 8-3	Overview of Seminar	8-6

Abbreviations

AfDB	African Development Bank
AMTS	Abuja Mass Transit System
BMT	Bus Mass Transit
BRT	Bus Rapid Transit
BOT	Build-Operation-Transfer
CBD	Central Business District
CCECC	China Civil Engineering Construction Company
DSA	Debt Sustainability Analysis
DB	Design-Build
DBB	Design-Bid-Build
ECOWAS	Economic Community of West African States
FCT	Federal Capital Territory
FCTA	Federal Capital Territory Administration
FCTDA	Federal Capital Territory Development Authority
FEC	Federal Executive Council
FGN	Federal Government of Nigeria
FMT	Federal Ministry of Transport
FRSC	Federal Road Safety Corps
F/S	Feasibility Study
FTK	Full Turn Key
ICRC	Infrastructure Concession Regulatory Commission
IDA	International Development Association
IMF	International Monetary Fund
LASG	Lagos State Government
LASPPDA	Lagos State Physical Planning and Development Authority
LMA	Lagos Metropolitan Area
LAMATA	Lagos Metropolitan Area Transport Authority
LRMT	Lagos Urban Rail Mass Transit
LRT	Light Rail Transit
MP	Master Plan
MRT	Mass Rapid Transit
MWI	Ministry of Works and Infrastructure
NPC	National Planning Commission
MEND	Movement for the Emancipation of the Niger Delta
NRC	Nigeria Railway Corporation
NITT	Nigeria Institute of Transport Technology
OBC	Outline Business Case
ODA	Official Development Aid
OD Table	Origin-Destination Table
PCU	Passenger Car Unit
pphpd	Passengers per hour per direction
PPP	Public-Private Partnership
STEP	Special Terms for Economic Partnership
STMP	Strategic Transport Master Plan
SVNRS	25 Year Strategic Vision of the Nigerian Railway System

Summary

Summary

1. Background and Overview of Study

(1) Background of Study

With the population growing rapidly and the numbers of newly registered automobiles and motorcycles increasing every year, Lagos is suffering from chronic traffic congestion and serious air pollution caused by exhaust gas.

Under such circumstances, JICA conducted a “Data Collection Survey on Mass Rapid Transit” from February to March of 2013. Although Nigeria already has plans to rehabilitate the existing railway lines and develop urban railways, and LRT lines are being built in Lagos, the Study found that validity for the development of the planned lines, priorities in the development of the lines, and other evaluation indicators have not been sufficiently examined.

In the fifth Tokyo International Conference on African Development (TICAD V) held in Yokohama in June 2013, Nigeria expressed the desire for Japan to lend support to its infrastructure development. However, further studies are desirable due to insufficient information on the specific contents of assistance and the projects’ validity.

From the above, it is necessary to gather information to support the development through additional research as Japan draws up future projects that may be applicable to the Nigerian railway sector.

(2) Objectives of Study

The Study sets the following objectives based on the analysis results of the “Data Collection Survey on Mass Rapid Transit” conducted by JICA in 2013:

- Objective 1: Enhance the understanding of concerned parties in Nigeria about the Japanese urban transportation systems
- Objective 2: Identify projects (planned lines) from the Lagos State urban railway development plan that are eligible for assistance
- Objective 3: Make specific recommendations of railway technologies, in which Japanese companies have international advantages, to Nigeria

(3) Survey Area

The Study will focus on Lagos State, a metropolitan area with the largest population and economy in Nigeria, as the area of study because the urban traffic condition in Lagos State has deteriorated in recent years.

2. Socio-economic Indicators of the Federal Republic of Nigeria

(1) Basic Information

Nigeria has a land area of 923,000 km², which is about 2.5 times the area of Japan. The population of the country is 173.6 million (2013), making it the most populous in Africa. It is expected to have the sixth largest population in the world in 2050. Nigeria’s GDP is 522.6 billion USD (2013). Its current economic scale has by far overtaken South Africa to become the largest in Africa. Despite the temporary downturn under the influence of the global economic crisis in 2009, Nigeria’s economy is growing at an annual rate of 6–8% on average. Although the per-capita GDP was more than 3000 USD in 2013, it is still less than half of that of the Republic of South Africa.

(2) Policies and Systems

1) Policy Measures

The “Nigeria Vision 20:2020,” the long-term development policy currently being implemented, is at the top of national policies. Its goal is for Nigeria to become one of the world’s twenty economic superpowers that has GDP of 900 billion USD and per-capita annual income of 4,000 USD by 2020.

2) Infrastructure Development using PPP

The “Infrastructure Concession Regulatory Commission Act” was enacted in 2005. It stipulates that all infrastructures in Nigeria, including the railway, shall be developed in the future using public-private partnership (PPP) schemes. Nigeria has used PPP to develop railway but none is in operation currently. It faces challenges, including the lack of ability to form PPP projects, lack of funds, lack of human resources with expertise in PPP, etc.

(3) Overview of Lagos State

Lagos is the largest city and port in Nigeria. At the time of the 2006 census, Lagos State had a population of 17.55 million people. It is estimated to have exceeded 21 million today. Lagos City has over 85% of the State’s population. It is one of the world’s largest megacities in Africa, along with Cairo, the capital of Egypt. Even today, Lagos is still an economic and cultural center. It has more than 50% of the industrial and commercial facilities and 70% of the manufacturing industry. The GDP of Lagos State in 2010 is about 80.6 billion USD, which is 35.6% of the GDP of Nigeria.

(4) Overview of Transportation Sector

1) Road

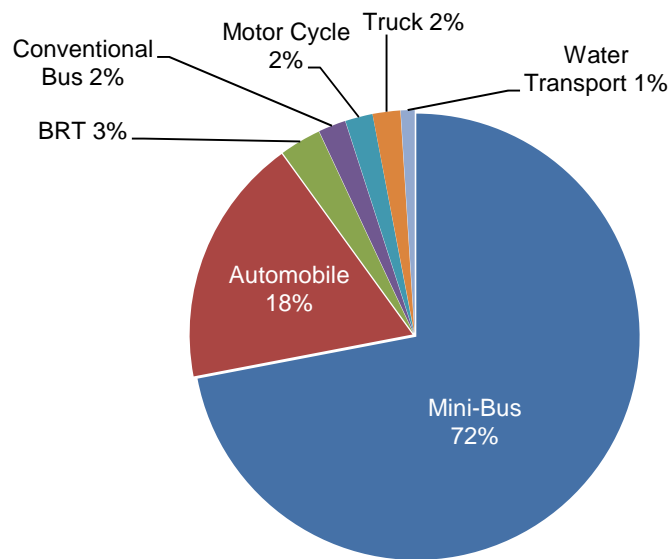
Nigeria has about 200,000 km of roads. Among the African countries, Nigeria’s road length is second to that of the Republic of South Africa. Due to the decline of the railway from the 1970s to the 1980s, road transport is now playing a key role in supporting domestic distribution. In recent years, road traffic accounts for 95% of the passenger and freight transport in Nigeria.

2) Railway

The Nigerian Railway Corporation (NRC) provides railway transport in Nigeria. Passenger transport is mainly inter-city transport. It has been sluggish in recent years, at about 1–2 million passengers annually. According to the trend of freight transport in recent years, the real tonnage of the transport volume has remained at around 50,000 tons per year between 2004 and 2008.

3) Transport Sector

Road transport plays a key role. The total number of trips in the Lagos metropolitan area is about 22 million trips per day, 40% of which are walking trips. Of the remaining 60%, minibuses using wagons with occupancy of 8–25 passengers account for 72%. The ratios of other public transport modes using road, such as Bus Rapid Transit (BRT) (3%) and conventional bus (2%), are low. The ratio of railway is less than 1%.



Source: Frederic Oladeinde, "Transportation Planning in Developing Countries," (2009)
 Figure 1 Modal Share in Lagos Metropolitan Area (Except Walking)

3. Current State of the Railway Sector in Nigeria and Issues

(1) Status and Issues of Railway Transport

At present, except for the urban railway lines planned for Abuja and Lagos State, all the railway lines in Nigeria are owned by NRC. The railway network has 3505 km of narrow-gauge (1067-mm gauge) sections and 255 km of standard-gauge (1435-mm gauge) sections.

1) Passenger Transport

After peaking at 15.5 million people in 1984, the passenger transport volume went into decline and hovered at about 1–2 million passengers per year in the 2000s. Since 2010, the volume has changed to an upward trend. Passenger transport services are provided between cities and inside cities but both intercity railway and urban railway have low train frequency.

2) Freight Transport

The freight transport volume was over one million tons until the first half of the 1980s but it went into decline afterwards. Except for 1997–1999, the freight transport volume went below 500,000 tons after 1990. Freight transport is mainly for cement, wheat, track materials, gravel, petroleum products, and so on.

3) Issues of Railway Transport

Many of the vehicles were manufactured between 1970 and 1980. Since they have not been maintained properly, they are aging quickly. Currently, only 29 diesel locomotives are operable.

Most of the railway lines were built by 1930. Since these narrow-gauge lines have sections that do not have good alignment, such as steep curve sections, the alignment is not suitable for high-speed operation. In addition, all the railway lines are single-track, except for the 30-km section at the center of Lagos. Stopping time is needed when the trains cross each other, thus limiting the transport capacity.

(2) Status of Development Plan and Issues

1) Overview of Development Plan

Nigeria is developing railways from 2002 to 2027 in accordance with "The 25 Year Strategic Vision of the Nigerian Railway System." The development plan is divided into 3 phases: short-term plan (Phase 1), mid-term plan (Phase 2), and long-term plan (Phase 3), and goals have been set up for each phase.

Phase 1 and Phase 2 are in progress at present. Rehabilitation of the existing railway lines is one of the major strategies of Phase 1, and over 90% of the lines are being rehabilitated. Construction of new lines using standard gauge, which is currently underway, is one of the main strategies of Phase 2.

2) Issues of the Development Plan

- Project Delay due to Fund Shortage

Standard gauge has been used in the construction of new lines since 1964. However, due to the lack of funds, railway construction has not proceeded as planned.

- Legal Environment

NRC is supposed to be the entity developing and operating railways under the current Railway Act. The private sector is not allowed to engage in the railway business. This is what prevents the private sector from entering into the railway business. Currently, the Railway Act is being amended. The amended Railway Act has been approved by the FEC and it is expected to be deliberated later at the National Assembly.

- Co-existence of Narrow Gauge and Standard Gauge

The 25-Year Development Plan envisions co-existence of the narrow-gauge lines and standard-gauge lines. While the existing lines in narrow gauge will be rehabilitated, the new lines will be constructed in standard gauge. In the future, more locomotives, freight cars, and passenger cars must be procured for both the narrow-gauge lines and the standard-gauge lines, thus increasing the cost.

(3) Technical Level

1) Current State of Railway Technologies of Various Fields

Field	Current State
Rolling Stock	NRC has about 84 locomotives as of 2014, but more than 65% of these locomotives cannot be used for operation. All the locomotives are imported from overseas. They are procured primarily from GE (General Electric). Some are also from China.
Electric Power	All the railways are operated by diesel. Nigeria does not have any electrified section. Since NRC has chronic power shortage, electrification is not being considered at this time.
Signaling and Telecommunication Systems	Although mechanical semaphore signals and electric signals are installed on NRC lines, they are not being used. The signaling system in Nigeria is not functioning at all. Radio is used for communication, but the facilities are very old.
Track	The surface of the rail, in particular, is rough, making it a source of vibration and noise. The gaps at the rail joints are not sufficiently controlled. Because the ballast is not compacted properly, vertical vibration of the track surface occurs during train operation. All the facilities are aging and they are not properly maintained.

2) Technical Issues of the Railway Sector

Almost no investment has been made in railway facilities until 2008. In addition, since the facilities have not been maintained and managed properly, aging of the rolling stock, signaling and communication facilities, and track is serious.

Since almost no investment has been made to the railway sector until recent years and no new lines have been built, the levels of railway technologies, including rolling stock, signaling and telecommunications, and track, have declined.

(4) Current State and Issues of Railway-related Industries (Private Sector and Supporting Industries)

1) E&M

The technical level of the railway in Nigeria is low. The cast iron wheels for the brake used in NRC rolling stock are manufactured by Metalogical Foundry in Lagos City. All the other parts and components are dependent on imports from overseas. There are almost no supporting industries for E & M.

2) Construction

The construction industry in Nigeria is an oligopoly of several construction companies. The German company Julius Berger, the Chinese company CCECC, the Lebanon company SETRACO, the Swiss company Reynolds, and the Nigerian companies HI-TECH and DANTATA & SAWOE are the major construction companies.

4. Investment Plans for the Nigerian Railway Sector

(1) Financial Analysis and Investment Plans of the Federal and State Governments

1) Financial Situation of the Federal Government

The deficit ratios of revenue and GDP in 2013 are 22% and 1.85% respectively. The International Monetary Fund and the World Bank had been performing Debt Sustainability Analysis (DSA) from 2005 to study the sustainability of public debt. The indicators of Nigeria are considered within the acceptable ranges.

Nigeria's public debt stock ratio to GDP has become 15.7% as of 2013, which is below the 40% threshold value for sustainability, according to DSA. Although the debt amount itself is increasing every year, the share of debt is still within the safety level since the GDP scale continues to grow in tandem with strong economic growth.

Nigeria's public debt stock amount as of June 2014 is 57 billion USD, an increase of 9 billion USD from the end of 2013. A breakdown shows 9.4 billion USD external debts from foreign countries and 47.6 billion USD from domestic market. The share of domestic debts accounts for more than 80%. The debt management policy shows clearly that the deficit has been financed by domestic debts instead of external debts after the Paris Club agreement.

2) Financial Situation of the State Government (Lagos State)

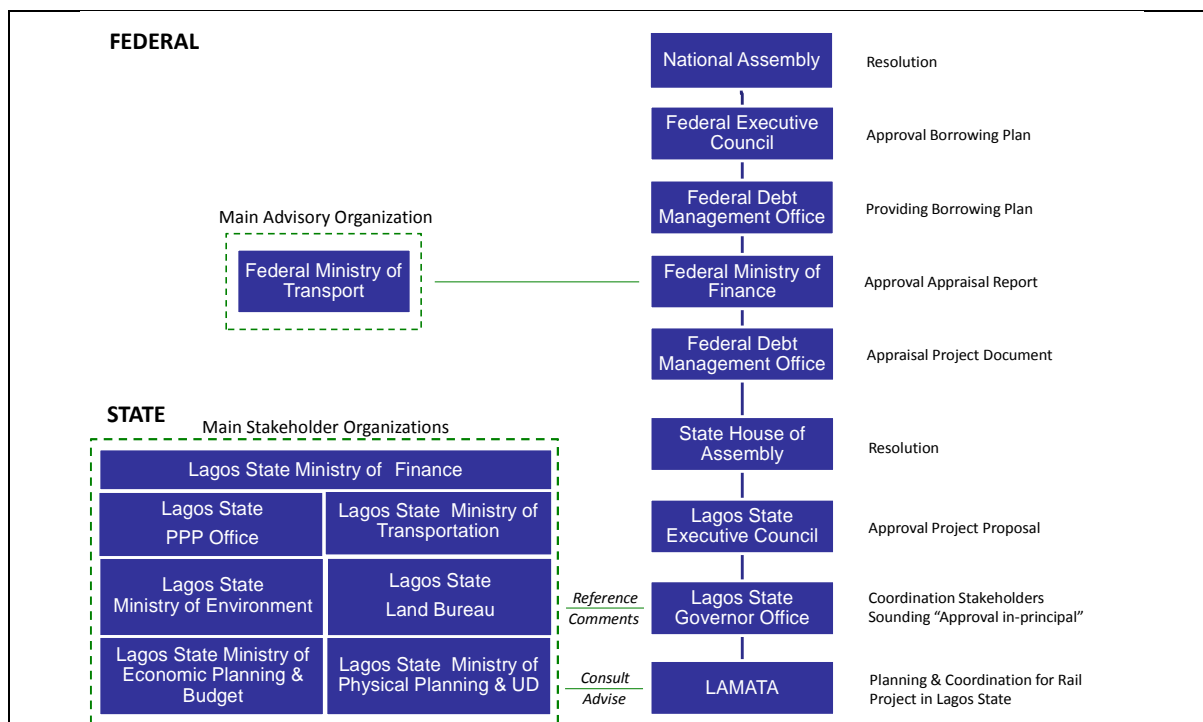
According to the 2012 actual data, revenue from the State, together with revenue from the Federal government to the Lagos State government amounted to approximately 400 billion Naira (about 2.58 billion USD). However, the shortfall amount appropriated from the public debt of donors was approximately 170 billion Naira (about 940 million USD). The ratio of debt to revenue reached 25.5%. It is planned that the percentage of public debt be reduced in the future to about 15% in 2015 and about 5% in 2025 and in particular, no external debt after 2015.

3) Status of Investment in the Railway Sector

The scale of investment in the transport sector in 2008 was about 5% of the total budget of Lagos State. On the other hand, the budget scale of LAMATA in 2013 corresponds to about 8.7% of the budget of Lagos State as a whole. Organizations responsible for the transport sectors in Lagos State are not limited to LAMATA. Thus, it can be said that investment in the transport sector shows a steadily rising trend.

(2) Decision-making Mechanism of the Railway Sector

Figure 2 shows the typical approval process for a project using external loan. The steps shown here represents the typical process according to the External and Domestic Borrowing Guideline 2013-2017.



Source: Compiled by Study Team based on the "External and Domestic Borrowing Guideline 2013-2017" and interviews

Figure 2 Typical Decision-making Process for the Realization of a Railway Project

(3) Prospect of Funding for the Railway Development Plan

In this Study, the Blue Line is used as a typical example of a project scheme in which the Nigerian government (Lagos State government) and other international donor organizations (bilateral financing or co-financing between international donors) will be responsible for the infrastructure and Nigerian companies, including a private consortium, will be responsible for the operation. The potential funding sources based on these conditions are summarized in Table 1.

Table 1 Potential Funding Sources for the Railway Development Plan

Source	Budget format	
Nigeria	State government budget (LAMATA)	
	Domestic loan	
	Commercial banks	
	Private investors	
Japan	Independent financing	Yen loan
		JICA overseas investment and loan
		JBIC direct financing
	Co-financing	Yen loan (ACFA)
		Yen loan (NSL)
Trade insurance	NEXI export insurance/investment insurance	
Other Countries	Independent financing	Funds from International Development Association (IDA) of the World Bank
		Funds from AFD
		Funds from AfDB
		Funds from the Export-Import Bank of China
	Co-financing	Co-financing program with AfDB
	Co-financing program with IDA (WB)	

Source: Summarized by Study Team

(4) Analyzing the Activities of Other Donors (Countries, Organizations)

1) Collect and Organize Data on the Latest Status of Assistance from Other Donors to the Railway Sector

Many other donors have supported Nigeria, including the World Bank (WB), African Development Bank (AfDB), and the Chinese Government. The activities of these main donors are summarized below.

- World Bank

The World Bank has not given any support to the railway sector since assisting NRC until the early 1990s. However, it has mentioned the importance of redeveloping the railway in its current assistance policy. On the other hand, it has provided assistance to the urban transport sector since 2002 by engaging in the Lagos State Urban Transport Project (LUTP), which includes the establishment of LAMATA, development of BRT system, rehabilitation of roads, capacity building, and so on. Since 2010, the World Bank has been in a co-finance scheme (parallel) with AFD.

- African Development Bank (AfDB)

AfDB does not have any experience in railway projects in Nigeria. However, since the current AfDB strategy paper mentioned improvement of the urban transport, the railway transport system, and support for the road sector, AfDB is reviewing the Abuja BRT project and Lagos cable car (rope way) project.

- China

China's assistance for Nigeria does not follow the Official Development Assistance (ODA) framework but tends to be on a bi-lateral basis. Nigeria and China mutually agreed to strengthen cooperation through state owned companies in the railway, electricity, and aviation sectors. China's assistance to Nigeria has taken the form of Chinese companies participating in infrastructure construction and PPP projects, which are indirectly supported by funds and loan guarantees provided by China's public financial institutions, such as The Export-Import Bank of China.

2) Involvement of Overseas Companies and Other Governments in Lagos and the Planned Lines

Most of the on-going infrastructure projects executed by LAMATA are supported by international donors, especially by the Chinese company CCECC. CCECC is highly competitive in any kind of construction works since they have rich experience in this field and is well known in Nigeria. On the other hand, CCECC has had criticism of fund shortage and low quality due to labor problems and inadequate construction planning.

GE, which has invested in various sectors in Nigeria, is currently constructing an assembly plant to manufacture GE locomotives in anticipation of future growth of the railway for distribution. Korean company POSCO received an order for the rehabilitation project of inter-city railway in 2006, which was a means for South Korea to gain access to Nigeria's oil resources. However, the project was canceled due to the lack of progress and it was awarded again to a third party. Because the new Nigerian president took office in 2007, the oil-mining contract that South Korea had concluded was canceled. This change in the project environment had affected the performance of the original memorandum.

3) Issues and Solutions related to Donors and Overseas Companies

Issues and solutions related to the involvement of donors and overseas companies:

- Transparency of the Approval Process in Nigeria

The prime concern is the lack of transparency of the loan approval process in Nigeria. At this moment, continuing strategic discussions between the Federal and state governments is important. Exchanging

memorandums of understanding with relevant organizations to share information is also effective.

- **Involvement of Governmental Agencies**

Involvement of the Federal government and the relevant state government agencies is very important for loan approval at the Federal level. It is advisable to engage the relevant ministries and agencies at an earliest possible stage. It is important to seek the cooperation of LAMATA in promoting further the project.

- **New Entry by Overseas Companies**

It is important for foreign investors interested in making entry to Nigeria to build collaborative relationships with reliable local companies in order to gather information and establish a business foundation, in addition to obtaining donors’ technical cooperation and financial support.

(5) Feasibility of Co-financing with Other Donors

The AfDB could be a candidate of co-financing partnership for the urban railway sector in Lagos. The co-financing scheme with AfDB is expected to be implemented through the Accelerated Co-financing Facility for Africa (ACFA) under the Enhanced Private Sector Assistance for Africa (ESPA) envisioned in 2005.

5. Status of the Transport Sector in Lagos State and Issues

(1) Overview of Urban Transport

1) Master Plan in Lagos

- **Comprehensive Master Plan and Master Plans By District**

A comprehensive master plan of Lagos State was completed in 1980, with year 2000 as its target year. In 2005, John Asiyebi Associate reviewed the master plan and issued a report. On the other hand, master plans for individual districts have been formulated in recent years. These urban master plans generally cover the period 2010 to 2030.

- **Strategic Transport Master Plan**

The "Strategic Transport Master Plan for Lagos Metropolitan Area," formulated in December 2009 pursues comprehensive development of LRT, BRT, water transport, and road with 2020 as its target year. In 2013, a revised Master Plan was formulated. The draft final report was completed in August 2014. The revised Master Plan, using 2032 as its target year, proposed seven items, as shown below in Table 2.

Table 2 Proposed Items in the Revised Master Plan

	Item
1	Road and public transportation network plan
2	Logistics plan
3	Non-motorized transport plan
4	Traffic safety plan
5	Climate change plan
6	Economic analysis
7	Proposal of systems

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

2) Urbanization of Lagos State and Issues

The current population of Lagos State is approximately 21 million, which is expected to surpass the Cairo metropolitan area in Egypt to become the largest city in Africa in 2015. Its population is

expected to exceed 30 million in 2030.

Because Lagos did not put in place appropriate plans for urban planning and urban transportation policies to cope with the rapid urbanization of the Lagos metropolitan area, it faces urban planning problems, such as neglected urban areas, and urban transportation problems, such as the lack of transportation infrastructure.

(2) Current State of Urban Transport and Issues

The Lagos metropolitan area is facing rapid urbanization, over-reliance on road transport, inadequate traffic control, and other problems.

1) State of Transportation and Issues

● **State of Road Development**

Although main roads have been built on Lagos Island, Victoria Island and the mainland, they are not adequately developed. The roads are poorly maintained in general. Sagging pavement can be seen in many places.

● **Current State of Public Transportation**

Public transportation in the Lagos metropolitan area is dependent on the road system, such as buses. Table 3 is a comparison of Lagos and major metropolitan areas in Asia that are of similar size. Railway is used for urban transport in Tokyo, Osaka, and Jakarta, the capital of Indonesia. Nigeria is not using the railway for urban transport at all.

Table 3 Comparison of Lagos and Metropolitan Areas in Asia

Item	Lagos	Jakarta	Tokyo metropolitan area	Osaka metropolitan area
Population (million people)	21	28	35	18.2
Area (km ²)	3,568	6,400	13,572	11,701
Population density (person/km ²)	5,885	4,367	2,629	1,604
No. of trips (million trips/day)	22	30.5	84.3	37.9
Length of urban railway (km)	42	235	2,308	1,456

Source: Compiled by Study Team based on the Tokyo metropolitan area and Osaka metropolitan area person-trip data, and information materials from JICA and LAMATA

2) Issues of Urban Transport

● **Road Congestion**

In Lagos, car ownership has increased 234% between 2001 and 2009. Congestion occurs in various parts of Lagos because of insufficient road network in the Lagos metropolitan area. In the northern part, in particular, the roads connecting to the main roads are also congested.

● **Challenges of Traffic Control and Traffic Management**

Traffic congestion occurs in the whole Lagos metropolitan area. Bus stops and terminals, boarding and alighting on the roads, and disorganized bus terminals (bays) are the most common causes of congestion.

● **Increase in Environmental Burden**

With the increased use of automobile in recent years, CO₂ emissions are on the rise. Nigeria as a whole had an emission amount of 80 million tons in 2000 and 100 million tons in 2008, showing an increase of 25%.

3) Challenges in Urban Planning

The Lagos metropolitan area experienced rapid urbanization. Since no urban development has been carried out systematically to date, few areas, even in the central business districts (CBD) of Lagos Island and Victoria Island, have optimized the land use. The city center shall be revitalized through re-development in the future. In addition, since land use on the west side of the Lagos Lagoon and along the Lagos-Badagry Express Way on the west side of the mainland is inefficient, appropriate development shall be made to utilize the land and to build cities.

(3) Review of Measures for Mitigating Congestion in Lagos City

The revised Master Plan proposed seven measures. The congestion mitigation measures include the development of roads and railways (LRT, monorail, and cable car). For the project period (2017–2032), goals and related measures have been set up in three phases: short term, medium term, and long term. The short-term (2017) goal is to launch Lagos' first LRT line (Blue Line), the medium-term (2022) goal is to expand the LRT network, and the long-term (2032) goal is to complete the LRT network (six lines).

(4) Collection of Information and Analysis of Demand for Urban Railway

1) Transportation Demand of Target Lines

The demand forecast results of urban transport (long term: 2032) indicates that the Purple Line has the highest demand with 1.66 million users/day, followed by the Red Line (the whole line) with 1.45 million users/day, the Blue Line with 1.35 million users/day, and the Green Line with 1.3 million users/day. The population growth and increase in facilities due to development along the Purple Line and the Green Line are expected to increase the number of users. Although demand of a little fewer than 600,000 users per day is expected for the Victoria Island Line, this route can also be used for feeder transport on Victoria Island from the suburban areas. If not for the feeder transport, the demand of the Victoria Island Line may fall substantially below forecast.

2) Selection of Lines for Assistance from the Viewpoint of Transport Planning

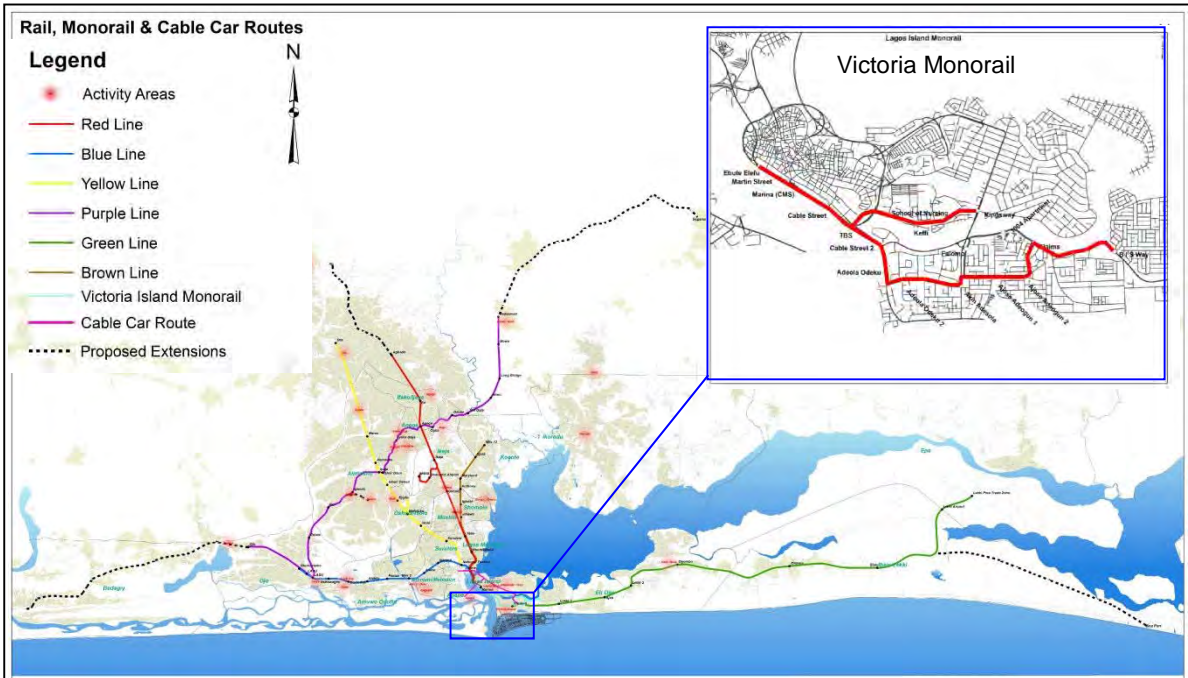
From the viewpoints of land acquisition risk and transit-oriented development (TOD), which is one of the characteristics of Japanese railway in which the areas along the railway line are developed together with the railway, the current state shows that the areas along these LRT lines are not yet developed. The Green Line, where the development of urban facilities is underway and population growth is expected to be high in the future, has the potential to be eligible for Japanese assistance.

Both the cable car and the monorail will pass through built-up areas. In our review of their validity as an urban transportation mode, the line for which monorail is planned has the greatest potential to be eligible for Japanese assistance.

6. Review and Selection of Route Options for Assistance

(1) Lagos Urban Railway Development Plan and its Progress

In the revised Master Plan, six LRT lines and one monorail line are planned for Lagos. Among the planned lines, the Blue Line, which has made the most progress, is currently under construction by a Chinese construction company CCECC. The phase-1 section of the Blue Line will open in 2016. The feasibility study of the Red line is scheduled to be updated. The pre-feasibility study of the Purple line has been completed and the subsequent feasibility study is slated to start from September 2014. No feasibility studies of the Green line, Brown line, or Victoria Island Monorail have been prepared.



Source: LAMATA materials

Figure 3 Planned Lines in Lagos State

(2) Feasibility of Participation by Japanese Companies

Technical uniqueness and superiority will be the necessary conditions for Japanese companies to participate in the Lagos urban railway project if a yen loan is granted. We propose the following technologies and systems, which can demonstrate the uniqueness and superiority of Japanese companies, based on the current state of the railway sector in Nigeria and the construction status of the Blue Line.

- AGT (Automated Guideway Transit) system
- Maintenance-free Track
- EMU (Electric Multiple Unit)
- Electricity Storage Equipment
- Traffic Control System
- ATP (Automatic Train Protection)

(3) Review the Possible Undesirable Effects on Nature and Society

Focusing on “Protected Area,” “Ecosystems,” and “Resettlement,” which experience significant impact due to differences in the location, we summarized the observation and evaluation findings of the various lines from the viewpoint of environmental and social considerations under three topics: “land acquisition,” “effect on the residents (relocation of residents, loss of livelihood, etc.),” and “natural environment (protected areas, ecosystems)” (Table 4). As a result, except for the Blue Line and Red Line that are currently in progress, the Green Line and the Victoria Island Line are expected to have less negative impact on the social and natural environments than the other lines.

Table 4 Observation and Assessment of the Various Lines from the Perspective of Environmental and Social Considerations

Line	Social environment		Natural environment
	Land acquisition	Impact to people	
Red Line	C	B	C
Blue Line	B	B	B
Green Line	C+	B	B
Yellow Line	A	A	C
Brown Line	C	C+	C
Purple line	A	A	C
Victoria Monorail	B	B	C

A: large negative impact B: medium negative impact C : small negative impact

Source: Compiled by Study Team

(4) Analysis of the Lines Using Evaluation Indicators and Selection of Target Lines for Assistance

The six LRT lines and the Victoria Island Line planned currently are analyzed using evaluation indicators as shown in Table 5 (progress of project, project cost, natural condition, social condition, benefit to Japanese companies, and other risks). Among these lines, the Victoria Island Line is the potential candidate if Japan were to participate in the projects.

Table 5 Assessment of Six LRT Lines and Victoria Island Line

Line	Remarks
Blue Line	▪ The project is in progress.
Red Line	▪ Negotiation with NRC for the land use is necessary.
Green Line	▪ Urban development along the railway is expected.
Purple Line	▪ The project risk is high due to the large-scale land acquisition and resettlement. However, the demand is also high.
Yellow Line	▪ It is ranked as low priority. On the other hand, the project risk is high due to the large-scale land acquisition and resettlement.
Brown Line	▪ It is ranked as low priority and it may be changed to BRT.
Victoria Island Line	▪ The project cost can be reduced with the adoption of AGT.

Source: Compiled by Study Team

7. Understanding and Analyzing the Current State for Japanese Companies to Participate in Projects

(1) Current State in Nigeria and Lagos State

1) Security

No terrorist activities have been reported in Lagos State to date. However, the rampant crime is a problem. Even within Lagos State, security related to the occurrence of general crime is different depending on the area within the Lagos State. Lagos Island and Victoria Island areas in Lagos State have relatively good security.

2) Electric Power

The power supply in Lagos State is poor. Currently, Nigeria as a whole, is estimated to have potential power demand of 10,000 MW. The power generation capacity is 6000 MW. The current power generation capacity can no longer be explored due to shortage in gas supply, constraint in power transmission, and the need to reserve power.

3) Partner Companies

Japanese companies that do not have experience in Nigeria can reduce risks by entering into joint ventures with local companies at the various stages of design, estimation, and construction. It shall be noted that even if a Japanese company enters into a joint venture with a local partner company, it still has to set up a local company in order to take part in the project in Nigeria.

4) Relationship with Other Transportation Modes

The minibus route network covers wide areas. Minibus is used by many citizens and it has many stakeholders. If a new urban railway is to be built, the impact on these stakeholders will be significant. Opposition movement may occur, affecting the progress of the project.

(2) Design, Construction and Manufacture Stage

1) Land and Building Barriers

The land for the Blue Line, the construction of which is currently underway, is prepared by the Nigerian side. If the same approach is used for the development of the Victoria Island Line, no problem is foreseen. The contracts shall be prepared taking into consideration delays from land acquisition.

2) Ground Condition

The coastal areas of Lagos State have many areas reclaimed from the lagoon, the support layer is deep down in the ground and the soil is soft. Since ground changes in general are expected to be significant, high-density ground surveys (boring surveys) shall be conducted at an early stage in order to draw up a detailed plan for structures and to calculate the project cost accurately.

3) Utilities

Since Victoria Island and Lagos Island are the biggest business areas in Lagos State, many utilities are expected to be buried underground. In addition to obtaining information materials from the utility companies in advance, relocation shall be carried out if necessary. Such measures can prevent increase in project cost and construction delays later on.

4) Contract

Use of the DBB (Design-Bid-Build) method, the Red Book, or the Yellow Book will be the acceptable condition for Japanese construction companies to participate in the project. Use of the Silver Book shall be avoided if Japanese construction companies are to take part in the project.

5) Estimation

Because Japanese construction companies do not have any experience of construction projects in Nigeria, it is very difficult for them to estimate the unit costs of equipment and labor, import, transport, taxation, and other costs accurately. Therefore, it is advisable to utilize local consultants and construction companies in Nigeria to increase the accuracy of estimation.

6) Transport and Delivery of Materials and Equipment

No special problem is foreseen because the existing roads can be used for the transport and delivery of materials and equipment. The local partner companies can arrange the trucks for delivery.

8. Hosting of Workshops and Seminar in Nigeria

To enhance the understanding of our Nigerian counterparts about the Japanese urban railway system, to improve communication, and to share useful information, we offered two workshops and a seminar in Lagos. These workshops and seminar successfully deepened the participants' understanding of the survey results, Japanese urban railway and its technologies, and therefore achieved the original goal as intended.

9. Recommendations and Challenges

(1) Recommendations to Japanese Companies for Participating in Urban Railway Projects in Nigeria

From among the urban railways planned for Lagos, this Study selected the Victoria Island Line as potential route for cooperation between Japan and Nigeria in the future. This Study has also identified issues that must be addressed in order to bring the line into reality. We recommend performing feasibility study, on the premise of using yen loan, as the next step to pave the way for Japanese companies to participate in the urban railway projects.

(2) Main Focus of the Feasibility Study

The following are the main points of the feasibility study:

- 1) Review Demand Forecast
- 2) Estimate Project Cost
- 3) Verify Ground Condition
- 4) Review Facilities Plan
- 5) Evaluate the Technical and Operational Levels of the Railway
- 6) Policy for Land Acquisition, Establishment of a System
- 7) Relocation of Residents, Anticipated Scale and Degree
- 8) Verify Project Components
- 9) Review Project Scheme and Perform Economic Analysis
- 10) Analyze the Risks for Japanese Companies to Participate in the Project

(3) Issues for Future Review

1) Collaboration with the Federal Government

The Federal Ministry of Finance holds the key to the process, from the decision to take out an external debt (borrowing of yen loan) to the approval of the borrowing plan. If the project entity is the State government, it is required to obtain an informal consent from the Federal Ministry of Finance in advance. This step is a key factor. LAMATA and the State government (Governor Office, etc.) shall make contact with the Federal Ministry of Finance as early as possible and continue to approach the Ministries. In this case, it is also effective to have the Federal Ministry of Transport to act as a go-between.

2) Promote Understanding of the AGT System

When the Study Team presented the AGT technology, the Nigerian side showed a great deal of interest. However, since AGT is a new technology to the concerned parties in Nigeria, they may not have developed a full understanding of the technology. Efforts shall be made to enhance the understanding of the Nigerian side about the technical aspect of AGT in order to facilitate adoption of the AGT.

3) Enhance Understanding of the Superiority of the Japanese Urban Railway Systems

In the two workshops and seminar, the Study Team presented the Japanese urban railway systems. The Nigerian side is believed to have gained certain understanding of the superiority of the Japanese urban railway systems. In the future, training programs in Japan shall be offered through JICA to enhance further the understanding of Nigerian railway personnel about the superiority of the Japanese urban railway systems.

Chapter 1

Background and Overview of Study

Chapter 1 Background and Overview of Study

1.1 Current State and Issues of Lagos State in the Federal Republic of Nigeria

The Federal Republic of Nigeria (hereinafter referred to as "Nigeria") has a population of approximately 170 million as of 2013. Its GDP is approximately 510 billion USD, making Nigeria the largest economy in Africa. Lagos (Lagos State), the former capital, is one of the cities in Sub-Saharan Africa that continues to enjoy rapid economic growth. With concentration of more than 50% of the country's industrial and commercial facilities and 70% of the manufacturing industries, Lagos attracts foreign companies to expand operations there as well as investment from overseas.

Lagos State has an area of 3,577 km². Its current population is estimated to be more than 21 million. With the population growing rapidly and the numbers of newly registered automobiles and motorcycles increasing every year, Lagos is suffering from chronic traffic congestion and serious air pollution caused by the exhaust gas.

Under such circumstances, JICA conducted a "Data Collection Survey on Mass Rapid Transit" from February to March of 2013. The Study found that although Nigeria already has plans to rehabilitate the existing railway lines and develop urban railway, and that LRT lines are being built in Lagos with funds from the Export-Import Bank of China and others, validity for the development of the planned routes, priorities in the development of routes, and other evaluation indexes have not been sufficiently examined.

In the 5th Tokyo International Conference on African Development (TICAD V) held in Yokohama in June 2013, Nigeria expressed the desire for Japan to lend support to its infrastructure development. Although Japanese assistance to the Nigerian railway sector, including the above-mentioned Lagos urban railway development plan, is expected to contribute to the economic development of Lagos, further study is desirable due to insufficient information on the specific contents of assistance projects and their validity.

From the above, it is necessary to gather information to support the development through additional research as Japan draws up future projects that may be applicable to the Nigerian railway sector.

1.2 Objectives of Study

The Study sets the following objectives based on the analysis results of the "Data Collection Survey on Mass Rapid Transit" conducted by JICA in 2013:

- Objective 1: Enhance the understanding of concerned parties in Nigeria about the Japanese urban transportation systems
- Objective 2: Identify projects (planned lines) from the Lagos State urban railway development plan that are eligible for assistance
- Objective 3: Make specific recommendations of railway technologies, in which Japanese companies have international advantages, to Nigeria

1.3 Survey Area

The Study will focus on Lagos State, a metropolitan area with the largest population and economy in Nigeria, as the area of study. Because its urban traffic condition has deteriorated in recent years, road-based public transport, such as railway and monorail, is being planned currently as a measure to resolve traffic problems.

1.4 Concerned Entities in Nigeria

The 1st field survey was done for 1.2 month from early August. Then the 2nd field survey was done for 0.3 month from end of October. During these field surveys period, members of study team interviewed to concerned parties of the Nigerian Railway Corporation, Federal Ministries of Nigeria and Lagos State Government. Data collection and site survey were also done during this period.

Table 1-1 shows the concerned parties took part in interviews and discussions of this Study. Table 1-2 shows the site survey for proposed routes of urban railway systems.

Table 1-1 Concerned Entities in Nigeria

Ministries and agencies	Name
Federal government agencies	National Planning Commission (NPC)
	Infrastructure Concession Regulation Commission (ICRC)
	Federal Ministry of Transport
	Federal Ministry of Finance
	Federal Ministry of Environment
	Nigeria Railway Corporation (NRC)
State government organizations	LAMATA
	State Ministry of Economic Planning and Budget
	State Ministry of Environment
	State Ministry of Physical Planning and Urban Development
	Land Bureau
	State Ministry of Transportation
	State PPP Office
	State Ministry of Finance
Government organizations of Japan	Embassy of Japan
	Japan External Trade Organization (JETRO)
Other donors	United States Agency for International Development (USAID)
	Agence Française de Développement (AFD)
	African Development Bank (AfDB)
	World Bank
Private companies	AEC (Advanced Engineering Company)
	Julius Berger Nigeria

Source: Compiled by Study Team

Table 1-2 Site Visiting for Proposed Routes of Urban Railway

Cities	Route
Abuja	Airport Access Line
Lagos	Red Line
	Blue Line
	Green Line
	Victoria Island
	Lagos Terminus
	Nigeria Railway Corporation (Workshop)

Source: Compiled by Study Team

1.5 Members of this study

Table 1-3 shows the members of the study team.

Table1-3 Member List of Study Team

Position	Name	Company*
Team Leader, Railway System	AKIYAMA, Yoshihiro	JIC
Deputy Team Leader, Railway Organization/ Management	SAKON, Yoshimasa	CFK
Infrastructure Investment	LIM, Poh Soon	MRI
Railway Technology (1) Infrastructure	YAMAMOTO, Naohisa	JIC
Railway Technology (2) E&M	ENOMOTO, Akira	JIC
Urban Transport	YAMAUCHI, Yasuhiro	YEC
Demand Forecast	TAKEUCHI, Ryusuke	JIC
Environmental and Social Considerations	KUDO, Yuriko	YEC

*Notes

JIC Japan International Consultants for Transportation Co., Ltd.

YEC Yachiyo Engineering Co., Ltd.

CFK Chuo Fukken Consultants Co., Ltd.

MRI Mitsubishi Research Institute, Inc.

Source: Compiled by Study Team

Chapter 2
Social-economic Indicators
of the Federal Republic of Nigeria

Chapter 2 Socio-economic Indicators of the Federal Republic of Nigeria

2.1 Basic Information

2.1.1 Land and Natural Conditions

Nigeria is located in West Africa. It is facing the Gulf of Guinea on the Atlantic Ocean in the south, the Republic of Benin in the west, the Republic of Niger in the north, the Republic of Chad in the northeast, and the Republic of Cameroon in the east. It has a land area of 923,000 km², which is about 2.5 times the area of Japan. The Niger River and Benue River—Nigeria's two big rivers—meet near Lokoja in Kogi State in the central part of Nigeria and then flow southward into the Niger delta to form the largest delta region in the world.

Except for the Jos Plateau in the central part and the Adamawa Plateau on the eastern border, Nigeria has a relatively flat terrain, but it is home to a variety of climate zones. The southern region has a tropical monsoon climate, with rainfall of about 2,000 mm a year and a fair distribution of mangroves. On the other hand, from the central region to the northern region, the climate is classified as Savannah climate, which has 500–1,500 mm rainfall per year. The northern part is a semi-arid region called the Sahel, which spreads to the southern edge of the Sahara.

2.1.2 Population and Races

Nigeria has a population of 173.6 million (2013), making it the most populous in Africa. It is expected to have the sixth largest population in the world in 2050. There are more than 250 tribes and ethnic groups living in the country. Hausa (north), Yoruba (southwest), and Igbo (southeast) are the three largest ethnic groups. They account for 70% of the population in Nigeria.

2.1.3 Government

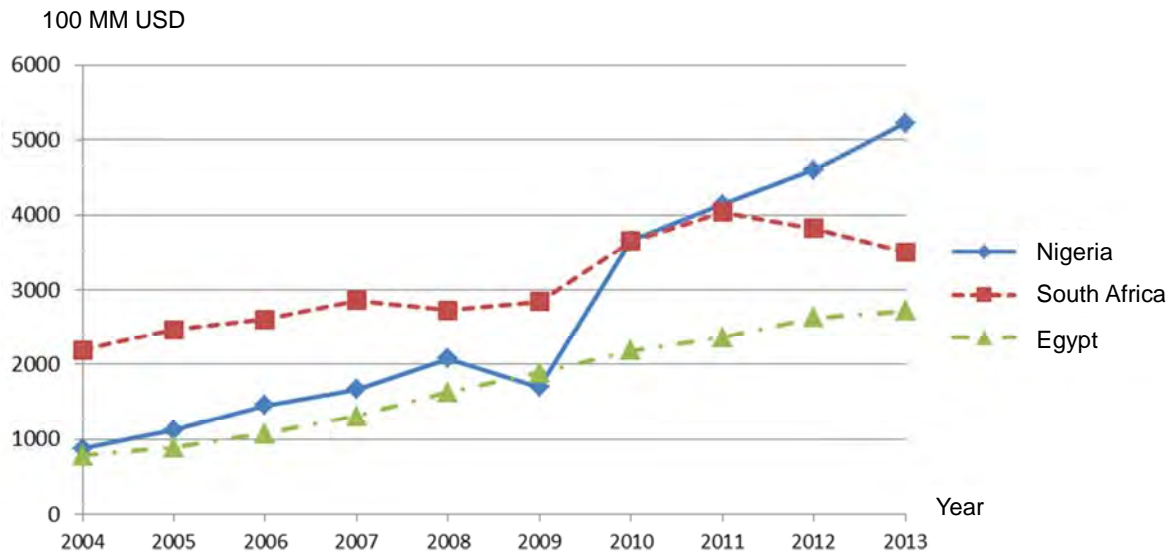
Nigeria is a Federal Republic. The President is the Head of State. Nigeria is composed of 36 States and the Federal Capital Territory (FCT). The States are further sub-divided into 774 Local Government Areas. At the Federal level, the executive branch is made up of the Federal Executive Council (FEC) led by the President, Vice President, and Ministers. The Council implements the laws enacted by the legislature as policies and programs. At the State level, the Governor and Deputy Governor are both elected to lead the State Executive Council and to work with the appointed Commissioners on State affairs. At the local government level, the elected Chairman and Vice-chairman, and Councillors appointed by the committee members of the Finance and General Purpose Committee (F&G) run the Local Government Council. By the way, the fifth presidential election will be held in 2015.

The National Assembly is a bicameral body consisted of the senate with 109 senators at the Federal level (three seats for each State and one seat for the Federal Capital Territory) and the House of Representatives with 360 Representatives. The State and Local governments have a unicameral assembly.

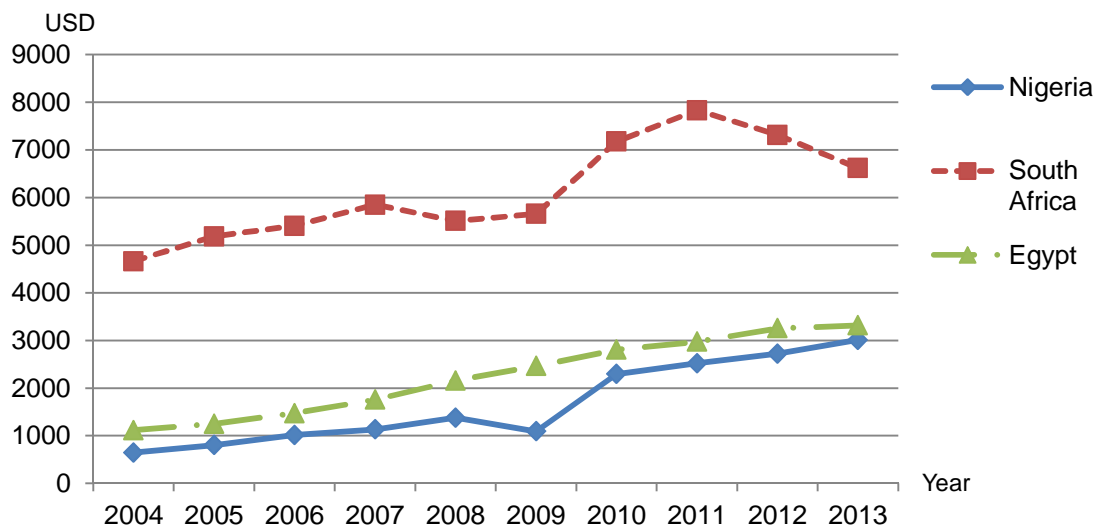
2.1.4 Economy

(1) GDP

Nigeria's GDP is 522.6 billion USD (2013). Its current economic scale has by far overtaken South Africa to become the largest in Africa. Figure 2-1 shows the changes in nominal GDP. Despite the temporary downturn under the influence of the global economic crisis in 2009, Nigeria's economy is growing at an annual rate of 6–8% on average. Although the per-capita GDP was more than 3000 USD in 2013, it remains less than half of that of the Republic of South Africa (Figure 2-2).



Source: Compiled by Study Team based on World Bank materials
 Figure 2-1 Changes in Nominal GDP



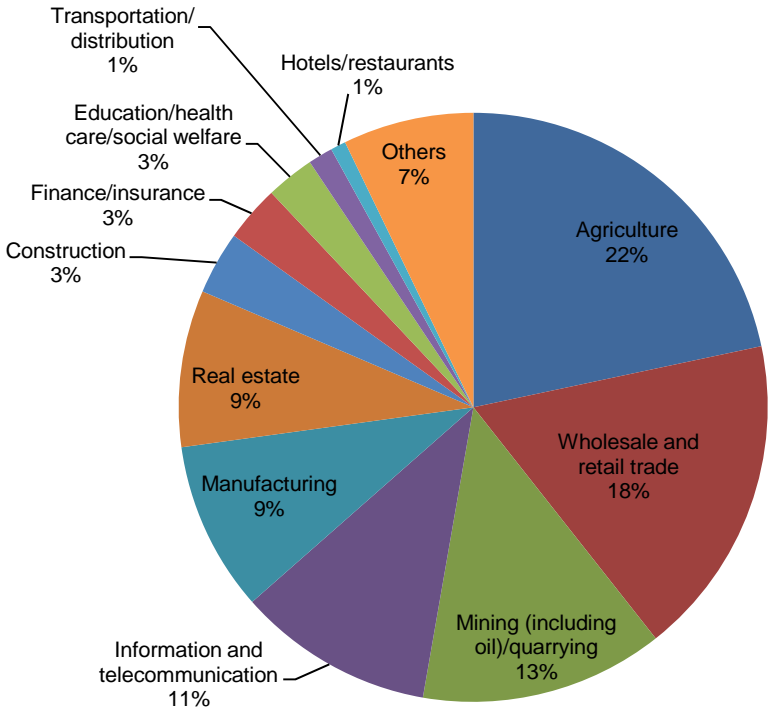
Source: Compiled by Study Team based on World Bank materials
 Figure 2-2 Changes in Per-capita Nominal GDP

(2) Industry

Nigeria is an oil-producing country with reserves ranking No. 8 in the world (OPEC, 2012). It has been pointed out that due to the long years of military dictatorship and the failure to use crude oil revenue properly, the alleviation of poverty and development of infrastructure have not made much progress. The investment in the oil and natural gas sector and production has been limited in recent years because of institutional constraints and security problem. The majority of the people are suffering from poverty. Although the purchasing power is low and the market has not been fully explored, industries geared toward the domestic market are growing gradually.

Figure 2-3 shows the GDP ratios in 2013 by sector. In 2014, when the 2010–2013 GDP was recalculated, the number of sectors was revised from 33 to 46. As a result, the ratios of wholesale and retail trade, services, manufacturing, construction, and water/electricity have increased while the ratios

of agriculture and oil/natural gas, which account for about three quarters of the original GDP, have decreased.



Source: Compiled by Study Team based on National Bureau of Statistics materials
Figure 2-3 GDP Ratios by Sector (2013)

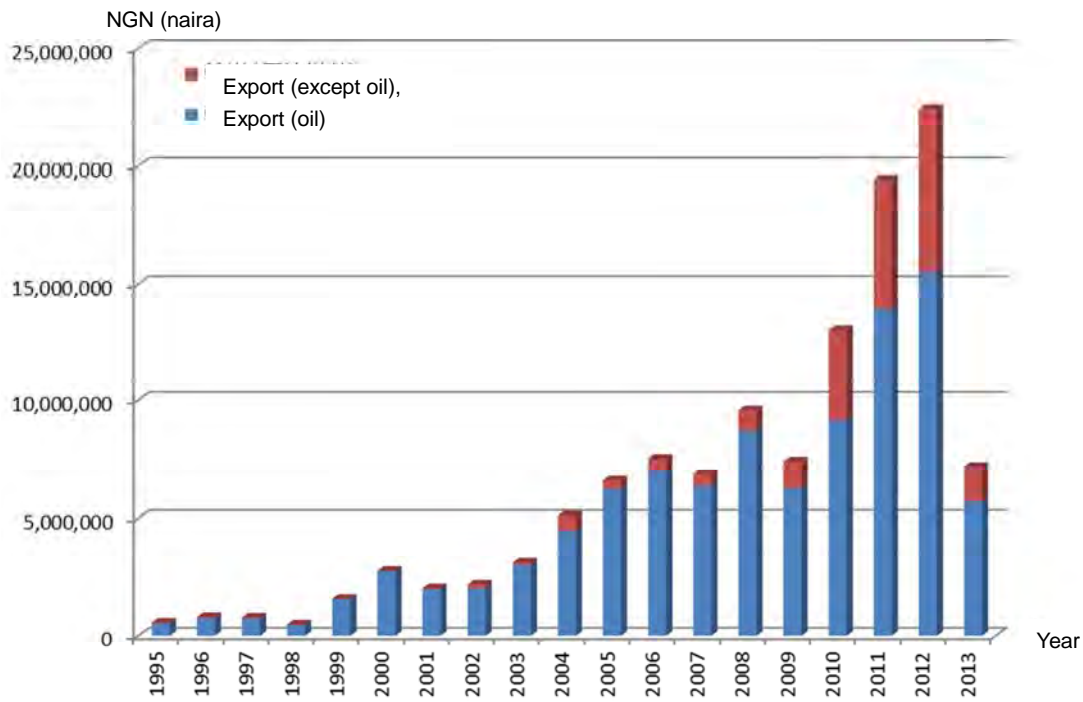
(3) Trade

Figures 2-4 and 2-5 show the changes in the export and import amounts. Although both the export amount and import amount are on the rise every year, the exports in 2013 and the imports in 2012 decreased significantly. For the exports, a decrease in oil export, which accounts for a high percentage of Nigeria’s exports, is the major reason. Decreases in the export of processed foods, tobacco, and agricultural products are also contributing factors. The decrease in imports is due to the government’s expansion of domestic production for some products, including vegetable oil, textile products, cement, and so on, in order to reduce dependency on imports. The contraction in certain domestic demand, caused by the slowdown in economic growth, is also responsible. The EU is the main trading partner in both exports and imports. China, USA, India, Brazil also rank high (Table 2-1).

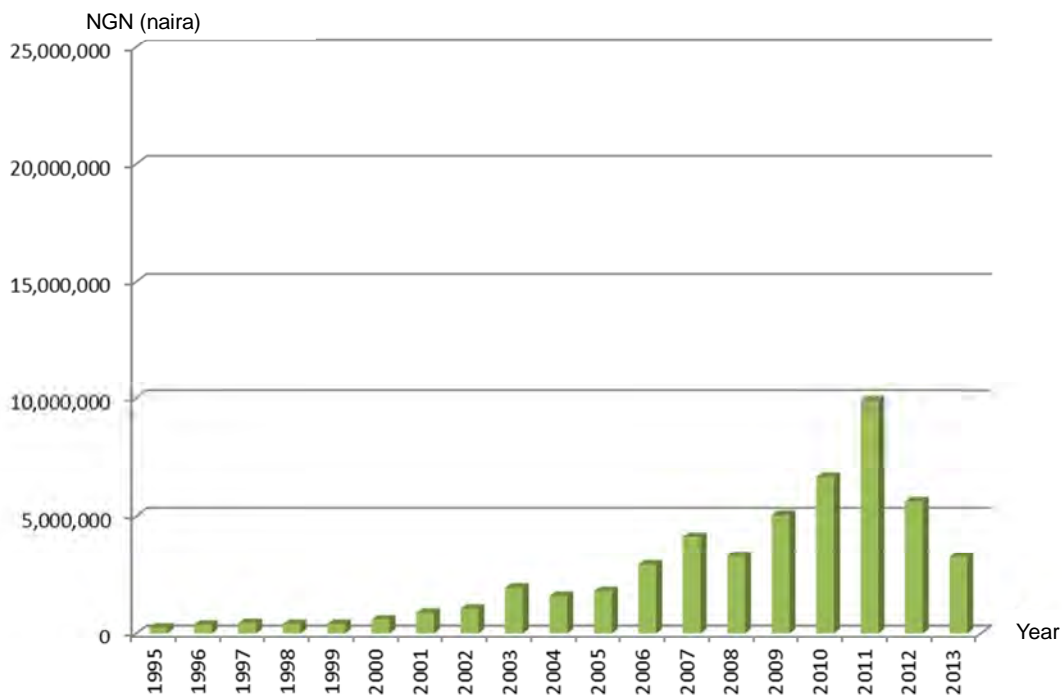
Table 2-1 Trading Partners in 2012

Import		Export	
Name of country	Percentage (%)	Name of country	Percentage (%)
1. EU	23.3	1. EU	35.6
2. China	21.5	2. USA	16.9
3. USA	13.6	3. India	11.1
4. India	8.0	4. Brazil	7.5
5. Brazil	8.0	5. China	5.6

Source: Compiled by Study Team based on WTO materials



Source: Compiled by Study Team based on National Bureau of Statistics materials
 Figure 2-4 Changes in Export Amount



Source: Compiled by Study Team based on National Bureau of Statistics materials
 Figure 2-5 Changes in Import Amount

2.2 Policies and Systems

2.2.1 Policy Measures

The “Nigeria Vision 20:2020,” the long-term development policy currently being implemented is at the top of national policies. It plans to (a) optimize the human resources and natural resources of the country to facilitate sustainable economic growth and (b) promote social development so that every citizen can receive the benefits of economic growth fairly. The goal is for Nigeria to become one of the world’s twenty economic superpowers with GDP of 900 billion USD and per-capita annual income of 4,000 USD by 2020. The specific strategies, plans, and programs are laid out in three implementation plans (Phase 1: 2010–2013, Phase 2: 2014–2017, and Phase 3: 2018–2020).

In addition, a medium-term policy “Transformation Agenda 2012–2015” was formulated in 2011 for the implementation of economic reforms from 2012 to 2015 as a part of the long-term development policy. This policy places emphasis on the creation of buffers to accommodate international trends and elements of macroeconomic instability, the appropriate inclusion of growth in the calculation, diversification of economic activities, and increase in the competitiveness of the Nigerian economy. Reform programs aimed at deficit reduction, management of internal debt, and increase of capital expenditures (infrastructure development in particular) are being carried out.

2.2.2 Infrastructure Development using PPP

The “Infrastructure Concession Regulatory Commission Act” was enacted in 2005. It stipulates that all infrastructures in Nigeria, including the railway, shall be developed in the future using public-private partnership (PPP) schemes. The urban railway plans for Abuja and Lagos State (LRT, monorail) are also expected to be financed with PPP schemes. Efforts are made to attract actively investment from the private sector. However, Nigeria has not had any railway projects developed using PPP. It faces challenges, including the lack of ability to form PPP projects, lack of funds, lack of human resources with expertise in PPP, etc. From 2011, the World Bank and the UK have provided support for the implementation of PPP through capacity building, preparation of PPP manual, and so on.

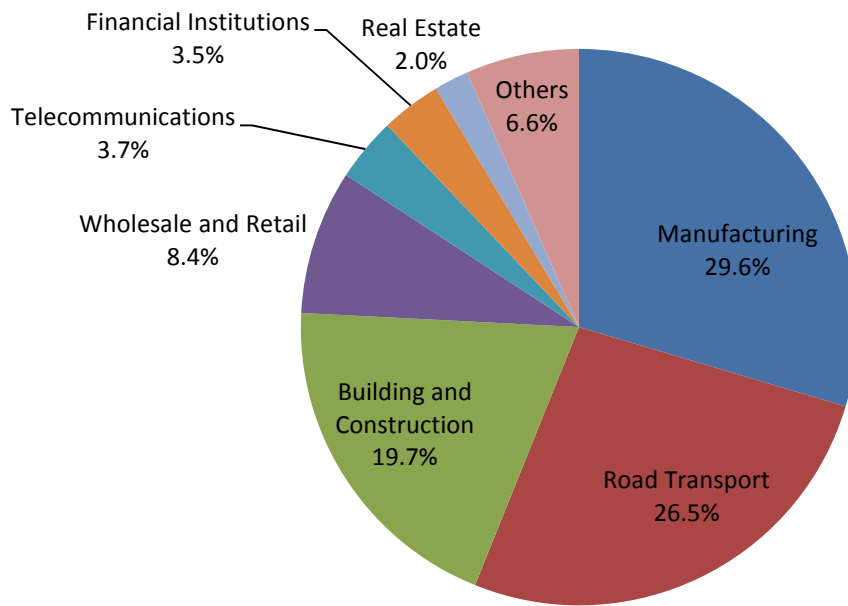
2.3 Overview of Lagos State

2.3.1 Basic Information

Lagos is the largest city and port in Nigeria. It is located at the Gulf of Benin in the southwestern edge of Nigeria. The State has an area of 3,577 km², making it the smallest state in Nigeria. At the time of the 2006 census, Lagos State had a population of 17.55 million people. It is estimated to have exceeded 21 million today. Lagos City has over 85% of the State’s population. It is one of the world's largest megacities in Africa, along with Cairo, the capital of Egypt. According to the estimates of the United Nations, Lagos City is expected to experience significant influx of population, making it a metropolis second only to Tokyo and Bombay in 2015.

2.3.2 Economy

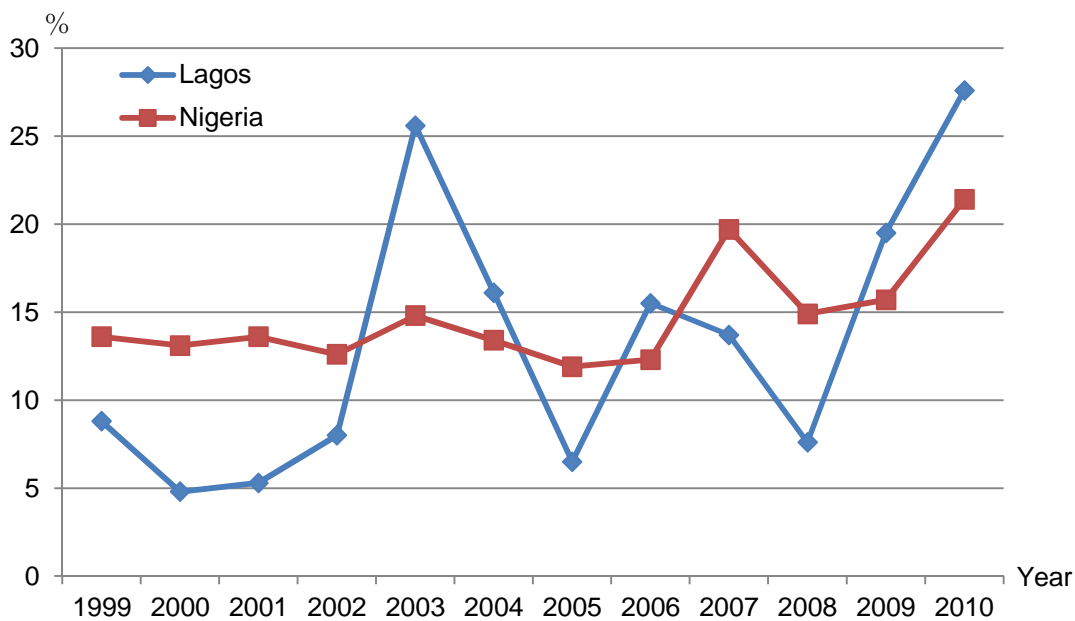
Lagos was the capital of Nigeria until the move to Abuja in 1991. Even today, it is still an economic and cultural center. It has more than 50% of the industrial and commercial facilities and 70% of the manufacturing industry. The GDP of Lagos State in 2010 is about 80.6 billion USD, which is 35.6% of the GDP of Nigeria. Excluding oil, Lagos State accounts for 62.3% of the country’s GDP. Figure 2-6 shows the GDP ratios by sector.



Source: Compiled by Study Team based on Lagos State Ministry of Economic Planning and Budget materials
 Figure 2-6 GDP Ratios by Sector (2010)

2.3.3 Employment

Despite the remarkable economic growth, about half of the population in Nigeria is the poor who lives on \$1 or less a day. The unemployment rate is high. The unemployment among young people has become particularly serious. Even Lagos State, home to the metropolitan Lagos City, has an unemployment rate of 27.6% in 2010, which is higher than the national average. The gap between the rich and the poor is widening. Such disparities are said to be the underlying cause of rampant crime, such as theft, armed robbery, etc. (Figure 2-7).



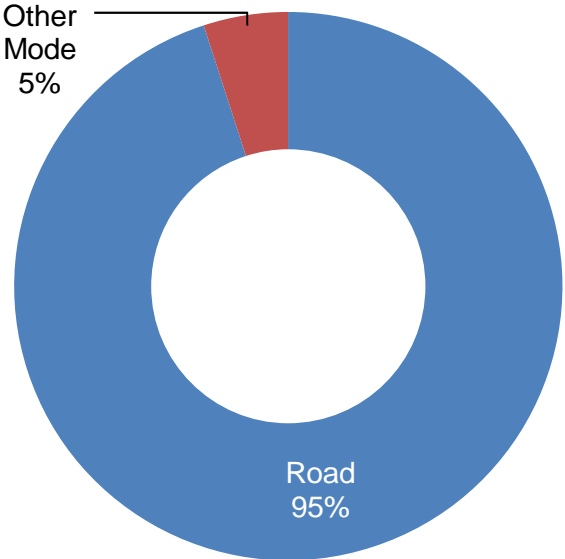
Source: Compiled by Study Team based on National Bureau of Statistics materials
 Figure 2-7 Unemployment Rates in Nigeria and Lagos State

2.4 Overview of Transport Sector

2.4.1 Current State of Transport Sector

(1) Overview of Passenger and Freight Transport Nationwide

Due to the decline of the railway system from the 1970s to the 1980s, road transport is now playing a key role in supporting domestic distribution. In recent years, road traffic accounts for 95% of the passenger and freight transport in Nigeria (Figure 2-8).

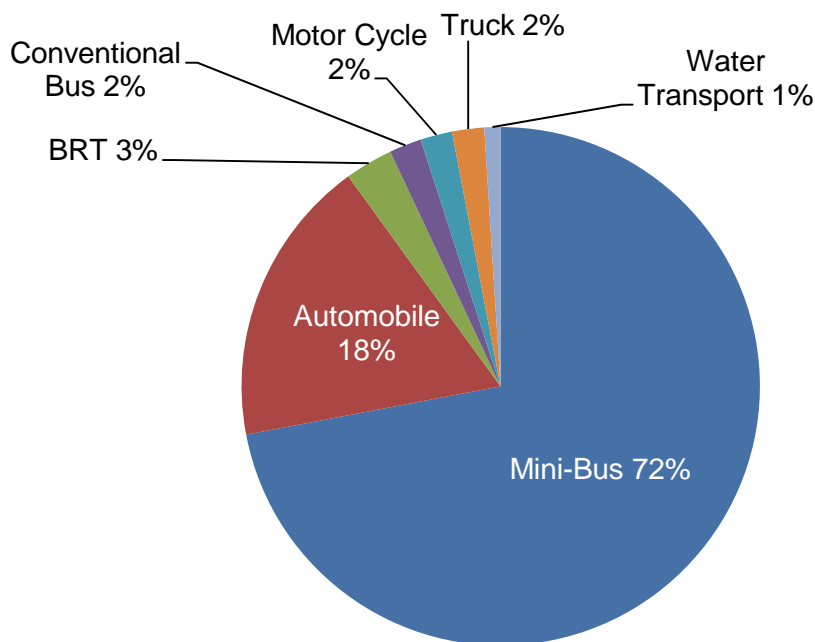


Source: Federal Ministry of Works, “Road Infrastructure & Related Development in Nigeria – An Investor’s Manual 2013”

Figure 2-8 Shares of Passenger and Freight

(2) Overview of Urban Transport

Since both Lagos and Abuja do not have urban railway at this time, road transport plays a key role. The total number of trips in the Lagos metropolitan area is about 22 million trips per day, 40% of which are walking trips. Of the remaining 60%, minibuses using wagons with occupancy of 8–25 passengers account for 72%. The ratios of other public transport using road, such as Bus Rapid Transit (BRT) (3%) and conventional bus (2%), are low. The Nigerian Railway Corporation provides services from the city to the suburbs but the ratio is less than 1% (Figure 2-9).



Source: Frederic Oladeinde, "Transportation Planning in Developing Countries," (2009)
 Figure 2-9 Modal Share in Lagos Metropolitan Area (Except walking)

(3) Policies related to the Transport Sector

1) Nigerian Vision 20:2020

The Nigerian Vision 20:2020 was issued by the National Planning Commission (NPC) in December 2009. It is the most important long-term development plan being implemented in Nigeria today. Its target years are from 2009 to 2020. It aims to achieve GDP of 900 billion USD and an annual per capita income of 4000 USD, and to become one of the world's top 20 economic superpowers by 2020. It will be implemented through the third phase of the medium-term development plan, which stipulates the specific strategies, policies, plans, and programs.

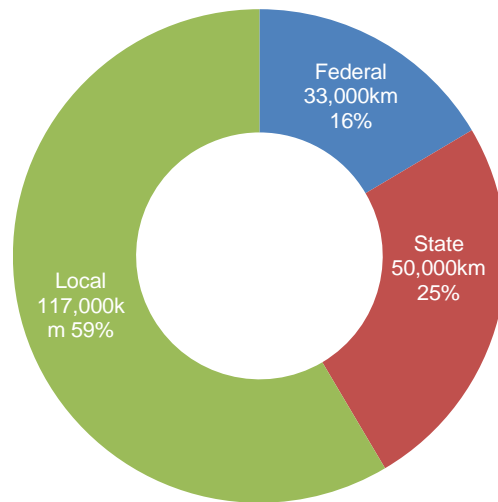
2) Master Plan for Integrated Transportation Infrastructure

The comprehensive transport master plan of Nigeria was issued by the Federal Ministry of Transport (FMT) in February 2, 2002. The master plan, which includes an infrastructure plan for roads, railways, ports, waterways, aviation, and pipelines, is a development plan with 2020 as its target year. In September 2014, the Draft Final Report of the "National Integrated Infrastructure Master Plan (NIIMP)" was formulated by the National Planning Commission of Nigeria. It is an integrated infrastructure development plan for roads, railways, ports, aviation, energy, and other fields. In response to a directive from the President, NPC started formulating the NIIMP in September 2012. It is a 30-year plan from 2014 to 2043. It provides policy continuity to the abovementioned Nigerian Vision 2020.

2.4.2 Overview of Road Sector

(1) Road Lengths by Road Classification

Nigeria has about 200,000 km of roads. Among the African countries, Nigeria's road length is second to that of the Republic of South Africa, which has 360,000 km. The roads are classified into three types: roads under the jurisdiction of the Federal government (Federal), roads under the jurisdiction of the State government (State), and roads under the jurisdiction of the local government (Local). Local roads account for about 60% of the roads (Figure 2-10).

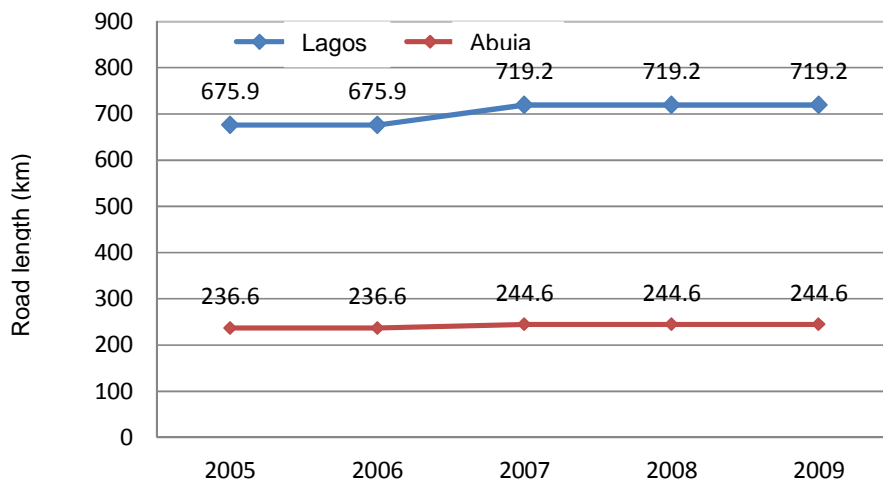


Source: Federal Ministry of Works, “Road Infrastructure & Related Development in Nigeria – An Investor’s Manual 2013”

Figure 2-10 Road Lengths by Road Classification

(2) Changes in Road Length

Figure 2-11 shows the changes in road length in Lagos and Abuja that are under the jurisdiction of the Federal government. Although the road lengths increased in both cities in 2007 by about 5%, no roads have been added since then.

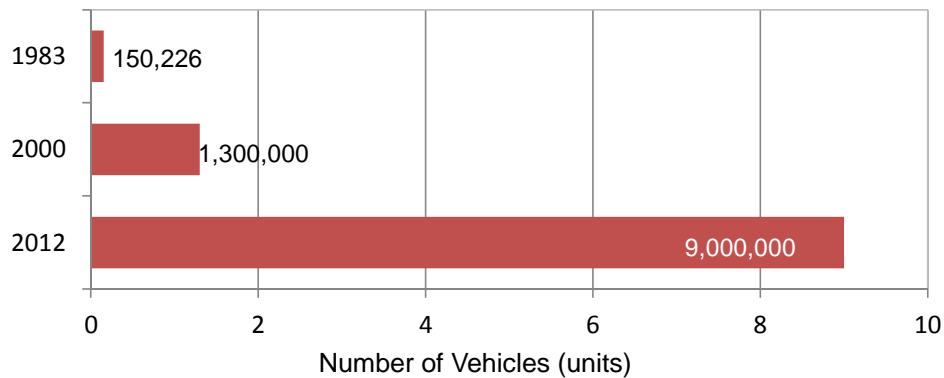


Source: National Bureau of Statistics, “Annual Abstract of Statistics 2011”

Figure 2-11 Changes in Road Length in Lagos and Abuja

(3) Car Ownership

With the shift of passenger and freight transport from railway to road from the 1980s, car ownership has dramatically increased in recent years, from 150,000 units in 1983 to 1.3 million in 2000 and 9 million in 2012 (Figure 2-12).

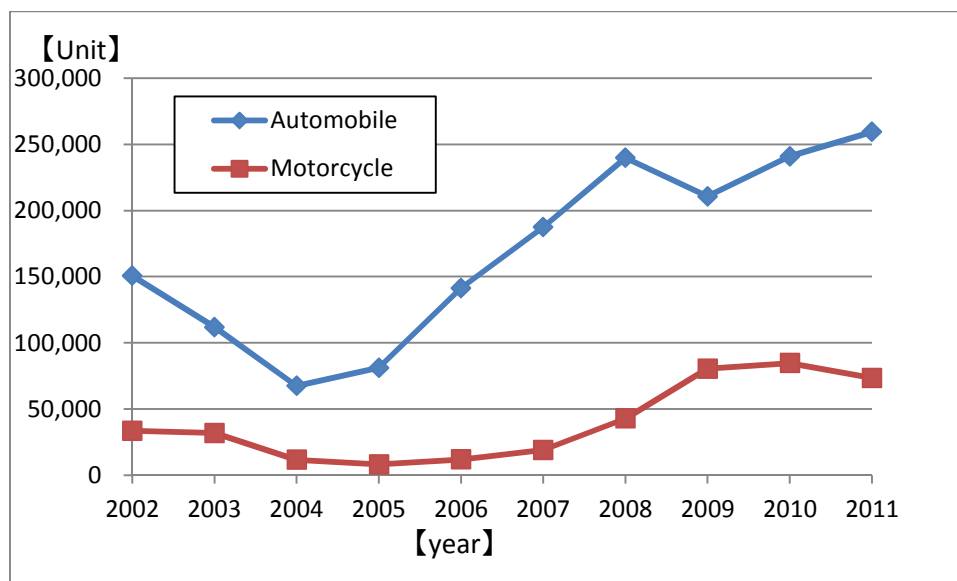


Source: Federal Ministry of Works, “Road Infrastructure & Related Development in Nigeria – An Investor’s Manual 2013”

Figure 2-12 Secular Changes in Car Ownership

(4) Number of Newly Registered Vehicles

Figure 2-13 shows the changes in the number of newly registered automobiles and motorcycles in Lagos State. Both the automobiles and motorcycles are increasing every year, worsening the traffic congestion problem. As a response, the Lagos State government implemented a new traffic law in August 2012 to prohibit motorcycle taxis from entering the main roads.

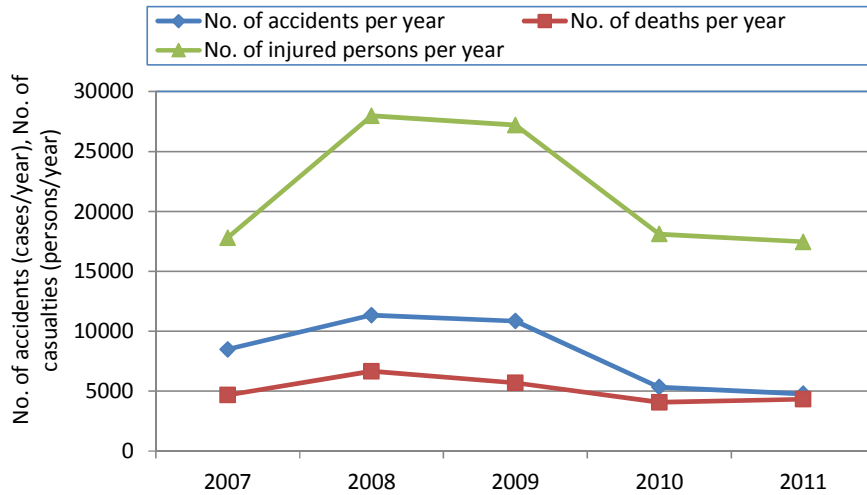


Source: Compiled by Study Team based on Lagos State Ministry of Economic Planning and Budget materials

Figure 2-13 Numbers of Newly Registered Automobiles and Motorcycles (Lagos State)

(5) Number of Traffic Accidents

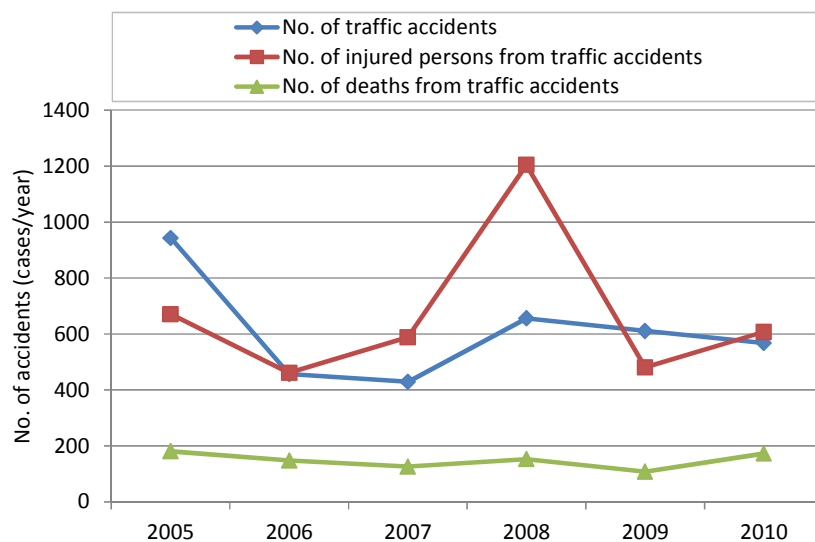
Figure 2-14 shows the changes in the number of accidents in Nigeria. The number of accidents per year and the number of casualties per year are on a downward trend since 2008. This is because the authority to manage traffic safety was delegated to the Federal Road Safety Corps in (FRSC) in 2007, which has strengthened measures to enhance traffic safety. The major causes of traffic accidents are approximately 25% speeding and 15–20% drunk driving.



Source: Sumaila, AbdulGaniyu Femi (2013), "Road crashes trend and safety management in Nigeria"
Figure 2-14 Changes in Traffic Accidents and Number of Casualties (Nigeria as a whole)

Figure 2-15 shows the changes in the number of traffic accidents in Lagos State. In the six years from 2005 to 2010, the number of traffic accidents was down to about 60%. The number of casualties per year fluctuated but there was almost no reduction in the six years.

The problem of traffic accidents in Lagos State is caused by many factors: (1) the space for the bicycles and pedestrians on the road is not sufficiently secured, (2) the legal system to regulate speeding, drunk-driving, and other violations is not sufficiently established, (3) an emergency response system is not in place, and (4) statistics of traffic accidents are not sufficiently maintained. Therefore, compiling statistics on traffic accidents, developing road infrastructure, controlling traffic, strengthening laws and regulations, and providing traffic safety education are essential for reducing traffic accidents.



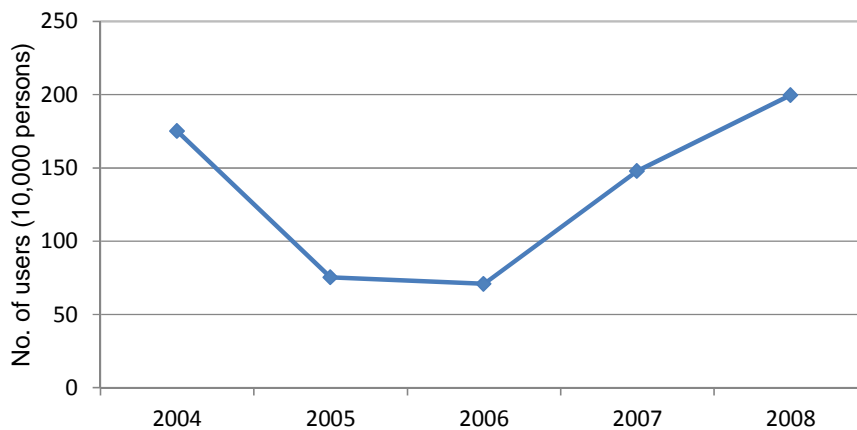
Source: National Bureau of Statistics, "Annual Abstract of Statistics 2011"
Figure 2-15 Changes in the Number of Traffic Accidents and Number of Casualties (Lagos State)

2.4.3 Transportation Sector

(1) Railway

1) Passenger Transport

The Nigerian Railway Corporation (NRC) provides railway transport in Nigeria. Passenger transport is mainly inter-city transport. However, passenger transport by rail has been sluggish in recent years, at about 1–2 million passengers annually. Road transport, as explained above, is the main transportation mode.



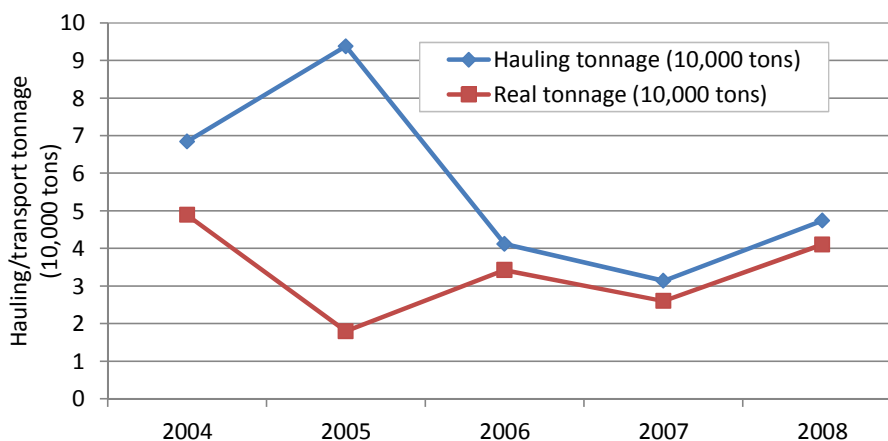
Source: National Bureau of Statistics, “Annual Abstract of Statistics 2011”

Figure 2-16 Changes in Passenger Transport by Railway

2) Freight Transport

Figure 2-17 shows the trend of freight transport in recent years. The real tonnage of the transport volume has remained at around 50,000 tons per year between 2004 and 2008. Between 2004 and 2005, the transport efficiency is poor because the real tonnage is substantially lower than the hauling tonnage. Since 2006, the difference between hauling tonnage and transport tonnage has narrowed, showing that railway transport has become more efficient.

It has been pointed out that due to the decline of agriculture, freight transport has been sluggish in the long term. Since bulk transport by rail has advantage over road transport, it shall be strengthened to increase rail freight in the future.

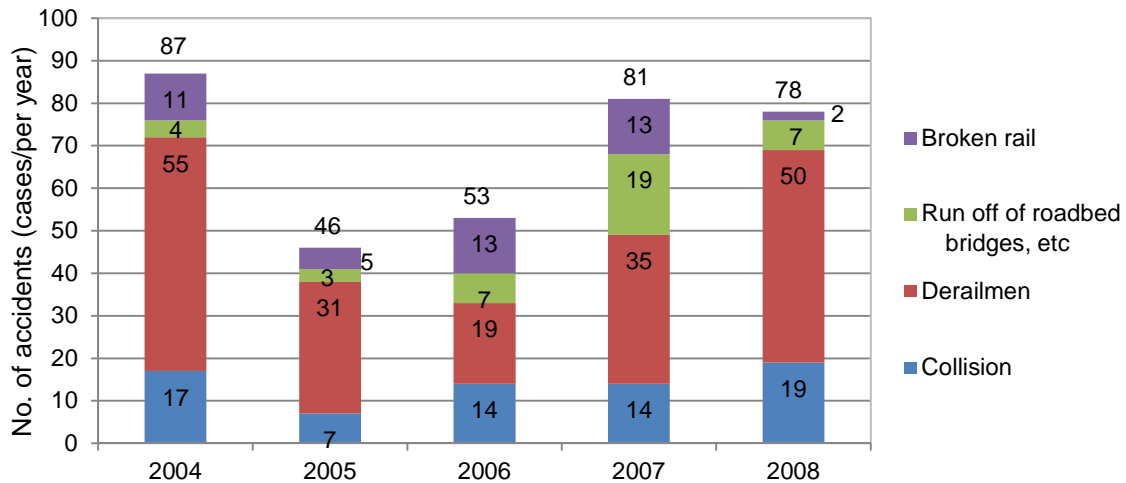


Source: National Bureau of Statistics, “Annual Abstract of Statistics 2011”

Figure 2-17 Changes in Freight Transport by Railway

3) Number of Accidents

There are about 50–90 cases of railway accidents per year. The most common cause of the accidents is derailment, which accounts for 20 to 50 accidents per year. Insufficient maintenance of the tracks is believed to be the reason. The next common cause is collision accident. Insufficient signaling and telecommunication systems are believed to be one of the factors causing the accidents (Figure 2-18).



Source: National Bureau of Statistics, “Annual Abstract of Statistics 2011”

Figure 2-18 Changes in the Number of Railway Accidents by Cause

(2) Bus

1) Bus Operating Condition in Lagos

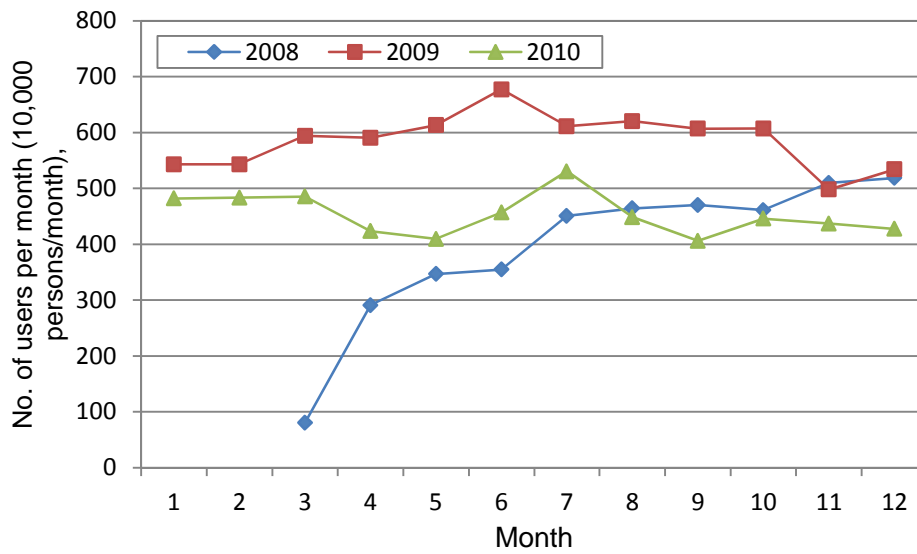
The conventional buses and minibuses in Nigeria are operated by a private union called the National Union of Road Transport Workers (NURTW). It has a local organization in each state, including Lagos and Abuja, to operate in different areas of the state. Of the two BRT systems (Blue and LAGUBUS) in Lagos, the Blue BRT is operated by NURTW and LAGUBUS is a franchise organization launched by the Lagos State in 2007 to operate the BRT.

The minibus is playing a central role in the current public transport. However, the stopping of minibuses along the main roads for the boarding and alighting of passengers and the minibus terminals in various parts of the city are the causes of congestion, contributing up to 50% of the congestion in Lagos. Development of the railway and BRT is planned for the future and minibuses will be used for feeder transportation rather than as a main transportation mode.

In addition, compared to the minibus, BRT has higher speed and greater transport capacity. It offers the advantages of operation efficiency and good customer service because the fare revenue per driver (one vehicle) is higher, which increases the income of each driver, and the fare can be kept at a lower level. BRT offers a solution to the problem in which the bus fare accounts for 20% of the disposable income of the users.

2) BRT in Lagos

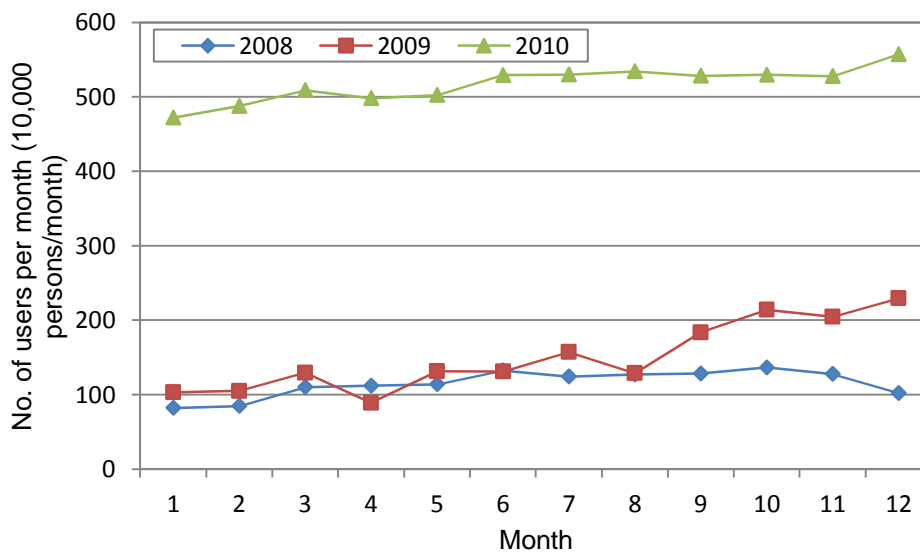
Figure 2-19 shows the changes in the number of users of BRT operated by NURTW. It took several months after the start of service in March 2008 to establish a steady number of users but the number of users since July 2008 has increased from 4 million to 6 million per month, averaging 140,000 to 200,000 users/day.



Source: Lagos State Government, “Digest of Statistics 2011”

Figure 2-19 Changes in the Number of BRT (BLUE) Users

The LAGUBUS established in Lagos State opened partially in February 2007. It had 1–2 million users per month from 2008 to 2009 (about 30,000 to 50,000 users per day on average). In 2010, the number of users per month increased up to 5 million per month (about 150,000 to 170,000 users per day) (Figure 2-20).



Source: Lagos State Government, “Digest of Statistics 2011”

Figure 2-20 Changes in the Number of BRT (LAGUBUS) Users

Chapter 3
Current State of the Railway Sector
in Nigeria and Issues

Chapter 3 Current State of the Railway Sector in Nigeria and Issues

3.1 Overview of the Railway Sector in Nigeria

At present, except for the urban railway lines planned for Abuja and Lagos State, all the railway lines in Nigeria are owned by NRC.

Railway was introduced to Nigeria by Britain, the former colonial power. The first railway line was constructed between 1898 and 1901—a 193-km line linking Lagos and Ibadan. Since then, extension works have been carried out from Lagos, Port Harcourt, and other major cities along the coast to various cities in the inland. The existing network was near completion in 1964 when the railway network reached Maiduguri, the capital of Borno State located in the upper northeastern part of the state. Except for the Kafanchan–Maiduguri section (640 km) constructed from 1954 to 1964, most of the network was constructed between 1898 and 1927. Figure 3-1 shows the NRC route map.

The railway network has 3505 km of narrow-gauge (1067-mm gauge) sections and 255-km of standard-gauge (1435-mm gauge) sections. The Lagos area has 30 km of double-track sections (narrow gauge). The new lines constructed after 1964 are in standard gauge.

The NRC lines are managed under seven areas: 1) Lagos area, 2) West area, 3) North area, 4) East area, 5) North-west area, 6) North-central area, and 7) North-east area. NRC has about 8400 employees. NRC is made up of six departments: 1) Civil Engineering/New Lines Department, 2) Mechanical/Electrical Engineering/Signal and Communication Department, 3) Operating and Commercial Department, 4) Planning and Investment Department, 5) Finance Department, and 6) Administration Department. This railway operating entity was originally called the Government Department of Railway. It was renamed NRC in 1955.



Source: Japan Railway Technical Service, “Latest Edition: World Railways Today”

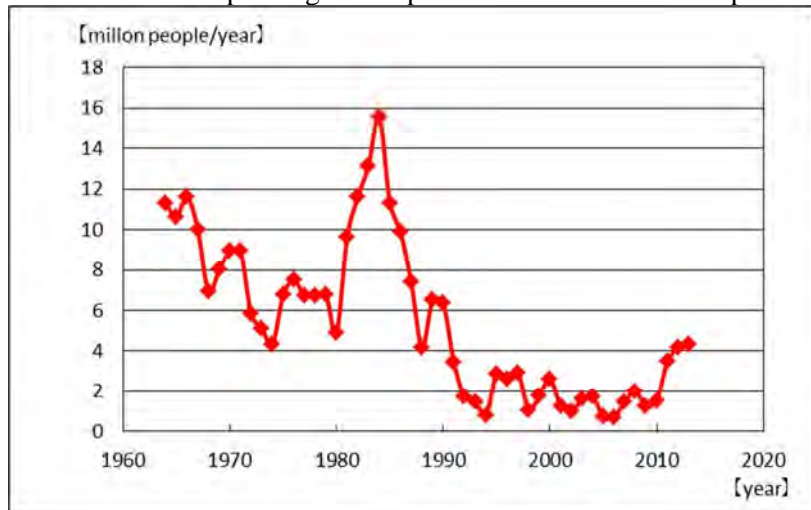
Figure 3-1 NRC Route Map

3.2 Status and Issues of Railway Transport

3.2.1 Passenger Transport

(1) Transport Volume

Figure 3-2 shows the changes in passenger transport volume. After peaking at 15.5 million people in 1984, the passenger transport volume went into decline and hovered at about 1–2 million passengers per year in the 2000s. Since 2010, the volume changed to an upward trend, thanks to the rehabilitation of the railway lines and increase in passenger transport after the lines were reopened.



Source: Compiled by Study Team based on NRC data

Figure 3-2 Changes in Passenger Transport Volume

(2) Operating Condition

Passenger transport services are provided between cities and inside cities. Table 3-1 shows the operating condition of intercity railway and Table 3-2 shows the operating condition of urban railway. Both intercity railway and urban railway have low train frequency.

The fare for the intercity railway is 1.7 naira per km on average. In the case of Lagos and Kano, the regular seat is 1930 naira, first class is 2890 naira, and sleeping car is 4990 naira. The urban railway has the same fare throughout the city. In Lagos, the urban railway runs five trains toward Lagos Terminus during the morning rush hours, three round trips during the day, and five trains departing from Lagos Terminus during the evening rush hours.

In addition to the above regular operation, special trains are operated during festivals and for group travel, etc.

Table 3-1 Intercity Railway Service (2013)

Section	No. of trains in operation (trains/week)	Transport volume (persons/week)
Lagos~Kano~Lagos	2	2500
Lagos~Ilorin~Lagos	3	6200
Minna~Kaduna~Minna	3	3500
Kano~Nguru	2	1000 (Include freight transport of 200 tons/week)

Source: Compiled by Study Team based on NRC data

Table 3-2 Urban Railway Service (2013)

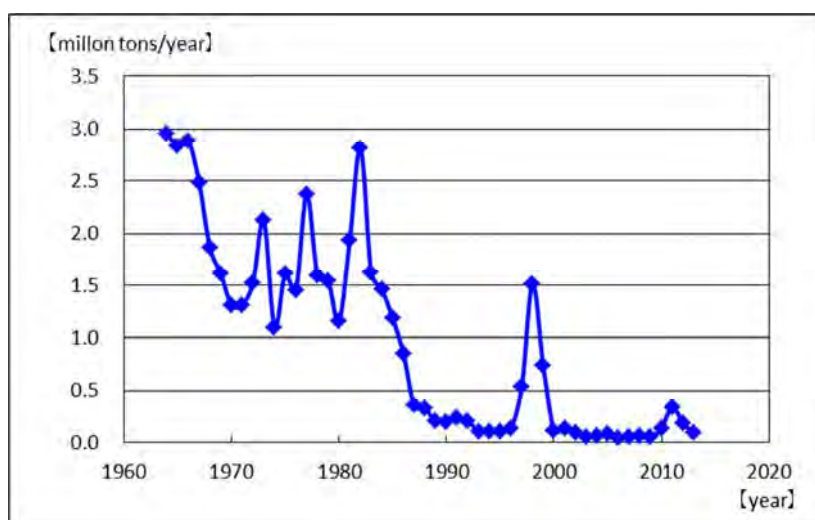
City	No. of trains in operation (trains/day)	Transport volume (persons/day)	Fare (naira)
Lagos	16	16000	150
Kaduna	10	10000	20

Source: Compiled by Study Team based on NRC data

3.2.2 Freight Transport

(1) Freight Transport

Figure 3-3 shows the changes in freight transport. The freight transport volume was over one million tons until the first half of the 1980s but it went into decline afterwards. Except for 1997– 1999, the freight transport volume went below 500,000 tons after 1990.



Source: Compiled by Study Team based on NRC data

Figure 3-3 Changes in Freight Transport Volume

(2) State of Transportation

Freight transport is mainly for cement, wheat, track materials, gravel, petroleum products, and so on. Table 3-3 shows the state of transportation of the various items.

Table 3-3 Freight Transport (2013)

Product	Section	Transport volume (tons/month)
Cement	Lagos~Kano	3000
Wheat	Lagos~Kano	1200
Track materials		3000
Gravel	Oturkpo~Makurdi	4000
Petroleum products	Lagos~Kano	NA
Others		1000

Source: Compiled by Study Team based on NRC data

3.2.3 Issues of Railway Transport

(1) Shortage of Rolling Stock

Many of the vehicles were manufactured between 1970 and 1980. Since they have not been maintained properly, they are aging quickly. Currently, only 29 diesel locomotives are operable. In addition, the freight cars and passenger cars are also aging fast and there is a shortage of cars.

(2) Limitation by Alignment and Track Layout

Most of the railway lines were built by 1930. Since these narrow-gauge lines have sections that do not have good alignment, such as steep curve sections, the alignment is not suitable for high-speed operation. In addition, except for the 30-km section at the center of Lagos, all the railway lines are single-track. Stopping time is needed when the trains cross each other, thus limiting the transport capacity.

3.3 Status of Development Plan and Issues

3.3.1 Status of Railway Development Plan

(1) Overview of Development Plan

Development was undertaken in Nigeria in accordance with “The 25 Year Strategic Vision of the Nigerian Railway System” from 2002 to 2027 (hereinafter referred to as “25-Year Development Plan”). It was put forth by the Federal Ministry of Transport (FMT) in July 2002. The development plan was divided into 3 phases: short-term plan (Phase 1), mid-term plan (Phase 2), and long-term plan (Phase 3), and goals were set up for each phase. Table 3-4 shows the development plan in each phase.

Phase 1 aims at bringing changes to the systems. The objective is to make the functions of the railway system more efficient in order to attract investment from the private sector in the future. Today Phase 1 and Phase 2 are being implemented concurrently. While the existing narrow-gauge lines are being rehabilitated, new lines are being constructed in standard gauge.

Table 3-4 Development Plan in Various Phases

Phase	Target	Main strategies	Target year	Progress status
1	Changes to systems	<ul style="list-style-type: none"> • Rehabilitation of existing facilities • Reorganization of entities • Revision of railway operation method • Training • Investment plan • Increase in capacity for producing railway materials in Nigeria • Improvement in technical capabilities 	2002~2007	In progress
2	Modernization of systems	<ul style="list-style-type: none"> • Construction of new lines and extension of existing lines • Railway development using funds from the private sector • Improvement in technical capabilities 	2007~2015	In progress
3	Stabilization of systems	<ul style="list-style-type: none"> • Completing the construction of new lines and extension of existing lines 	2016~2027	Not implemented yet

Source: Compiled by Study Team based on “25 Year Strategic vision for Nigerian Railway System”

(2) Plan for the Rehabilitation of Existing Railway Lines

Rehabilitation of the existing railway lines is one of the major strategies of Phase 1 of the 25-Year Development Plan. Over 90% of the lines are being rehabilitated.

The rehabilitation of the main line between Lagos and Kano (1124 km) is almost complete. Passenger transport and freight transport of the section were reopened in December 2012. Table 3-5 shows the rehabilitation plans of the existing major railway lines.

Table 3-5 Rehabilitation Plans for Existing Railway Lines

Section	Distance (km)	Contents	Contractor	Contract amount (100 million naira)	Progress (%)
Lagos~Ibadan~Ilorin~Jebba	488	Track, signal	CCECC Nig Ltd.	123	100
Jebba~Minna~Kaduna~Zaira~Kano	636	Track, signal	Costain (WA) Ltd.	122	98
Port Harcourt~Maiduguri	1657	Track, signal	Ansaldo A3 & O Ltd.	56	25
Port Harcourt~Umuahia~Enugu~Makurdi	463	Track	Eser Contracting W.A	200	56
Makurdi~Lafia~Kuru ~Spur to Jos~Kafachan and Kaduna	554	Track	CGGC	245	34
Kuru~Bauchi~Gombe ~Maiduguri	640	Track	Lingo	237	24
Zaria~Funtua~Gusau~Kaura Namoda	221	Track	Duluidas	32	46

Source: Compiled by Study Team based on information materials from NRC

(3) Construction of New Lines

Construction of new lines using standard gauge, which is currently underway, is one of the main strategies of Phase 2 of the 25-Year Development Plan. Currently, construction of new lines are being carried out in the Ajaokuta–Itakpe–Wari section (277 km, construction by Julius Berger) and in the Abuja–Kaduna section (187 km, construction by CCECC). Construction of the Lagos–Ibadan section is slated to start soon.

In addition, it was agreed in May 2014 that the China Civil Engineering Construction Corporation (CCECC) would construct a new coastal railway line (650 km) from Calabar in Cross River State to Lagos via Port Harcourt, Wari, and Benin City. The total project cost is approximately 13 billion USD.

Besides construction of the abovementioned new lines, feasibility studies of the lines shown in Table 3-6 below have been completed or have been planned.

Table 3-6 Lines for Which Feasibility Studies Have Been Completed or Planned

	Section	Length (km)
1	Lagos~Shagamu~Ijebu Ode~Ore~Benin City	300
2	Lagos~Ibadan~Osogbo~Baro~Abuja (High Speed)	615
3	Ajaokuta (Eganyin) ~Obajana~Jakura~Baro~Siraj~Abuja with additional line from Ajaokuta to Otukpo	533
4	Zaria~Kaura Namoda~Sokoto~Ileila~Birnin Koni(Niger Republic)	520
5	Benin~Agbor~Onitsha~Nnewi~Oweri~Aba with additional line from Pnitsha~Enugu~Abakaliki	500
6	Eganyin (Near Ajaokuta) ~Lokoja~Abaji~Abuja	280
7	Benin~Sapele Warri~Yenagoa Port Harcourt~ Aba~Uyo~Calabar~Akampa~Ikom~Obudu Cattle Ranch	673
8	Port Harcourt~Aba~Umuahia~Enugu~Makurdi~Lafia~Kuru~Bauchi~Gombe~Biu~Maiduguri	N.A.
9	Ikom~Obudu~Ogoja~Katsina Ala~Wukari~Jalingo~Yola~Maiduguri	N.A.
10	Kano~Nguru~Gusau~Damaturu~Maiduguri~Gamborugala	N.A.

Source: Compiled by Study Team based on NRC data

3.3.2 Issues of the Development Plan

(1) Project Delay due to Fund Shortage

Standard gauge has been used in the construction of the new lines since 1964; however, due to the lack of funds, railway construction has not been able to proceed as planned. For example, the project to construct a new line between Abuja and Wari (277 km) was started in 1987. Initially, the construction was to be completed in five years. However, a 22-km section is still under construction at this time. There were cases in which construction was halted because of insufficient funds and then the construction was restarted once the fund was procured. Construction of the new line between Abuja and Kaduna and construction of the Abuja LRT currently underway are funded by The Export-Import Bank of China. Nigeria is dependent on the overseas not only technically but also financially.

(2) Legal Environment

NRC is supposed to be the entity developing and operating railways under the current Railway Act. The private sector is not allowed to engage in railway business. This is what prevents the private sector from entering into the railway business. Currently, the Railway Act is being amended. The amendment includes allowing the private sector to participate in the railway business (see 3.4 for details). Until the amended Railway Act is enacted, a railway operator can enter into a Special Agreement with the Federal government to proceed with the project.

(3) Co-existence of Narrow Gauge and Standard Gauge

The 25-Year Development Plan envisions co-existence of the narrow-gauge lines and standard-gauge lines. While the existing lines in narrow gauge will be rehabilitated, the new lines will be constructed in standard gauge. The existing narrow-gauge lines and the newly constructed standard-gauge lines will be used for both passenger transport and freight transport. Even in the current situation, there is a shortage of locomotives, freight cars, and passenger cars for the narrow-gauge lines. In the future, more locomotives, freight cars, and passenger cars must be procured for the standard-gauge lines, thus increasing the cost burden. Furthermore, due to the lack of a clear strategy to divide the use of narrow-gauge lines and standard-gauge lines, rational and coherent development may not be possible.

(4) Feasibility Study not Sufficient

We cannot confirm if the feasibility studies of some planned routes have been conducted properly or not. For example, the new line for the Abuja–Kaduna section (187 km) is currently being constructed by CCECC. The line is financed with a loan of 500-million USD from The Export-Import Bank of China and approved by the National Assembly in 2010. However, it has been pointed out that construction of the line was allowed to proceed without a proper feasibility study being conducted. Construction of all the highways parallel to the new Abuja–Kaduna railway line to be constructed has been completed and no road congestion has been reported, bringing into question the need for this new railway line.

3.4 Current State of Legislation and Issues

3.4.1 The Railway Act

The current Railway Act was enacted in 1955. It does not allow the private sector to operate railways. However, the law is inconsistent with the 2005 Infrastructure Concession Regulatory Commission Act, which stipulates that all future infrastructures in Nigeria, including the railway, be developed using the PPP scheme. For this reason, the Nigerian government is amending the Railway Act. The following points are expected to be incorporated in the amended Railway Act.

- 1) Separate the entities responsible for policymaking and regulatory oversight from the entities operating the railways.
- 2) Put in place an environment that makes it possible for the private sector to invest in the railway sector.
- 3) Set up the National Transport Commission and National Rail Development Authority as independent organizations to monitor the economic viability of railway undertakings.

The amended Railway Act has been approved by the FEC and it is expected to be deliberated later at the National Assembly. However, the amendment of the Railway Act is slower than planned because the Federal government is cautious about allowing the private sector to operate railways for safety reason and the NRC wants to hold on to its existing interests in the railway business.

Until the amended Railway Act is enacted, a railway operator can enter into a Special Agreement with the Federal government to proceed with the project. Currently, LAMATA has concluded a Special Agreement with the Federal government. The entity is responsible for the construction and operation of the LRTs.

3.4.2 Safety System

To prevent railway accidents and ensure the safety of users should be one of the highest priorities of a railway operator. The Lagos Metropolitan Area Transport Authority (LAMATA), which is responsible for the planning and development of LRT projects, plans to establish the Transport Safety Department (TSD) in-house to manage safety. LAMATA also plans to set up the Railway Safety Regulatory Unit (RSRU) within TSD to monitor and enforce the railway safety system. It will be responsible for the evaluation and certification of safety, formulation of laws and regulations, and improvement to ensure safe operation of railways.

RSRU plans to work with railway operators in Lagos State and in Nigeria to perform the following functions:

- 1) Work with railway operators, railway safety workers, and railway safety supervision personnel to enhance and improve railway safety.
- 2) Provide advice, education, and training to enhance railway safety.
- 3) Manage, monitor, and review the safety evaluation and certification system.

- 4) Provide information on railway safety supervision, including causes of railway accidents, safety evaluation and certification process, accident investigation methods, risk assessment methods, etc.
- 5) Conduct accident investigation on behalf of the Nigerian government.
- 6) Collect and publish information on railway safety.
- 7) Monitor and investigate compliance with laws and regulations.

The Blue Line (Phase 1) is slated to start service in 2016. The abovementioned organizations shall be set up before the 2016 opening. However, since LAMATA does not have experience in operating railways, the lack of expertise and human resources is a concern.

3.4.3 Land Use System

The land use system of Nigeria is based on the Land Use Act. If a private entity needs land for a project and if the project is expected to bring public benefits, the government can acquire land on behalf of the private entity. However, the private entity is responsible for the cost of land acquisition, including compensation, etc. The burden of private entity increases when land acquisition is large in a project at urban area.

3.5 Technical Level

3.5.1 Current State of Railway Technologies of Various Fields

(1) Rolling Stock

Currently, all the locomotives owned by the NRC are diesel locomotives. NRC has about 84 locomotives as of 2014. Most of them are electric locomotives, which use a diesel engine to run the generator to drive the motor. However, more than 65% of these locomotives cannot be used for operation. Table 3-7 shows the number of vehicles owned by the NRC.

All the locomotives are imported from overseas. They are procured primarily from GE (General Electric). Some are also from China. Many of the freight cars and passenger cars are procured from China. Eleven units have been purchased from China from last year to this year. Some cars were also procured from Japan in the past. In our local survey, we saw some Japanese freight cars made in 1975 (see Figure 3-4). Last year, Nigeria purchased two train sets of the 5-car DMUs (2 locomotives with 3 passenger cars in the middle) from China and they have been used to provide transportation service in the Lagos suburb. The interior of the passenger car is lined with long seats made of fiber-reinforced plastic. Double doors are installed at two locations on one side of the car (Figure 3-6).

Table 3-6 Rolling Stock Owned by NRC

Year		1999	2004	2009	2014
Rolling stock					
Locomotives for the main lines	Total a)	115		140	84
	Operable b)	23		35	29
	b/a (%)	20		25	34.5
Locomotives for shunting	Total a)	50	59	54	
	Operable b)				
	b/a (%)				
Freight cars	Total a)	2478	3987	4900	800
	Operable b)	1262	1578		250
	b/a (%)	50.7	39.6		31.3
Passenger cars	Total a)	556		480	170
	Operable b)				120
	b/a (%)				70.6

DMUs	Total a)				10
	Operable b)				10
	b/a (%)				100

Source: Compiled by Study Team based on African Development Bank materials



Source: Photographed by Study Team
 Figure 3-4 Freight cars made in Japan (1975)



Source: Photographed by Study Team
 Figure 3-5 Passenger cars at Lagos Station



Source: Photographed by Study Team
 Figure 3-6 New DMU made in China



Source: Photographed by Study Team

(2) Electric Power

All the railways are operated by diesel. Nigeria does not have any electrified section. Since NRC has chronic power shortage, electrification is not being considered at this time.

(3) Signaling and Telecommunication Systems

Although mechanical semaphore signals and electric signals are installed on NRC lines, the lights do not light up and the signals are not being used. At the station, a station staff uses the radio to inform the next station of a train's departure. The signaling system is not functioning at all. Since signaling is relying on a manual system, human errors may lead to accidents and safety is a problem.

Radio is used for communication. Since the facilities are old, the capability is limited, it is difficult to find spare parts in the event of an equipment breakdown. Figure 3-7 shows the signaling facilities and Figure 3-8 shows the communication equipment.



Source: Photographed by Study Team



Source: Photographed by Study Team

Figure 3-7 Signaling Facilities



Source: Photographed by Study Team

Figure 3-8 Communication Equipment

(4) Track

Lightweight rail of less than 40 kg/m is used primarily. The standard-length rails are not welded together but are connected by fishplates. Iron sleepers and pandrol rail fasteners are used. The surface of the rail, in particular, is rough, making it a source of vibration and noise. Since the gaps at the rail joints are not properly controlled, the widths of the gaps vary. Because the ballast is not properly compacted, vertical vibration of the track surface occurs during train operation. All the facilities are aging and they are not properly maintained.

Among the track materials, ballast is produced domestically. However, since the sizes of the ballast are not even, the quality is not good. The rails, sleepers, and fastening devices are imported from the UK and China. The existing lines that are undergoing rehabilitation are replaced gradually with track materials from China.



Source: Photographed by Study Team
Figure 3-9 Track Structure



Source: Photographed by Study Team
Figure 3-10 Ballast of Uneven Sizes

3.5.2 Current State of Technical Education Institutions

NRC has technical schools to provide technical education and training for employees. They offer education on 1) Mechanical, 2) Operation, 3) Civil Engineering, and 4) Signal. The Mechanical department has a technical school in Lagos; the Operation department has technical schools in Lagos and Enugu; and the Civil Engineering department has a technical school in Zaria. The headquarters of the technical schools has an administration office in Abuja.

The students range from 16 to 25 in age. The curriculum is for three years, 80% of which is OJT and the remaining 20% is lecture. The National Directory of Employment (NDE, a governmental organization) selects the students and sends them to the NRC training schools for occupational training. Therefore, NDE pays tuition to the NRC.

The technical school in Lagos provides education not only for railway but also for computer, fashion, civil engineering, and so on. However, since each department has only about one instructor, the instruction is insufficient. Projects made using technical skills are at quite low levels, to say the least. Since the machine tools have been put in place at the school's establishment (1924), NRC does not seem to place emphasis on technical training.

It is hard to say that the technical education system is working—an observation made from our visit to the NRC technical schools. The next step is to find out the causes, such as by analyzing the system, budget, human resources, etc.

3.5.3 Current State of Maintenance and Management

The railway facilities have not been maintained and managed properly for a long time. Aging of the facilities is becoming increasingly serious, causing safety concern. Figure 3-11 shows the damaged rail, Figure 3-12 shows track that does not have enough ballast, and Figure 3-13 shows an aging train. Large-scale rehabilitation of the existing lines has been carried out since 2009. However, only a portion of them has been improved. Most of the lines have safety issues. Some new vehicles have been put into service in recent years but most lines are still operating with old rolling stock. The service level is very low.



Source: Photographed by Study Team
 Figure 3-11 Damaged Rail



Source: Photographed by Study Team
 Figure 3-12 Track with Insufficient Ballast



Source: Photographed by Study Team



Source: Photographed by Study Team

Figure 3-13 Aging Train

3.5.4 Railway Technical Standards

NRC uses the British Standard as its railway technical standard. The new lines (standard gauge) to be developed from now on will also be designed and constructed based on the British Standard.

The LRT planned for the Lagos State will use the AREMA (American Railway Engineering and Maintenance-of-Way Association) and the British Standard as technical standards. Among the LRTs, the detailed design and construction of the Blue Line are carried out by the China Civil Engineering Construction Corp (CCECC). Even though the Chinese railway technical standard is used, if the contents of the technical standards are different, the AREMA and the British Standard will be given priority.

3.5.5 Technical Issues of the Railway Sector

(1) Aging Facilities

Almost no investment has been made in railway facilities until 2008. In addition, since the facilities have not been maintained and managed properly, aging of the rolling stock, signaling and communication facilities, and track is serious. When the rolling stock, signaling and communication equipment break down, the repair cannot be done because no spare parts are available in some cases. Because of these reasons, new DMUs and passenger cars have been purchased since last year. However, the number of trains is still insufficient, resulting in a reduction in the number of trains for operation. Since the signaling facilities are not functioning, the safety of railway transport has declined. As a result, only 10 trains per week operate between cities and 16 trains per day operate in the city (Lagos area). Figure 3-14 shows a timetable at the Lagos Station of the trains operating in the city.

NEW TRAIN TIME TABLE		
UP TRAINS		
TRAINS	STATIONS	DEPARTURE TIME
MTT	DD-JK	7:30AM
DMU	DD-JK	7:40AM
MTT	APL-JK	12:00NOON
MTT	DD-JK	2:00PM
MTT	DD-KAJ	4:15PM
DMU	DD-JK	5:30PM
MTT	APL-KAJ	5:40PM
DMU	APL-KAJ	6:20PM
MTT	DD-JK	7:15PM
DOWN TRAINS		
MTT	GD-DD	5:30AM
DMU	JK-DD	6:30AM
MTT	JK-APL	6:25AM
DMU	KAJ-APL	7:10AM
MTT	KAJ-DD	7:15AM
MTT	JK-DD	9:00AM
DMU	JK-DD	9:45AM
MTT	JK-APL	2:15PM
MTT	JK-DD	4:15PM

Source: Photographed by Study Team
 Figure 3-14 Railway Timetable for the City (Lagos Station)

(2) Constraints of Line Conditions

The existence of many single-track sections and steep curve sections imposes constraints on increasing the number of trains for operation and improving speed. The existence of both narrow-gauge lines and standard-gauge lines not only makes it difficult to transfer between lines but also worsens the current shortage of rolling stock because each type of gauge requires its own locomotives, passenger cars, and freight cars.

(3) Decline in the Level of Railway Technologies

Table 3-7 shows the changes in the Federal Ministry of Transport’s budget amount for the railway sector. The budget for the railway sector has increased since 2009. However, since almost no investment has been made to the railway sector until recent years and no new lines have been built, the levels of railway technologies, including rolling stock, signaling and telecommunications, and track, have declined. Currently, the private sector is rehabilitating the existing railway lines and constructing new lines. If NRC leaves it to the private sector to do the works, its own railway technology level will go down, causing concern about the hollowing-out effect on railway technologies in Nigeria.

Table 3-8 Federal Ministry of Transport’s budget amount for the railway sector
 [Unit : billion Naira]

Year	New investment ^{*1)}	Maintenance ^{*2)}	Total
2007	0.12	0	0.12
2008	0.05	0	0.05
2009	12.6	8.3	20.9
2010	N.A.	N.A.	N.A.
2011	N.A.	N.A.	N.A.
2012	8.9	18.5	27.3
2013	17.6	10.6	28.3

*1) Construction of new line, Study, and Installation of new equipment, *2) Rehabilitation of existing line and rolling stock

Source: Compiled by Study Team based on Nigeria budget office of the federation

3.6 Current State and Issues of Railway-related Industries (Private Sector and Supporting Industries)

3.6.1 E&M

As shown in “3.5 Technical Level,” the technical level of the railway in Nigeria is low.

The cast iron wheels for the brake used in NRC rolling stock are manufactured by Metallurgical Foundry in Lagos City. All the other parts and components are dependent on imports from overseas. The mechanical press machines and other machinery in the NRC workshops are all imported. Many of them are very old. As shown above, there are almost no supporting industries for E & M. The lack of supporting industries causes problems. For example, the facilities are not properly maintained and the reliance on foreign companies to maintain facilities results in high cost.



Source: Photographed by Study Team
Figure 3-15 Machines in a Workshop



Source: Photographed by Study Team
Figure 3-16 Condition inside the Workshop

3.6.2 Construction

(1) Current State of the Construction Industry in Nigeria

The construction industry in Nigeria is an oligopoly of several construction companies. The German company Julius Berger, the Chinese company CCECC, the Lebanese company SETRACO, the Swiss company Reynolds, and the Nigerian companies HI-TECH and DANTATA & SAWOE are the major construction companies. The following is an overview of Julius Berger and CCECC, which have especially large shares in Lagos State:

1) Julius Berger

This private company has the greatest number of employees (17,000 people) in Nigeria. It provides services in resource engineering and the construction of infrastructure facilities and buildings.

Julius Berger is a German company. Its first job (Eko Bridge) in 1965 became its stepping-stone into Nigeria. So far, it has constructed the Tin Can Island Port, Lagos Inner Ring Road, Central Bank of Nigeria Head Office, and Abuja International Airport phase II, but it does not have any experience of building railway viaduct in Nigeria.

2) CCECC Nigeria Limited

CCECC Nigeria Limited is the Nigerian subsidiary of China Civil Engineering Construction Corporation (CCECC). In recent years, it has increased its share in Nigeria’s construction industry, especially in the construction of railways. It has made considerable inroads, including the railway modernization project for the Abuja–Kaduna section in 2010 and the railway modernization project for the Lagos–Ibadan section in 2011. Both the Abuja Airport Line and the structures of the Lagos Blue Line currently being constructed are by CCECC. Only CCECC has experiences of building railway structures in Nigeria.

(2) Current State of the Construction of LRT Structures

Conditions of the CCECC railway construction sites in Abuja and Lagos are shown below. Considerable differences are found in both work procedures and quality from the railway structures in Japan.

1) Earth Structure Section (Abuja Airport Line)

- Laying of the tracks is completed in some sections. Cutting and roadbed work are being carried out in other sections. The construction procedures are quite different from those of Japan.
- The construction of intersections with roads is postponed until later. In Japan, such construction will be of a much larger scale and will last longer in order to facilitate road traffic and to ensure safety (Figure 3-17).
- The cut surface is left open after drilling and no surface work is carried out, giving rise to the high possibility of erosion by wind and rain.
- The quality of the platforms of some completed ground stations and concrete ducts is poor. Bubbles and peanut brittle-like surfaces are seen at many locations (Figure 3-18).



Source: Photographed by Study Team
Figure 3-17 Civil Engineering Section
(Road Intersection)



Source: Photographed by Study Team
Figure 3-18 Concrete Duct

2) Viaduct Section (Abuja Airport Line)

- The viaduct is a typical structure overseas. It has a superstructure made of PC-4 main girders and a substructure made of wall-type piers. The sizes of the girders and the piers do not differ substantially from those of the Japanese structures (Figure 3-19).
- The viaduct has been completed for less than a year but the concrete surface is already peeling off, exposing the reinforced bars. Construction defects are also seen everywhere. The overall quality is poor (Figure 3-20).
- The bridge sidewalk is made of steel and is anchored to the PC girders.



Source: Photographed by Study Team
Figure 3-19 Panoramic View of Viaduct



Source: Photographed by Study Team
Figure 3-20 Bottom Surface of the Girder

3) Viaduct and Elevated Station (Lagos Blue Line)

- The superstructure is made of PC-4 main girders and the substructure is made of double piers. The sizes of the girders and the piers do not differ substantially from those of the Japanese structures (Figure 3-21).
- Bubbles, peanut brittle-like surfaces, extensions, and so on are seen at the construction sites of elevated stations and PC girder manufacturing sites. The poor quality is noticeable.
- Almost all the workers at the PC girder manufacturing sites and viaduct construction sites are Nigerians. At another worksite, one Chinese is supervising 25 Nigerian workers.



Source: Photographed by Study Team
Figure 3-21 Panoramic View of Viaduct



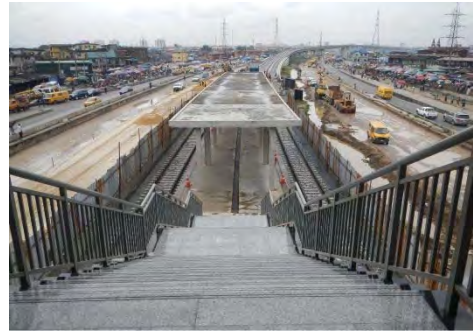
Source: Photographed by Study Team
Figure 3-22 Work Site of CCECC

4) Ground Stations (Lagos Blue Line)

- The intermediate stations have one platform and two lines. The stations are elevated.
- The platform floor and the concourse floor is connected by stairs, escalators and elevators. However, no facilities have been installed to provide access between the concourse floor and the street (Figure 3-23).
- The platform has roof but there is no roof above the stairs to the station building.
- No platform doors are installed.
- Even though the casting was done recently, the concrete surface has already damage. The durability of the structures is poor (Figure 3-24).



Source: Photographed by Study Team
Figure 3-23 Image of Completed Station



Source: Photographed by Study Team
Figure 3-24 Roof of Platform under Construction

Chapter 4
Investment Plans
for the Nigerian Railway Sector

Chapter 4 Investment Plans for the Nigerian Railway Sector

4.1 Financial Analyses of the Federal and State Governments, Investment Plans

Nineteen countries attended the Paris Club meeting for Nigeria's debt in July 2005 and concluded a debt relief package for Nigeria. It was agreed that the countries would forgive \$18 billion of the debt and that Nigeria would buy back the remainder of the debt with revenue from oil exports. As a result, the debt was paid off completely in April 2006. That incident prompted Nigeria to solicit private capital actively for the development and operation of its infrastructure.

Based on information obtained from interviews with related local organizations and existing literature, we summarized and analyzed the financial situation of the Federal government and the State government (Lagos State), as well as investment plans for the sector (mainly transportation) below.

4.1.1 Financial Situation of the Federal and State Governments

(1) Federal Government

Even after the 2005 debt relief, the budget deficit of Nigeria continued. The deficit ratio was 22% to revenue and 1.85% to GDP in 2013. The International Monetary Fund (IMF) and the World Bank have been performing debt sustainability analysis (DSA) from 2005 to study the sustainability of public debt. The indicators of Nigeria are considered within the acceptable ranges.

Nigeria's cumulative public debt ratio to GDP has become 15.7% as of 2013, which is below the 40% threshold value for sustainability, according to DSA. Although the debt amount itself is increasing every year, GDP growth, which is backed by strong economic growth, is also on the rise. Therefore, the percentage of cumulative debt in relation to the scale of the economy is still low.

Table 4-1 Financial Situation of the Federal Government

Item	Year							
	Actual					Forecast		
	2009	2010	2011	2012	2013	2014	2015	2016
Revenue (trillion Naira)	2.27	2.09	3.09	3.56	4.10	3.58	3.55	3.98
Expenditure (trillion Naira)	3.10	4.08	4.23	4.70	4.99	4.50	4.74	4.84
Balance of payment (trillion Naira)	-0.84	-1.99	-1.14	-1.14	-0.89	-0.91	-0.89	-0.86
Balance of payment / Revenue (%)	37	95	37	32	22	25	23	22
Balance of payment / GDP (%)	0.84	3.02	6.11	2.96	1.85	1.90	1.70	1.50

Source: Budget Office of the Federal, "Medium Term Expenditure Framework and Fiscal Strategy Paper 2014 – 2016", Debt Management Office, "National Debt Management Framework 2013 – 2017"

Table 4-2 Standard Value of Public Debt Burden according to DSA

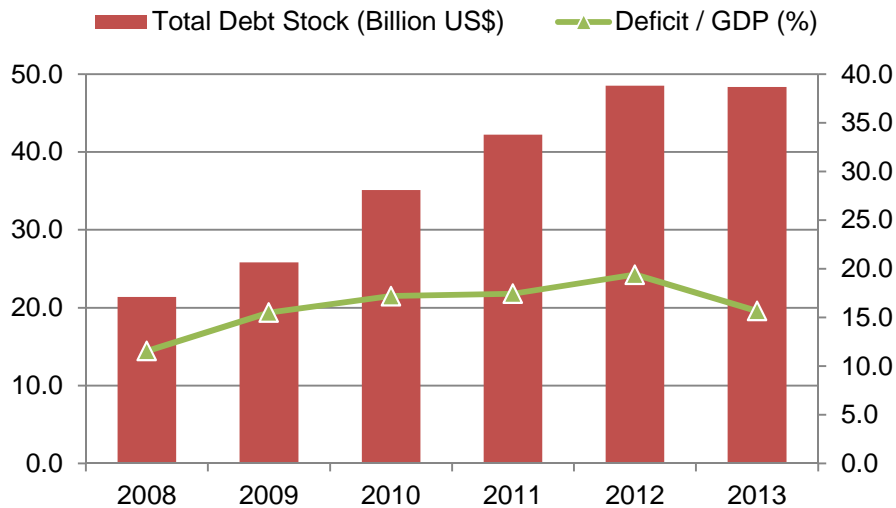
Item	Standard value	Nigeria (2013)
Cumulative public debt/GDP	40 %	15.7 %
Debt repayment/Revenue	30 %	11.7 %

Source: Nippon Export and Investment Insurance, "Country Review: Nigeria,"

Table 4-3 Changes in Cumulative Public Debt of Nigeria and GDP Ratios

Item	2008	2009	2010	2011	2012	2013
Cumulative public debt amount (100 million USD)	214.0	258.2	351.0	422.3	485.0	483.6
Balance of payment/GDP(%)	11.6	15.5	17.2	17.5	19.4	15.7

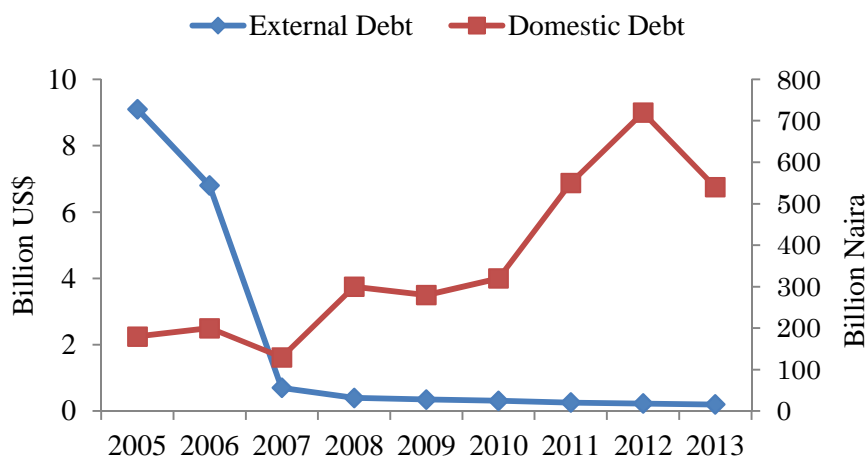
Source: Budget Office of the Federal, “Medium Term Expenditure Framework and Fiscal Strategy Paper 2014 – 2016”



Source: Budget Office of the Federal, “Medium Term Expenditure Framework and Fiscal Strategy Paper 2014 – 2016”

Figure 4-1 Changes in Cumulative Public Debt Amount of Nigeria and GDP Ratio

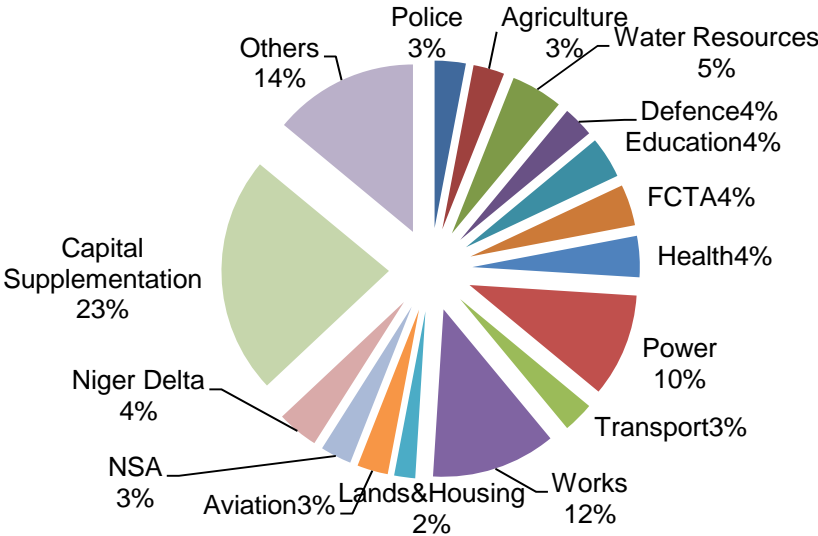
Nigeria’s latest cumulative public debt amount as of June 2014 is 57 billion USD, an increase of 9 billion USD from the end of 2013. A breakdown shows 9.4 billion USD external debts to foreign countries and 47.6 billion USD domestic debts. Domestic debts account for more than 80%. A significant trend emerged after the Paris Club agreement that granted Nigeria debt relief, showing a clear policy of suppressing external debts and compensating with domestic debts.



Source: Budget Office of the Federal, “Medium Term Expenditure Framework and Fiscal Strategy Paper 2014 – 2016”

Figure 4-2 Changes in the Repayment Amount of Public Debt

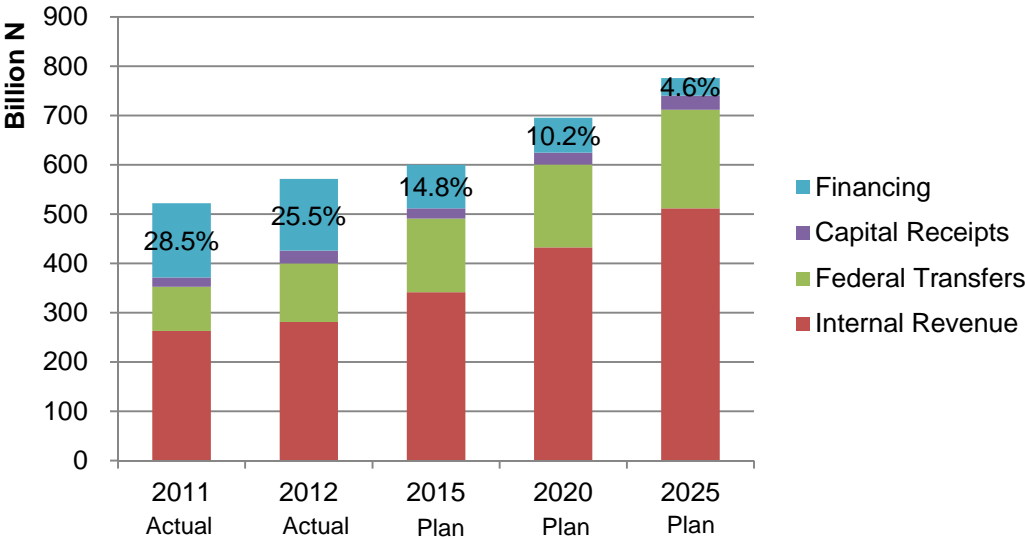
The following are by-sector investments of Nigeria in 2013. Except for roads, bridges, and aviation, the total budget for investment in the transport sector is about 3%.



Source: Federal Ministry of Finance, “2013 Fiscal Year Understanding Budget”
 Figure 4-3 Investment by Sector in Nigeria

(2) State Government (Lagos State)

According to the 2012 actual data, revenue from the State and the Federal government to the Lagos State government amounted to approximately 400 billion Naira (about 2.58 billion USD). However, the shortfall amount appropriated from the public debt of donors was approximately 170 billion Naira (about 940 million USD). The ratio of debt to revenue reached 25.5%. According to information materials from the Ministry of Economic Planning & Budget, a policy has been put in place to reduce gradually the percentage of public debt in the future. It plans to reduce the public debt ratio to about 15% in 2015 and about 5% in 2025, with a goal of having zero external debt after 2015. However, this is the plan; the actual situation is not clear.

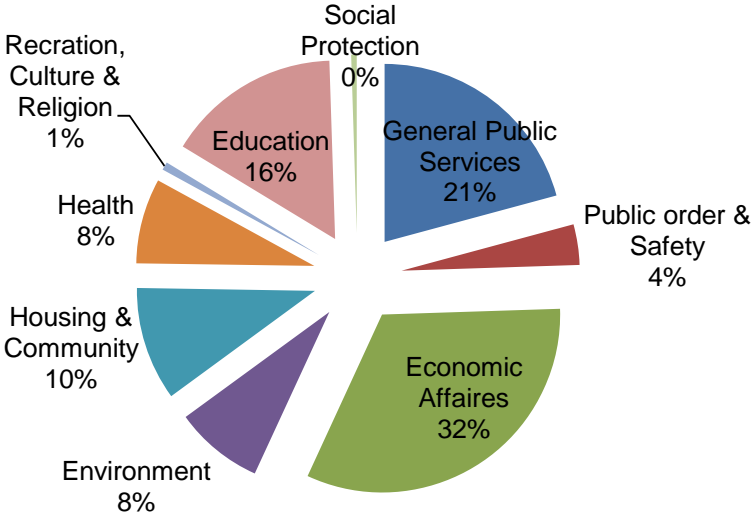


Source: State Ministry of Economic Planning & Budget, “Lagos State Development Plan 2012-2025”
 Figure 4-4 Changes in Lagos State Government Budget and Revenue Breakdown

4.1.2 Status of Investment in the Railway Sector

According to the “Lagos State Development Plan 2012-2025,” the general opinion on the infrastructures needed for Nigeria are transportation (road), electricity, health care, education, and transportation (railway), in that order. In relation to this, the by-sector budget outlays in 2013 are economy (including infrastructure development), general administration, education, and housing/community development. Based on our interview with the Ministry of Economic Planning & Budget, we got the impression that development is carried out extensively in all sectors based on the current levels.

On the other hand, the “Lagos State Development Plan 2012-2025” states that investment in the power sector and transport sector shall be given priority. This point is consistent with the contents of the Nigeria Vision laid out in the development plan for Nigeria as a whole. On reflection of the small-scale investment for megacities like Lagos, a policy has been drawn up to increase investment aggressively, especially for the transport sector, from now on.



Source: Lagos State Ministry of Finance data
 Figure 4-5 Investment in Lagos State by Sector

The scale of investment in the transport sector in 2008 was about 5% of the total budget of Lagos State. On the other hand, the budget scale of LAMATA in 2013, as described below, corresponds to about 8.7% of the budget of Lagos State as a whole. Besides LAMATA, other organizations are also involved in the transport sector. It can be said that investment in the transport sector shows a steadily rising trend.

4.1.3 Methods of Funding for Infrastructure Development

(1) Legal Status

Public work projects of the Nigerian government have changed from paying in full by the government as in the past to using private capital through PPP in the late 2000s. As of March 2013, all the public work projects of the Federal government are required to use the PPP scheme (Infrastructure Concession Regulatory Commission Act, 2005, currently under revision).

The backdrop to the decision to make this change is that after the fall of oil prices in the 1980s, Nigeria’s foreign debt balance rapidly increased, pushing the country into chronic budget deficit. In addition to the huge cumulative debt, the lack of transparency in the government, lax financial practices, poor efficiency of public entities in meeting goals, problems in crude oil producing regions, and other problems have exposed the vulnerabilities of the economy.

Officials of the local agencies mentioned that changing the funding method of government projects was an initiative led by the IMF and World Bank, but it was also due to the following reasons:

- Poor record of the government in achieving infrastructure development goals
The official in charge mentioned the government’s lack of ability in policymaking and project formation and overly optimistic planning in setting unrealistic goals. Specifically, he pointed out the power supply volume and delay in the track-laying plan of an intercity railway.
- Government lacks sufficient maintenance and management system
It has become obvious that the government cannot maintain the functions of social and transport infrastructures in a sound manner. It is now studying ways to resolve the current issues.

(2) Examples of Funding for Railway Construction

Table 4-4 summarized the project financing methods used currently for the railway sector in Nigeria. The Federal government is the project entity of the Abuja LRT construction plan (Line 1 and Line 3). The DBMOT (Design, Build, Manage, Operate, and Transfer) scheme has been selected for the construction and operation. The Chinese company CCECC, which received assistance in the form of a low-interest loan of 500 million USD from the Chinese government, has won the concession for the DBMOT scheme.

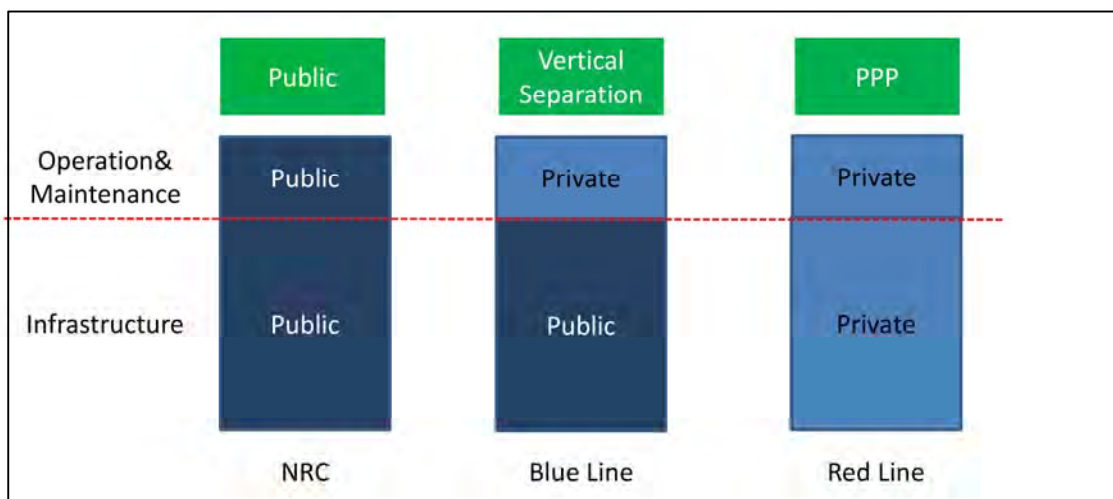
In the Lagos State LRT plan, construction work of the Blue Line is carried out first using two schemes: a DB (Design, Build) contract awarded to CCECC and an OT (Operation, Transfer) contract awarded to Eko Rail. On the other hand, negotiation for the Red Line is underway under a DBOT scheme (first negotiation right: Marina Express Consortium, MEC). Funds for the development are expected to be appropriated from the State government’s budget.

Table 4-4 Examples of Funding for Railway Construction Projects in Nigeria

Item	Project scheme	Funding source
Abuja LRT construction plan (Line 1 and Line 3)	DBMOT scheme (Design, Build, Manage, Operate, and Transfer) (CCECC)	Financial layout of the Federal government, The Export-Import Bank of China
Lagos LRT construction plan (Blue Line)	DB scheme (CCECC) OT scheme (Eko Rail)	Expenditure in the State government budget
Lagos LRT construction plan (Red Line)	DBOT scheme (Marina Express Consortium, MEC)	Expenditure in the State government budget
Rehabilitation project for existing NRC lines	Construction contract	Financial layout of the Federal government, Loans from Export-Import Bank
NRC high-speed railway development plan (Abuja– Kaduna section)	Construction contract	Loan from The Export-Import Bank of China
New line construction project (Benin–Calabar section)	Construction contract	
Procurement of new locomotives and refurbishment of rolling stock	Procurement contract	Government fund

Source: Compiled by Study Team based on interviews with related organizations

As shown in Figure 4-6, the project schemes for railway projects in Nigeria are classified into 1) public project (e.g. NRC), 2) separation of operation and infrastructure ownership (e.g. Blue Line) and 3) PPP (Red Line).



Source: Compiled by Study Team

Figure 4-6 Project Schemes for Railway Projects in Nigeria

4.2 Decision-making Mechanism of the Railway Sector

(1) Legal Status

The railway project proposed in this Study is intended to be implemented with an ODA loan. Therefore, we conducted interviews of related organizations, and summarized and analyzed existing data to find out the process for deciding railway projects, bearing in mind that Nigeria would take out an external loan.

In Nigeria, all projects involving foreign borrowing must be listed in “Borrowing Plans” to obtain approval from the National Assembly. The “External and Domestic Borrowing Guideline 2013-2017” (hereinafter referred to as “EDBG”) in the “National Debt Management Framework 2013-2017” (hereinafter referred to as “NDMF”) prepared by the Federal Debt Management Office (FDMO) serves as reference for the procedures required until the projects are posted to these Borrowing Plans. This Guideline is a revised version of the guideline formulated in 2008 by the Federal Ministry of Finance, National Planning Commission (NPC), and FDMO. The EDBG states the requirements (required documents, procedures, etc.) for the Federal government, State government, or an organization when implementing a project with external loan or domestic loan. We also summarized below the major laws and regulations that shall be used as legal reference in conjunction with this guideline.

Table 4-5 Laws and Regulations for Approving Projects using External Loans

Laws/regulations/guidelines	Remarks
External and Domestic Borrowing Guideline 2013-2017	Stipulate the contents of various procedures and matters for the application of external loans.
Fiscal Responsibility Act, 2007	Stipulate the authority of various related entities in the procedures and approval of external loans.
Debt Management Office Act, 2003	Stipulate that FDMO is responsible for preparing the annual borrowing plan (in conjunction with the Federal Ministry of Finance, NPC, and the Budget Office of the Federal).
Investment and Securities Act, 2007	Stipulate the matters to be verified for domestic loans.

Source: Compiled by Study Team based on “External and Domestic Borrowing Guideline 2013-2017”

(2) Requirements for the Approval of an External Loan

The Federal government is said to review, on a project basis, the items below for the approval of projects submitted by State governments that use external loans. According to the guideline, application of a proposed measure to the borrowing plan can be submitted annually depending on the project. However, according to our interview with the Federal Ministry of Finance, cases received from the 36 states are aggregated to form a borrowing plan. The plan currently being prepared summarizes the cases for three years from 2014 to 2016.

Table 4-6 Requirements for the Approval of an External Loan

Category	Contents	Responsible entity
Project screening	<ul style="list-style-type: none"> ● Verify if the project matches the 1) National Debt Management Strategy, 2) the Borrowing Guideline, and 3) the priority areas of the country. ● Prepare the project assessment report and submit it to the Federal Ministry of Finance. 	FDMO FDMO
Preparation of a borrowing plan (draft)	<ul style="list-style-type: none"> ● Verify if the project matches the national development priority areas and the by-country strategic direction of the donor country, select the project in line with these criteria, and submit a project report. ● Prepare a borrowing plan (draft). 	Project entity Collaborate with FDMO (Federal Ministry of Finance), NPC, Budget Office of the Federal
Approval by Federal Executive Council (FEC) and submission to National Assembly	<ul style="list-style-type: none"> ● Submit the project assessment report and the borrowing plan (draft) approved by the Minister to FEC. ● Submit the borrowing plan (draft) to the National Assembly as one of the items in the proposed annual budget. 	Minister of the Federal Ministry of Finance Federal Ministry of Finance and Budget Office of the Federal
Verifying the contents of project components	<ul style="list-style-type: none"> ● Verify if the project is only for the areas of infrastructure development and capacity development 	Minister of the Federal Ministry of Finance and FDMO
Change in funding	<ul style="list-style-type: none"> ● Assuming that the National Assembly approves the project, the Federal government may change to securing funds from the long-term financial market 	Federal Ministry of Finance and National Assembly

Source: "External and Domestic Borrowing Guideline 2013-2017"

We summarized the following considerations that shall be taken by the State government and project entity when applying for a project that uses external loan:

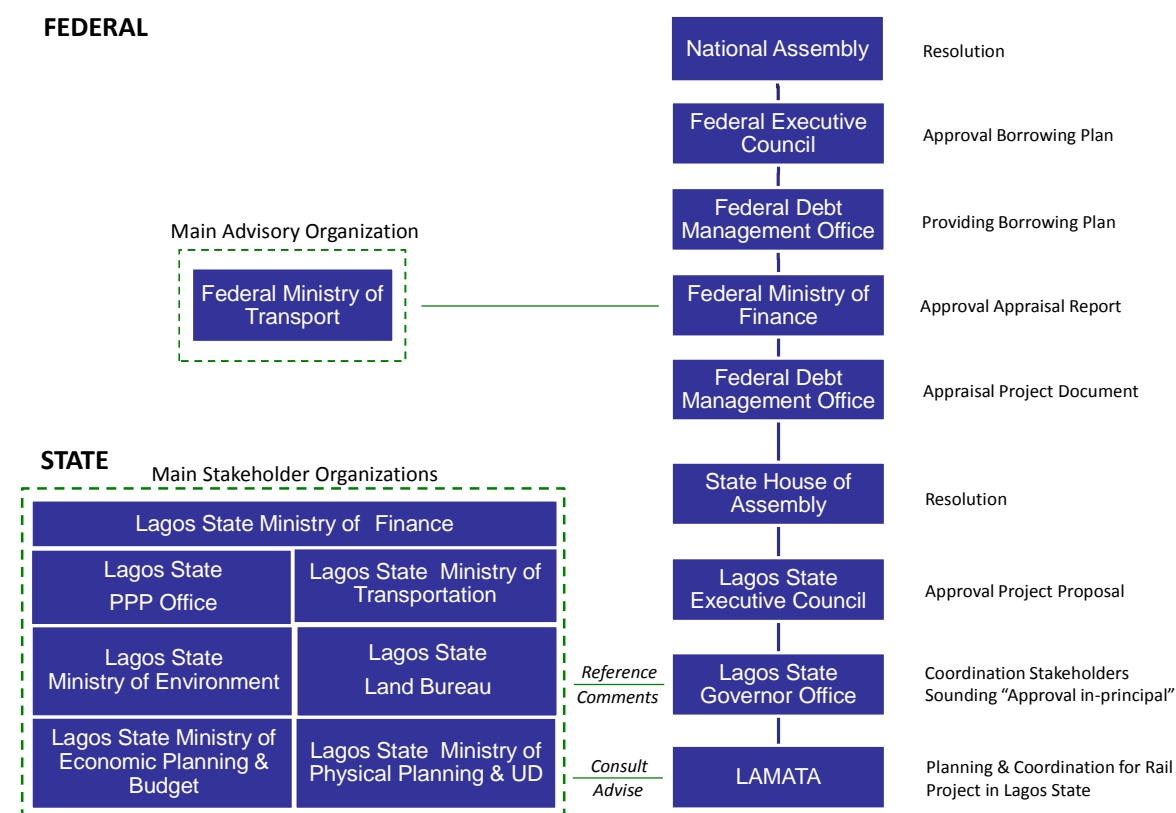
Table 4-7 Considerations for External Loans by the State Government and Project Entity

Category	Contents	Responsible party
Forbid direct borrowing	<ul style="list-style-type: none"> The State government and other local governments cannot take out an external loan directly. 	State government or project entity
Informal consent in advance	<ul style="list-style-type: none"> The State or other government shall obtain an informal consent for the project from the Federal Ministry of Finance in advance. 	State government
Approval process within the state	<ul style="list-style-type: none"> The State's Executive Council needs to approve the proposed loan contents and then pass a resolution in the State House of Assembly. 	State government or project entity
Timing for submitting the proposal	<ul style="list-style-type: none"> The proposal of a project using external loan shall be submitted to the Federal Ministry of Finance at least 90 days in advance before the anticipated start year of the borrowing plan. 	State government or project entity
Contents to be included in the proposal	<ul style="list-style-type: none"> The proposal to be submitted to the Minister of the Federal Ministry of Finance shall be submitted to the Federal Ministry of Finance and the FDMO at the same time for review. The proposal shall include 1) the meaning and objective of the loan and its relationship to the national development plan, 2) cost-benefit analysis, 3) cash flow analysis to demonstrate feasibility and sustainability, 4) copies of the certification issued by the State's Executive Council and the resolution of the State House of Assembly. 	State government or project entity
Examine financial structure	<ul style="list-style-type: none"> The debt soundness of the State shall be verified in advance in order to obtain the informal consent. 	FDMO
Negotiation and conclusion of loan agreement	<ul style="list-style-type: none"> A team shall be put together to negotiate the conclusion of the loan with the Federal Ministry of Finance and submit the report to the Minister of the Federal Ministry of Finance. The negotiation report shall be submitted at the same time to the Justice for Clearance. A presentation is given to the FEC and the concluded contents of the loan are officially approved. Loan agreement procedures and signing 	Federal Ministry of Finance Federal Ministry of Finance and Justice for Clearance Federal Ministry of Finance Federal Ministry of Finance
Subsidiary loan agreement	<ul style="list-style-type: none"> The State government concludes an subsidiary loan agreement with the Federal government 	Federal Ministry of Finance and State government

Source: "External and Domestic Borrowing Guideline 2013-2017"

(3) Approval Process for Project Using External Loan

In the previous section, we summarized the general approval process for a project using external loan and related considerations. Figure 4-7 shows the various steps. The steps shown here is the general process according to the Guideline. We found out from our interviews with relevant organizations that the actual process until approval does not necessarily follow these steps. According to the information that we obtained from our interviews with donors, depending on the thought and timing of the person in charge in each related organization, the situation may vary substantially. However, the Federal Ministry of Finance is definitely the entity holding the key to the approval process. Even the Guideline states that the State government shall obtain informal consent in advance to facilitate the approval process. Therefore, it is important for the project entity and the State government (Governor Office, etc.) to establish close relationship with the Federal Ministry of Finance from an early stage and approach the Ministry actively and repeatedly.



Source: Compiled by Study Team based on "External and Domestic Borrowing Guideline 2013-2017" and interviews

Figure 4-7 Standard Decision-making Process for the Realization of a Railway Project

(4) Considerations to be Taken to Facilitate Approval

The next step of this study is assumed the implementation of a preliminary study for cooperation on the premise of a yen loan. The project proposal ultimately submitted by LAMATA is prepared based on the contents of such preliminary study. Therefore, it is desirable to move forward with the above-mentioned process by including the final consensus with the main stakeholder organizations, including the Lagos State Governor Office, in the preliminary study. A final proposal to the related organizations in Nigeria shall be formulated at an early stage.

It can be said that the method to explain the external loan to the Federal Ministry of Finance is the most important. In our interview, the Federal Ministry of Finance emphasized keeping close contact with LAMATA and the Federal Ministry of Transport, including coordination of the presentation.

Therefore, in addition to the main stakeholder organizations, it is also important to provide timely information to the Federal Ministry of Finance through the Federal Ministry of Transport. It seems that such repeated lobbying can lead to informal consent (covering the considerations in Table 4-7) from the Federal Ministry of Finance and facilitate the subsequent approval at the Executive Council and the State House of Assembly in Lagos State.

4.3 Prospect of Funding for the Railway Development Plan

According to the “Extension of The Strategic Transport Master Plan” (hereinafter referred to as “revised Master Plan”) that is being reviewed by LAMATA currently, the scale of project investment for all the transportation infrastructures proposed in the revised Master Plan is huge, at approximately 20 billion USD. Of the amount, LRT is estimated at approximately 9 billion USD and monorail at 1.7 billion USD. Thus, the amount earmarked for railway is approximately 10.7 billion USD, which is more than half of the investment amount of the revised Master Plan.

Table 4-8 Investment Scale of Transport Infrastructure in the Lagos State Revised Master Plan

Unit: 100 million USD

Type	2017	2022	2032	Total
BRT	2.16	3.20	1.32	6.68
LRT	19.89	34.77	35.43	90.19
Monorail	0.0	16.51	0.0	16.51
Others	19.74	13.26	45.60	78.60
Total	41.88	67.75	82.36	191.99

Source: LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region,” (Draft Final Report)

Table 4-9 Scale of Infrastructure Investment of Various Lines in the LRT Project

Unit: Million USD

LRT	2017	2022	2032	Total
Blue Line	11.00			11.00
Red Line	8.99		6.39	15.38
Green Line		6.87	17.97	24.84
Yellow Line			11.07	11.07
Brown Line		5.83		5.83
Purple Line		22.088		22.08
Total	19.99	34.77	35.43	90.19

Source: LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region,” (Draft Final Report)

Table 4-10 shows the changes in the budget amount of LAMATA. The budget for 2013 was 276 million USD but the budget varies every year depending on the projects. Viewed from the budget scale of 2013, however, the total project investment scale required until 2031 will correspond to about 70 years. Of course, many of the transport infrastructures, including toll roads, are expected to be developed using private funds through PPP in the future. According to the Ministry of Economic Planning & Budget, despite the policy to utilize the private sector for about half of the cost in the development of infrastructure, huge amount of funds will still be needed to cover the investment in transport infrastructure. For this reason, we can recommend increasing as much as possible the proportion of external loan, which has low risk in terms of interest and project duration, and reexamining the borrowing practice that has been in place since the Paris Club agreement.

In fact, the push to change the practice in recent years has been gaining momentum, such as the restart

of yen loan, which has been suspended for a long time. Even the Lagos State Development Plan 2012-2025 puts forth a policy to utilize actively loans from donors that offer favorable borrowing conditions.

Table 4-10 Annual Budgets of LAMATA in Recent Years

Unit: 100 million USD

Year	Personnel cost and various expenses	Infrastructure development	Budget total
2012	0.07	2.11	2.18
2013	0.11	2.65	2.76

Source: Compiled by Study Team based on LAMATA data

Funding shall be considered in light of the development and operation schemes, which shall be worked out. We refer to the project contract format of the Blue Line, which is the first to be developed in Lagos State, as the basic model for the development of transport infrastructure. The Blue Line adopted a scheme that separates infrastructure from operation (including rolling stock, etc.). The Lagos State government is responsible for the development of infrastructure (issuance of bonds) and a consortium made up of investment banks, engineering companies is responsible for railway operation, including the rolling stock.

In this Study, we used this example as reference for the anticipated project scheme, assuming that basically the Nigerian government (Lagos State government) and other international donor organizations (bilateral financing or co-financing between international donors) will be responsible for the infrastructure and that Nigerian companies, including a private consortium, will be responsible for the operation. The potential funding sources based on these conditions are summarized in the table below. It shall be noted that since the project is in Lagos State, it is not possible for the Federal government to have an assistance scheme in parallel with that of the State. Furthermore, since LAMATA, the project implementation entity, is not under the Lagos State Ministry of Transportation but an independent entity, a scheme of receiving assistance from the Lagos State Ministry of Transportation is also unthinkable.

Table 4-11 Potential Funding Sources for the Railway Development Plan

Source	Budget format		Contents
Nigeria	State government budget (LAMATA)		<ul style="list-style-type: none"> ● LAMATA, the project entity, is independent of Lagos State Ministry of Transportation. It will receive direct budget appropriation from the State Ministry of Finance. ● Since the project is a state project, it will not have subsidies from the Federal government. ● Depending on the project scheme and earning position, use of viability gap funding (VGF) is conceivable. In such case, the payment is assumed to come from the budget of the State government. It is necessary to determine the terms and conditions prior to concluding the contract.
	Domestic loan		<ul style="list-style-type: none"> ● Domestic loans are administered by the Lagos State Debt Management Office, which issues points via the Debt Issuance Program (same as Blue Line). ● The State government is also proactive in using domestic loans. It is necessary to examine how to coordinate with external loans, comparing the pros and cons, and demarcation, etc.
	Commercial banks		<ul style="list-style-type: none"> ● Long-term loans from commercial banks, such as Eco Bank, First Bank, Infrastructure Bank, etc.
	Private investors		<ul style="list-style-type: none"> ● Major conglomerates with banking or real estate department
Japan (ODA loan)	Independent financing	Yen loan	<ul style="list-style-type: none"> ● Loan limit and other constraints shall be examined to provide a better understanding of the possible scope of development, demarcation between STEP and the State government, and need for co-financing
		JICA overseas investment and loan	<ul style="list-style-type: none"> ● Its applicability will be discussed after the project scheme has been reviewed because assistance is dependent on the form and degree of participation of the Japanese companies.
		JBIC direct financing	<ul style="list-style-type: none"> ● Same as the above
	Co-financing	Yen loan (ACFA)	<ul style="list-style-type: none"> ● There are many examples in the past. AfDB is also proactive in co-financing with JICA as long as the contents are in line with the policy on the Nigeria side.
		Yen loan (NSL)	<ul style="list-style-type: none"> ● Possibility is low, based on the past financing examples.
	Trade insurance	NEXI export insurance/investment insurance	

			dependent on the form and degree of participation of the Japanese companies.
Other countries	Independent financing	Funds from International Development Association (IDA) of the World Bank	● The possibility of funding is low, judging from its assistance policy and compatibility.
		Funds from AFD	● The possibility of funding is low, judging from its assistance policy and compatibility
		Funds from AfDB	● The possibility of funding is low, judging from its strategy paper and compatibility.
		Funds from the Export-Import Bank of China	● The funds are mostly for projects supported by China and undertaken by Chinese companies. They will likely compete with the yen loan
	Co-financing	Co-financing program with AfDB	● Same as above (ACFA, NSL
		Co-financing program with IDA (WB)	● Co-financing by the WB and AFD will be the same system as the BRT projects currently underway. Co-financing is possible as a scheme; however, the possibility is low due to the assistance policies and compatibility of the two organizations. On the other hand, JICA assumes that co-financing for Africa will mainly be programs with AfDB. The possibility of co-financing with the WB is low

STEP: Special Terms for Economic Partnership

ACFA: Accelerated Co-Financing Scheme for Africa

NSL: Non-sovereign loan, assistance loan to the private sector under a joint initiative to develop the private sector in Africa (Private Sector Assistance Loan)

NEXI: Nippon Export and Investment Insurance

JBIC: Japan Bank for International Cooperation

Source: Compiled by Study Team based on interviews, etc.

4.4 Analyzing the Activities of Other Donors (Countries, Organizations)

4.4.1 Collect and Organize Information on the Latest Status of Assistance by Other Donors to the Railway Sector

We will give an overview of the ODA assistance extended to the railway sector of Nigeria to date by the World Bank, African Development Bank, China, the United States (USAID), France (AFD), South Korea (KOICA), and the UK (DFID), based on relevant documents on assistance to Nigeria published by the donor countries and interviews.

(1) World Bank

The World Bank published the “Country Partnership Strategy for the Federal Republic of Nigeria, 2014-2017” in April 2014, putting forth a policy to provide approximately 2 billion USD annually over the next three years as assistance to Nigeria. The specific contents of assistance are focused on the three items stated below. The policy also mentioned the importance of redeveloping the railway sector to improve infrastructure.

- Promote various growth and employment by restructuring the electricity sector, enhancing agricultural productivity, and promoting funding.
- Improve the quality and efficiency of social services to promote the social participation of citizens (at state level).
- Strengthen the management of public projects and governance.

The World Bank supported NRC until the early 1990s but the project was not able to deliver satisfactory results. Since then, the World Bank has not provided any assistance to the railway sector. On the other hand, the World Bank helped implement the Lagos Urban Transport Project (LUTP) from 2002 as assistance to the transport sector. The contents of LUTP are as follows:

- LUTP1 (2002–2010)
Of the total amount of 135 million USD, the World Bank provided 100 million USD. With the objectives to increase the efficiency of the transport network and to enhance the management capacity of the transportation sector on an ongoing basis, LAMATA was established, the BRT system was launched, and capacity building of the stakeholders was carried out.
- LUTP2 (2010–2015)
Of the total amount of 325 million USD, the World Bank provided 190 million USD and the AFD co-financed (parallel) 100 million USD. Launch of new BRT routes, road renovation, and capacity building are planned. In accordance with the World Bank procurement guidelines, international competitive bidding was held for the civil engineering works of LUTP2 and CCECC won the bid.

(2) African Development Bank (AfDB)

AfDB offers assistance to the government of not only Nigeria but also to those of other African countries for policy approaches and infrastructure development in areas such as economic growth, gender, environment, and so on. According to the “Country Strategy Paper 2013-2017” formulated by AfDB in 2013, AfDB will provide assistance in the following two areas to support the transition of Nigeria to an export-led economy, based on the mining and manufacturing industries promoted by Nigeria.

- Assistance area 1: Support the development of policy environment (funding, petroleum resources, management of grants, PPP, job creation, green growth, social participation of women, regional integration)
- Assistance area 2: Invest in critical infrastructure that will contribute to the growth of the real sectors of the economy (roads, energy, agriculture, water, and sanitation)

The AfDB can provide funds to all sectors for the development of infrastructure in Nigeria; however, there is no record of assistance to the railway sector so far. On the other hand, AfDB cited urban transport, improvement of the railway transport system, and support to the road sector as examples of assistance to facilitate low-emission, high-growth, and sustainable development in its Country Strategy Paper. Currently, the following two projects are being reviewed:

- Abuja BRT project:
Of the 158 million USD total amount for Phase 1 (pilot phase), AfDB is planning to provide 50 million USD. In addition, the Clean Technology Fund of the World Bank (fund for supporting mitigation measures that will contribute to the reduction of greenhouse gas emissions in developing countries) will provide 50 million USD.
- Lagos cable car project:
Of the total amount of 275 million USD, AfDB plans to extend 60 million USD through private sector financing. Most of the funds will be funded by the private sector in a collaborative form. The project is a PPP project. The concessionaire Ropeways Transport Limited will use the

technology of Doppelmayr, Inc. (Switzerland). Electric power will be procured from IPP.

(3) China

Although we were not able to obtain materials about China's assistance policy for Nigeria, it was announced in the joint statement issued at the time when the Chinese Premier visited Nigeria in May 2014 that the two countries would strengthen cooperation. In particular, the statement mentioned the strengthening of cooperation through public entities in the railway, electricity, and airport areas. Nigerian has also pledged full support to the special economic zone for Chinese companies in Lagos State.

In principle, China's foreign aid is bilateral cooperation. China tends to act alone without following the framework of international cooperation. The principles, formats, and conditions of aid are different from those of the traditional donors. China's assistance to Nigeria has taken the form of Chinese companies participating in infrastructure construction and PPP projects, which are indirectly supported by funds and loan guarantees provided by government financial institutions, such as The Export-Import Bank of China and others.

As shown in Table 4-12, China's assistance to the railway sector is extremely proactive. Besides the numerous construction projects currently underway, including the Blue Line project in Lagos State, China is also promoting the export of Chinese-made rolling stock.

Table 4-12 Railway Projects with Chinese Involvement

Project	Source of fund	Concessionaire	Status
Rehabilitation of Lagos–Kano urban railway line	Total amount: 8.3 billion USD (The Export-Import Bank of China: 500 million USD)	<ul style="list-style-type: none"> Lagos–Jebba: <u>CCECC</u> Jebba–Kano: Costain (UK) 	<ul style="list-style-type: none"> Completed in 2012
Construction of a new line for the Abuja–Kaduna section	Total amount: 874 million USD (The Export-Import Bank of China: 500 million USD)	<u>CCECC</u>	<ul style="list-style-type: none"> Under construction To be completed in 2014
Rehabilitation of the existing Port Harcourt–Maiduguri railway line	Total amount: 4.1 billion USD	<u>CGGC</u> , Esser (Turkey), Lingo	<ul style="list-style-type: none"> Under construction To be completed in 2014
Lagos LRT (Blue line)	Total amount: 1.2 billion USD	Construction: <u>CCECC</u> O&M: EkoRail	<ul style="list-style-type: none"> Under construction To be completed in 2015 The Export-Import Bank of China got involved when the construction was interrupted due to insufficient fund.
Abuja LRT (Lot 1 and Lot 3)	Total amount: 800 million USD (The Export-Import Bank of China: 500 million USD)	<u>CCECC</u> (O&M for 5 years)	<ul style="list-style-type: none"> Under construction To be completed in 2015
Double track for the Lagos–Ibadan section	Total amount: 1.4 billion USD (The Export-Import Bank of China: 100 million USD)	<u>CCECC</u>	<ul style="list-style-type: none"> Under construction To be completed in 2016

Construction of a new coastal line for the Lagos–Calabar section	Total amount: 13.1 billion USD	<u>CCECC</u>	<ul style="list-style-type: none"> • Concluded a concession contract in 2014 • Development of a coastal line with total length of 1,385 km, design speed of 120 km/h, and 22 stations
------------------------------------------------------------------	--------------------------------	--------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Note: The underline indicates Chinese companies/organizations.

CGGC = China Gezhouba Group Corporation

Source: Compiled by Study Team

(4) United States (USAID)

The USAID assistance to Nigeria for 2010–2013 is focused on five areas, which are the strengthening of governance, agricultural support, HIV and AIDS, health and sanitation, and education. In addition, USAID is currently putting efforts in the electricity sector, based on the electricity assistance program under "Power Africa," which is part of the African anti-poverty policy announced by President Obama in 2013. USAID is currently formulating a strategic document for assistance after 2014 and it is expected to be completed in the second half of 2014. However, the aid policy is not expected to have significant difference from the ones in the past.

So far, the United States has not extended any assistance to the railway sector in Nigeria. According to the interview with USAID, without an assistance policy, such as "Power Africa," to promote development of the railway sector, the United States is not thinking of engaging in railway development projects at this time. Currently, USAID is implementing a multi-modal logistics improvement program in cooperation with the private sector for agricultural products between the north and the south (Lagos–Kano–Jibiya) in Nigeria, known as the "Nigeria Expanded Trade and Transport." Railway has been assessed as one of the means to transport rice, sesame, and other crops. The program highlights the need for railway reform from the viewpoint of utilizing logistics to revitalize the economy.

(5) France (AFD)

According to the AFD documentation of assistance to Nigeria "AFD Group in Nigeria," AFD is placing emphasis on infrastructure development for electricity, water and sanitation, transportation, and housing supply, as well as agriculture, small and medium-sized enterprises, and microfinance.

AFD has not provided any assistance to Nigeria's railway sector in the past. For the transport sector, as described above, AFD cooperated with the World Bank in 2012 to participate in LUTP2 of the Lagos BRT project. AFD had its eyes on developing the BRT infrastructure (development of BRT lanes, etc.) and introducing an operation scheme (capacity building). Road repair and tasks not related to BRT that are included in LUTP2 are carried out by funds provided by the World Bank. The difference in the loan procedures with the World Bank made the project a parallel financing project. According to an interview with AFD, AFD continues to be interested in other projects in Lagos State, including urban railway.

(6) South Korea (KOICA)

According to the statistics of the OECD, South Korea's assistance to Nigeria in 2012 was 3.66 million USD. In fact, the assistance by KOICA to Nigeria is focused on basic education, vocational training, human resources development, policy support, and agriculture. No assistance was given for infrastructure development.

KOICA, in cooperation with Korean companies, has been very active in recent years, making offers to NRC to provide education and training to the railway sector. Their actions in the future shall be watched closely.

(7) United Kingdom (DFID)

DFID assistance to Nigeria is focused on five areas, which include governance, increase in income, health care/education, water/sanitation, and poverty/gender. In addition, DFID has also increased assistance to include electricity development in recent years. For infrastructure development, including the power sector, DFID started an advisory program called the “Nigeria Infrastructure Advisory Facility (NIAF)” in 2010. In addition to facilitating reform of the electricity sector and technical cooperation, the program also provides PPP support and technical cooperation to the transport sector. Assistance for infrastructure development in Nigeria using the PPP scheme is gaining momentum.

So far, DFID has not had any assistance geared specifically toward the railway sector. However, it is providing technical support to the urban transport development planned by the state government through NIAF and is also involved in the BRT project in Lagos and the construction scheme for the LRT project.

4.4.2 Involvement of Overseas Companies and Other Governments in Lagos and Routes

Table 4-13 shows the involvement of overseas companies in the LAMATA project (including railway) currently in progress. Except for the cable car (ropeway) project, the other projects adopt the scheme separating infrastructure and operation. The donors are involved in the construction of the infrastructure. As mentioned above, Chinese assistance to intercity railway and urban railway through financing provided by The Export-Import Bank of China generates tremendous momentum. Chinese companies, especially CCECC, are considered one of the competitors of Japanese companies in the railway sector of Nigeria. In the following, we will give an overview of the companies and governments in China, the United States, and South Korea that are actively engaging in infrastructure construction, exports of rolling stock, and others that pertain to the railway sector.

Table 4-13 Involvement of Overseas Companies in the LAMATA Projects
Currently Underway

Item		LRT (Blue line)	BRT (LUTP1)	BRT (LUTP2)	Cable car (ropeway)
Project scheme	Infrastruct ure	Public project (CCECC)	Public project	Public project (CCECC)	Ropeways Transport (30 years)
	O&M	EkoRail (25 years)	NURTW	NURTW	
Donor		The Export-Import Bank of China	World Bank	World Bank AFD	AfDB
Type of financing		Guaranteed	ODA loan	ODA loan	Private sector loan

NURTW=National Union of Road Transport Workers

Source: Compiled by Study Team

(1) China

Chinese companies are involved mainly in contracted projects, including the research, design, and construction of infrastructure projects. The expansion of Chinese companies to Africa is characterized by Chinese companies gaining competitive edge through China’s foreign aid, in the form of preferential loans, and China’s supply of labor, plants, technologies, capital, and resources with the objective to develop the resources in Africa. In addition, the strengthening of relationships through diplomacy between the top government officials of both countries in recent years has considerable

effect. In fact, when the Study Team was visiting NRC, NRC executives were visiting China at the time to purchase rolling stock from the China South Locomotive And Rolling Stock Industry Company (CSRGC).

CCECC has made entry not only into the railway sector but also into a wide variety of projects for the construction of roads, airports, buildings, and factories. It has become a major construction company in Nigeria today. Chinese companies gained expertise and experiences from participating in infrastructure development projects and established a high profile in Nigeria. In recent years, China has been awarded the Lagos BRT project through international bidding, showing that it is highly competitive internationally as well. Such circumstances can be said the result of “networking” that China has cultivated so far, “low price,” and “short construction period.”

(2) United States

GE has been doing business in Nigeria in various fields, including oil and gas, electric power, health care, and financial services, for many years. As a target country for projects, Nigeria is the largest in Africa. In recent years, GE has focused on major infrastructure areas. It signed a memorandum of understanding with the Nigerian government in 2009. GE delivered 25 locomotives in 2010 to the railway sector. It also set its eyes on revitalizing the railway as a means of distribution in the future. It is currently constructing an assembly plant to manufacture GE locomotives. According to NRC, GE is in the midst of selecting a site for construction.

Prior to the first summit held in Washington, DC in August 2014 between the United States and African leaders, GE announced an investment of 2 billion USD by 2018 in infrastructure development and education/training in Africa. While the political instability of African countries can be a risk, GE determines that profit from investment will outweigh the risks. GE’s involvement in Nigeria’s railway sector will not stop at the delivery of rolling stock but rather it will likely pursue opportunities actively in the future. At this time, no collaboration between GE and the United States government (USAID) in the railway sector is seen; however, they are expected to work closely in the railway logistics area in the future.

(3) South Korea

Korean company POSCO received an order for the rehabilitation of inter-city railway in December 2006 for the Port Harcourt–Maiduguri section at a total cost of 10 billion USD. This is the largest overseas project for a single Korean company. The project is based on a memorandum signed between the two countries in which as an exchange condition, South Korea will help modernize Nigeria’s railway and South Korea will be allowed to proceed with its first oil field development in Nigeria. The backdrop to the railway assistance project stems from South Korea’s intent to secure oil resources. However, no progress of this project made by POSCO has been seen. Rather, the Nigerian government announced in 2012 that a contract for the same section had been awarded to three companies (CGGC, Esser, and Limbo) and POSCO was not one of them. POSCO might have canceled the project but we are not able to confirm that at this time. The reason is that when the new Nigerian president took office in 2007, the oil-mining contract that South Korea had acquired was canceled. This change in the project environment has affected the performance of the original memorandum. It seems like Nigeria, which has pursued nation building in recent years without relying on its petroleum resources, has rejected the trade-off of accepting assistance for its infrastructure development and opted for direct control of its resources instead.

With the exception of POSCO, we cannot confirm involvement of other Korean companies in the railway sector at the moment. However, Korea Rail Road Corporation (Korail) has been very proactive in recent years. It visited Lagos in 2013 and expressed interest in assisting NRC. KOICA and the Export-Import Bank of Korea are also expected to be involved in the future advancement of Korean companies to Nigeria.

4.4.3 Issues and Solutions Related to Donors and Overseas Companies

Based on the gathered information and interviews of related organizations on the assistance policies of other donors to the railway and transport sectors, and the situations with private companies overseas and foreign countries, we summarized the following issues and solutions relating to the donors and overseas companies:

(1) Increase Transparency of the Approval Process in Nigeria

The prime concern is the lack of transparency of the loan approval process in Nigeria. All the donors, including the World Bank, AFD, and the African Development Bank, commented that they have experienced delay in the start of a project due to the late project posting to the “Borrowing Plan,” which required approval of the Nigeria Federal Ministry of Finance. The “Borrowing Plan” itself is not disclosed to the public. Donors either receive an official document notifying them of the completion of the draft or posting of the project or are informed verbally. No information on the actual contents posted or the time of submission to the National Assembly is available.

Clarification of the federal government’s approval process and disclosure of the information are the only ways to resolve this problem. At this moment, conducting strategic consultation with the state and federal governments on an ongoing basis is important. Until the project is approved, it is advisable to consult closely with the Federal Ministry of Finance, concerned ministries and agencies, the state governments, and many other stakeholders and to make revisions to reflect the intents of the Nigerian side. If a project is to be undertaken by the state, it is advisable to make the state government fully understand the merits of implementing the project so that the state government will take initiative to negotiate with the federal government. Exchanging memorandums of understanding with relevant organizations to share information is also effective.

(2) Strengthen Involvement of Governmental Agencies

As described above, involvement of the federal government and the relevant state government agencies is very important for loan approval at the federal government. On the other hand, there are agencies that are actively involved at this time and there are agencies that are not. Their positions in the formation of the project are not clear. In this regard, we were advised by other donors and the Federal Ministry of Finance during our field study to elicit the involvement of relevant ministries and agencies from the earliest possible stage. This has the merit of facilitating even a little the approval process of the “Borrowing Plan.” As a counterpart, LAMATA is believed to have sufficient project implementation capacity. It is important to collaborate with LAMATA in promoting the project by encouraging the involvement of government agencies and enhancing awareness of the project.

(3) Promote Collaboration with Local Companies

While there are companies like CCECC and GE that have established a business base in Nigeria and are conducting a wide range of businesses in Nigeria today using the experiences that they have gained over time, there are also examples like POSCO that illustrate the difficulty for foreign companies to make inroads into Nigeria. This is mainly due to the lack of transparency in the government and the changes in laws, regulations, and the terms and conditions of contracts resulting from the change in the presidency.

Currently, the PPP method has become a standard for public work projects in Nigeria. The public bidding and contract procedures have also been established to encourage the participation of private companies. Donor agencies, such as DFID, have also extended technical support to PPP projects. The environment for overseas companies to start business has become easier compared to the past and it is expected to improve further in the future. However, since there are few new entrants to the railway sector through the PPP scheme at this time, it is important for a foreign company making entry to Nigeria to build a collaborative system with reliable local companies in order to gather information and to establish a business foundation, in addition to the donors’ technical cooperation and financing support.

4.5 Feasibility of Co-financing with Other Donors

4.5.1 Analysis of Assistance Policies of Other Donors for the Railway Sector

We summarized the assistance policies of other donors for the railway sector in Table 4-14, based on the assistance activities of other donors described in 4.4 and interviews that we conducted in Nigeria. Currently, multiple donors are involved in the formation of an intermodal transport system that combines BRT, LRT, monorail, cable car (ropeway), and water transport spearheaded by LAMATA.

The Blue Line is the only urban railway line in Lagos that is being developed with the assistance of a donor. Specifically, The Export-Import Bank of China supports CCECC in obtaining the order and in the construction of the infrastructure project. Assistance by donors to other urban railway lines cannot be confirmed. The assistance policies of the World Bank and AfDB mentioned supporting the railway sector; In particular, AfDB cited improving urban transport and the railway transport system as examples of assistance. It shows greater interest than the other donors do.

Table 4-14 Assistance Policies of Other Donors for Nigeria

Donor	Priority Measures	Assistance to railway sector	Lagos-related project
World Bank	<ul style="list-style-type: none"> Promote diverse growth and increase employment by strengthening the electricity sector, agricultural production, and financing Improve the quality and efficiency of social services to encourage the social participation of citizens (state level) Strengthen the management and governance of public works projects 	Mention the importance of re-developing the railway sector to improve infrastructure	Urban transport project (BRT)
AfDB	<ul style="list-style-type: none"> Support development of the policy environment (funding, petroleum resources, management of grants, PPP, job creation, green growth, social participation of women, regional integration) Invest in critical infrastructure that will contribute to the growth of important sectors of the economy (roads, energy, agriculture, water, and sanitation) 	Urban transport, improvement of the railway transport system, and road sector are cited as examples of assistance to facilitate low-emission, high-growth, and sustainable development	Cable car (ropeway) project (private sector funding is being reviewed currently)
China	<ul style="list-style-type: none"> Strengthen cooperation through public entities in the railway, electricity, and airport areas 	China is extremely proactive. While numerous construction projects are currently underway, China is also promoting the export of Chinese-made rolling stock.	Blue Line project (The Export-Import Bank of China provides support to Chinese companies in obtaining orders and in construction)
U.S. (USAID)	<ul style="list-style-type: none"> In addition to the five areas of strengthening governance, agricultural 	The U.S. is not thinking of getting involved in railway development project at this	—

	support, HIV and AIDS, health and sanitation, and education, the U.S. is also putting efforts in the electricity sector.	time.	
France (AFD)	<ul style="list-style-type: none"> • Infrastructure development for electricity, water and sanitation, transportation, and housing supply • Agriculture, small and medium-sized businesses, and microfinance 	Interested in urban railway projects in Lagos State but taking a stance of not getting involved actively at this time.	Urban transport project (BRT)
South Korea (KOICA)	<ul style="list-style-type: none"> • Focused on basic education, vocational training, human resources development, policy support, and agriculture 	Cooperate with Korean companies to conduct actively activities in the railway sector	—
U.K. (DFID)	<ul style="list-style-type: none"> • Focused on five areas, which include governance, increase in income, health care/education, water/sanitation, and poverty/gender, as well as increase support to the electricity sector 	No assistance provided specifically to the railway	Advisory program for the transport sector

Source: Compiled by Study Team

4.5.2 Feasibility of Co-financing with Other Donors

In the review of co-financing for Lagos' urban railway, we found that AfDB could be a candidate based on 4.5.1. Even in the interview, AfDB took a very proactive stance in co-financing for the urban railway sector. LAMATA was established in 2002 and LAMATA has been working on improving the Lagos transport sector as a whole, such as by introducing the BRT. Rather than co-financing urban railway projects, Japan shall establish a cooperative relationship with the World Bank to improve urban transport in order to create a synergy effect.

The co-financing scheme with AfDB is expected to be implemented through the Accelerated Cofinancing Facility for Africa (ACFA) under the Enhanced Private Sector Assistance for Africa envisioned in 2005. Through ACFA, JICA provides funds to the governments of various African countries for economic infrastructure projects to promote private sector development. As of September 2013, agreements for fourteen ACFA projects in all of Africa have been concluded. The ACFA project for Nigeria is Cameroon–Nigeria road transport advancement project for the Bamenda–Mamfe–Ekok section and the Mfum–Abakaliki–Enugu section. As of April 2014, there has not been any ACFA project for the railway sector.

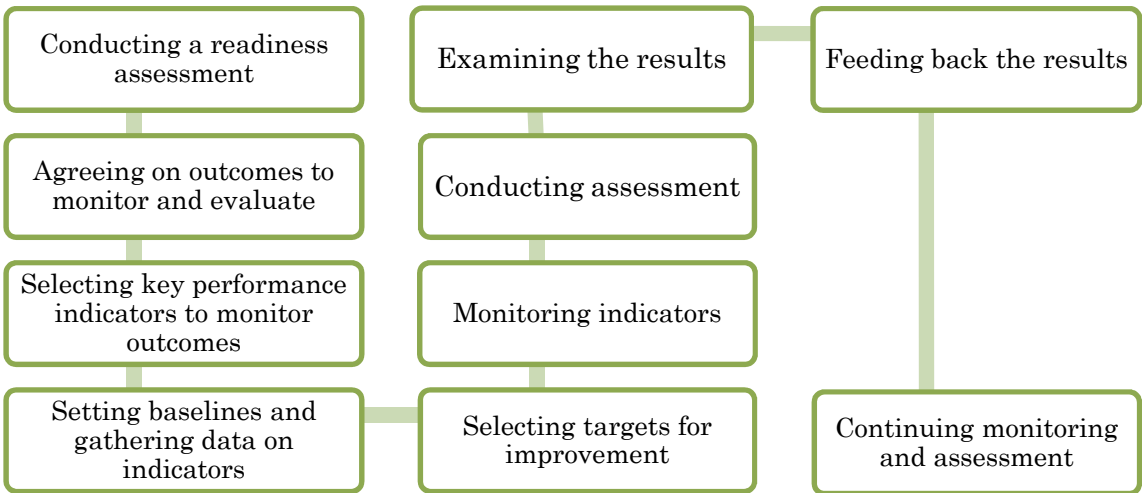
4.6 Socio-economic and Environmental Impact of the Current Investment Plans

4.6.1 Project Evaluation Mechanism

The assessment system for upper-level development program for Lagos State and the safeguards policy prepared by LAMATA, which is responsible for the implementation of the LRT, were reviewed. They were crosschecked against the evaluation points (pre-evaluations) for the LRT Blue Line and Red Line, the construction of which are currently underway, and the Purple Line, the pre-feasibility study of which has been conducted.

(1) System for Evaluating Medium-to-long Term Plans

The monitoring and evaluation of the Lagos State Development Plan 2012–2025, which is the long-term plan for Lagos State, is based on the "Mid-Term Sector Strategic," a medium-term plan prepared for each sector. In a medium sector plan, a post-project evaluation is required for the implementation of each project. This evaluation procedure is based on the "10-Steps Results-based M&E System" created by the World Bank. It uses the following steps to monitor and evaluate a project:



Source: Compiled by Study Team based on "Lagos State Development Plan 2012–2025"
 Figure 4-8 Procedures for Monitoring and Evaluation

(2) LAMATA Safeguards

LAMATA formulated the "Procedural Manual on Social Assessment" in 2004, putting forth guidelines for assessing socio-economic impact, considerations for health and safety, considerations for cultural, historical, and religious aspects, and impact on poverty reduction. These guidelines have been positioned as the assessment manual for road projects but the concepts and ideas can be utilized for other transportation sectors as well.

The items (the contents) shown below have been mentioned as the main points for the assessment of socio-economic impact. They are to be examined by the Environment/Social Safeguards Unit of LAMATA and by outside experts (including consultants).

These evaluations use two methods: the "before and after" comparison and the "with and without" comparison. The former is a post-project evaluation to measure the project's actual impact and the latter is pre-project evaluation to predict its impact.

Table 4-15 Major Points of Assessment (Contents)

Assessment items	Contents
Working environment and employment	Create jobs during the construction period and new job opportunities in the operation stage, improve the technical level of local labor, expand the labor-intensive fields (LBM: Labor, Based, Methods) of the construction market, increase the number of local small and medium-sized contractors that can implement LBM, etc.
Transport infrastructure and services	Increase transport volume, increase the number of bus passengers, save travel time, facilitate physical movement, enhance the comfort of users, improve the congestion and delay situation, improve the quality and quantity of public transportation modes, etc.
Economic activities	Increase the number of shops along the line, increase the number of street shops, revitalize the market areas along the line, etc.
Income	Increase household income, etc.

Source: Environment/Social Safeguards Unit of LAMATA, “Procedural Manual on Social Assessment, 2004”

4.6.2 Contents of Project Assessment in the Revised Master Plan

Because the revised Master Plan is the master plan for future transportation projects, it conducts pre-project assessments. The contents of project assessment are focused on demand forecast and cost-benefit analysis. The indices of saving travel time, reduction in a vehicle’s operating cost, reduction in traffic accidents, and reduction in air pollution are selected as the elements of benefit for a project. Their calculations are performed using a traffic demand simulation model.

The project package that is certain to be implemented by 2032 is set as the “do minimum scenario” and the impacts of the projects are evaluated between the revised Master Plan scenario, which contains the projects proposed in the report, and the do-minimum scenario in each target year (2017, 2022, and 2032). Ideally, each project, rather than a project package, shall be evaluated individually using the “with and without” method. Since the revised Master Plan report only contains the comparison of three target years in time, the project impacts are not assessed on a project basis but on a scenario basis. According to our interview with LAMATA, however, it confirmed that it conducted the project-based evaluation and has the data used in the actual calculation. (The evidence data is not available for our reference due to attribution and compliance in draft stage.)

Based on the revised Master Plan report and information obtained from LAMATA, the contents of evaluation of the LRT and monorail projects are summarized as follows:

Table 4-16 Major Contents of the Prior Assessment of LRT Projects

LRT	No. of users 2032 (10,000 people) Note	Population along the lines 2014 (10,000 people)	Population along the lines 2032 (10,000 people)	Population growth along the line	Remarks
Blue Line	135.1	97.9	297.2	3.0	
Red Line	123.8	176.8	306.9	1.7	
Green Line	89.4	50.5	200.2	4.0	
Yellow Line	114.8	96.2	179.2	1.9	
Brown Line	57.5	131.4	166.1	1.3	
Purple Line	166.1	88.0	312.4	3.6	
Monorail	44.7 - 57.9	120.6	227.5	1.9	Depending on the section

Note: Number of users in both directions per day

Source: Compiled by Study Team based on the revised Master Plan data

If the projects described in the revised Master Plan are implemented, the running speed of private vehicles can expect to increase on average 4 km/h in 2017 and 8–9 km/h in 2022.

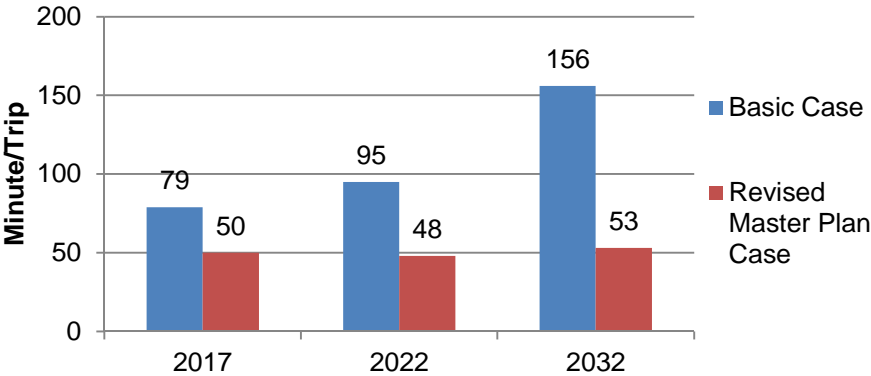
On the other hand, when viewed in terms of the time required for the public transport, the average time reduction of one trip for all public transportation is estimated to be about 37% in 2017, 49% in 2022, and 66% in 2032.

Table 4-17 Increase in Travel Speed of Private Vehicles

LRT	2017	2022	2032
Basic case (Note)	23 km/h	21 km/h	16 km/h
Revised Master Plan case	27 km/h	29 km/h	27 km/h

Note: This refers to the case in which only projects that are certain to be implemented, such as the Blue Line and the Red Line, are included. In contrast to this, the revised Master Plan case is the full implementation of the yearly (2017, 2022, 2032) development plans.

Source: Compiled by Study Team based on the “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)



Source: Compiled by Study Team based on the “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Figure 4-9 Reduction in the Travel Time of Public Transport

With regard to the environmental aspect, reduction in the emissions of major greenhouse gases is forecasted. In the 2017 stage, all the greenhouse gases increase slightly relative to the basic case (an increase of approximately 1%). The development in 2017 with respect to the increase in traffic demand is still insufficient. However, the emissions of all greenhouse gases after 2022 will reduce substantially (reduction of approximately 20–50%).

Table 4-18 Reduction in the Emissions of Greenhouse Gases

	Gas emissions	2017	2022	2032
Revised Master Plan basic case (Metric ton)	CO	635 (0.7)	-65,693 (-53.1)	-114,365 (-58.3)
	NO _x	8 (0.9)	-660 (-51.1)	-1168 (-57.5)
	HC	17 (0.6)	-714 (-16.4)	-1827 (-26.2)
	PM	0 (0)	0 (0)	0 (0)
	CO ₂	5172 (1.1)	-176,130 (-27.3)	-363,480 (-36.3)

() indicated the increase/decrease vs. the base case if the revised Master Plan case is implemented

Source: Compiled by Study Team based on the “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

4.6.3 Status of Assessment

The feasibility studies for the Blue Line, Red Line, and Purple Line are believed to have examined the various evaluation aspects. The Study Team was able to obtain the feasibility reports of the three above-mentioned projects and found that description on evaluation is not enough for the requirements. As summarized in the previous section, the mainstream project assessment system used in Nigeria (Lagos State) is a post-project assessment system. For this reason, the pre-project assessment is only performed at a minimum level. In addition, infrastructure projects have been changed to mainly the PPP scheme and the schemes are proposed by the private sector. The potential contractors expressing interest to a project conduct assessment individually but the information is not usually shared. Even if assessment has been studied, it is difficult to compare the proposals evenly provided by the potential contractors due to inconsistent methods. In the full-scaled feasibility study to be carried out in the near future, these evaluation data, i.e. evaluation by project basis, shall be reviewed. The impacts of each project shall be identified with the help of LAMATA to clarify the project priority and position.

Chapter 5
Status of the Transport Sector
in Lagos State and Issues

Chapter 5 Status of the Transport Sector in Lagos State and Issues

5.1 Overview of Urban Transport

5.1.1 Master Plan of Lagos State

(1) Comprehensive Master Plan and Master Plans By District

A comprehensive master plan of Lagos State was completed in 1980, with year 2000 as its target year. In 2005, John Asiyebi Associate reviewed the master plan and issued a report. On the other hand, master plans for individual districts have been formulated in recent years. These urban master plans generally cover the period 2010 to 2030.

(2) Strategic Transport Master Plan

The "Strategic Transport Master Plan for Lagos Metropolitan Area," formulated in December 2009 by the Israeli transport consultant ROM Transportation Engineering and the Swiss company Phoenix Engineering and Research, is the transport master plan of Lagos State. With 2020 as its target year, the Master Plan pursues comprehensive development of LRT, BRT, water transport, and road. The strategic transport master plan was developed some time after the review of comprehensive master plan. Therefore, the strategic transport master plan is not directly related to the comprehensive master plan in many points.

In 2013, a revised Master Plan was formulated by a consortium consisted of the Spanish consultant Advanced Logistics Group (ALG) and a Nigerian consulting firm Advanced Engineering Consultant (AEC). The draft final report was completed in August 2014. The revised Master Plan, using 2032 as its target year, proposed seven items, as shown below in Table 5-1. It also reflects the contents of the master plans for individual districts shown in (1).

Table 5-1 Proposed Items in the "Revised Master Plan"

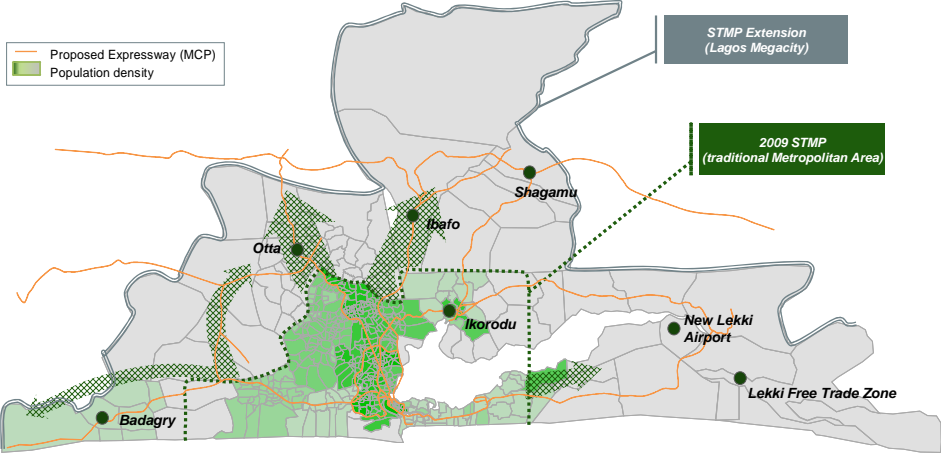
Item	Summary
1) Road and public transportation network plan	Formulate a master plan by coordinating and integrating the existing urban plan and transportation plan
2) Logistics plan	Propose logistics corridors and distribution centers
3) Non-motorized transport plan	Formulate a plan for non-motorized transport that will enable it to serve the role of a feeder mode and contribute to the reduction of environmental load
4) Traffic safety plan	Formulate a traffic safety plan that will also include walking and 2-wheel vehicles
5) Climate change plan	Analyze the environmental changes of Lagos, which faces the risk of rising sea level because of its low altitude (analyze the emission volumes of waste gases)
6) Economic analysis	Implement cost and benefit analyses for project evaluation
7) Proposal of systems	Propose systems for project planning, implementation, and financing

Source: Compiled by Study Team based on the LAMATA "Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region" (Draft Final Report)

In the analysis of the 2013 revised Master Plan, the consortium used similar method as in Japan and other countries for analyzing master plans. The travel behavior of each household was researched through person-trip survey. Based on the data, the four-step estimation method was used to analyze

future traffic forecast and to obtain an understanding of the overall urban transport in a quantitative manner. (“Trans CAD” was used for the analysis. The software can estimate OD matrix from observed traffic flows.)

Changes from the 2009 Master Plan to the 2013 revised Master Plan are as follows: 1) part of Ogun State, which forms the northern part of the metropolitan area, is added to the overall Lagos State as the target area (Figure 5-1), 2) urban logistics is added as a topic, and 3) development plans for the targeted areas necessary for the formulation of long-term plans are added. Although the 2009 Master Plan is premised on the opening of all railway lines by 2020, only the Blue Line, the first of the railway lines, is in construction as of August 2014. Development of the other lines has not taken place. Due to the poor feasibility of the 2009 Master Plan, the revised Master Plan is formulated as a more realistic plan.



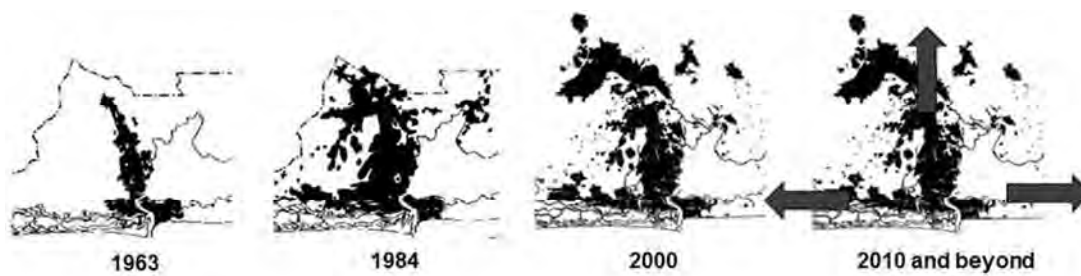
Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Traffic Demand Model to Cover the Mega Region,” (Draft Final Report)
 Figure 5-1 Comparison of Areas in the 2009 Master Plan and the 2013 Revised Master Plan

5.1.2 Urbanization of Lagos State and Issues

(1) Status of Urbanization

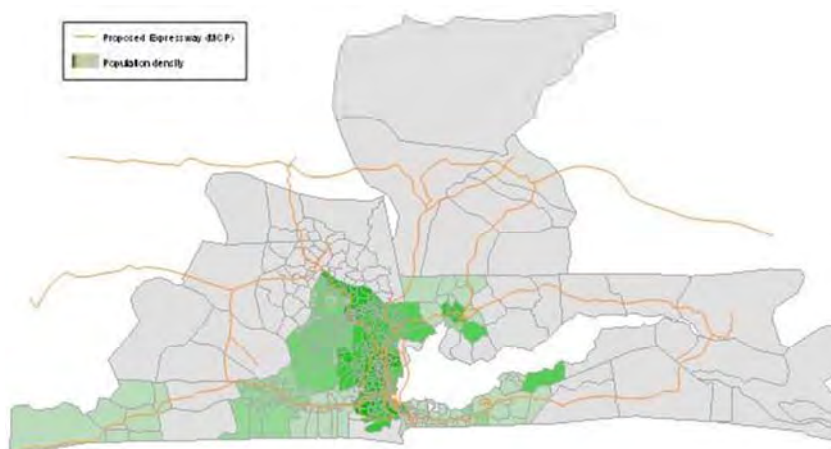
As mentioned in Chapter 1, the current population of Lagos State is approximately 21 million. Figure 5-2 shows expansion of the urban areas over time. In 1963, urbanization started in the north and south directions around the northern part of Lagos Lagoon. As population grew, the urban areas expanded to the Ota and Ijoko directions in the northwest and to the Ojo direction in the west in 1984. The urban areas expanded to the northern part of Ogun State in 2000. In addition to the expansion to the northern and western parts after 2010, urbanization reached Lekki in the east. Lagos is expected to surpass the Cairo metropolitan area in Egypt to become the largest city in Africa in 2015. Its population is expected to exceed 30 million in 2030.

Figure 5-3 shows the population density of the Lagos metropolitan area. The areas with high population densities are centered on the northern part of Lagos Lagoon and around the western part of the lagoon.



Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Figure 5-2 Expansion of the Lagos Metropolitan Area



Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Figure 5-3 Population Distribution of the Lagos Metropolitan Area

(2) Urbanization Issues

Because Lagos did not put in place appropriate plans for urban planning and urban transportation policies to cope with the rapid urbanization of the Lagos metropolitan area, it faces urban planning problems, such as dilapidation of the urban areas, and urban transportation problems, such as the lack of transportation infrastructure (Table 5-2).

Table 5-2 Issues of the Urban Plans and Transportation Plans of the Lagos Metropolitan Area

Item	Summary
Issues of urban plans	Slums and dilapidation of existing urban areas
Issues of transportation plans	Insufficient infrastructure, over-reliance on road transport, lack of road links to form networks, improper traffic regulations, unregulated street stalls and parking, security and crime-prevention issues

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

5.2 Current State of Urban Transport and Issues

The Lagos metropolitan area does not have sufficient transportation infrastructure to provide urban transportation services. This is the result of rapid urbanization, over-reliance on road transport, inadequate traffic control, and other issues, as described in the previous section. The problems are discussed below.

5.2.1 State of Transportation and Issues

(1) State of Road Development

We will first give an overview of Lagos Island and Victoria Island, which are the central business districts (CBD) to explain the road development situation in Lagos. Lagos Island has a ring road on the west side. It is built as a highway with three lanes in each direction. Three bridges (Eko Bridge, Carter Bridge, and Third Mainland Bridge) connect to the mainland on the north side of the island. Other main roads include the Osborne Road, which runs east to west, and the Kingsway Road, which runs north to south in the eastern part of the island. The others are roads with two lanes in each direction that do not have a center divider and one-way roads, showing that the main roads have not been developed adequately.

Victoria Island has Ozumba Mbadiwe Avenue that runs north to south on the island and links Lagos Island to the new areas developed in recent years in the Lekki direction in the east, Ahamadu Bello Way that runs along the coast on the west side of the island, and Adetokunbo Ademolsa Street. Similar to Lagos Island, the other roads have not been sufficiently developed.

On the mainland, three highways (Ikorodu Road, Third Mainland Bridge, and Apapa Owinronshoki Expressway) run in the Ikeja direction on the north side of the Lagos metropolitan area where government buildings and the airport are located. There is also the Lagos-Badagry Express Way on the west side. However, the roads are not sufficiently developed, similar to the situation on Lagos Island and Victoria Island. They are either one-way roads or roads with only one lane in one direction.

The roads are poorly maintained in general. Sagging pavement can be seen in many places. In other words, the road infrastructure has many problems in terms of both quality and quantity.



Source: Photographed by Study Team
Figure 5-4 Third Mainland Bridge



Source: Photographed by Study Team
Figure 5-5 Local Road on Lagos Island

(2) Development of Public Transportation

As shown in “3.2 Status of Railway Transport and Issues,” NRC operates the urban railway in the Lagos metropolitan area but it only offers 16 trains a day. Therefore, public transportation in the Lagos metropolitan area is dependent on the road system, such as buses. Table 5-3 is a comparison of Lagos and major metropolitan areas in Asia that are of similar size. Railway is used for urban transport in Tokyo, Osaka, and Jakarta, the capital of Indonesia. Even though Jakarta only has 235 km of railway

at this time, Nigeria is not using the railway for urban transport at all. The inefficiency of urban transport in Nigeria is due to the underdevelopment of mass transit.

As shown in “2.4 Overview of Transport Sector,” minibus (Danfo) accounts for over 70% of the share by transportation mode, excluding walking. BRT only accounts for 3% and conventional bus 2%. There are approximately 75,000 minibuses. The fare in the city is 100–200 Naira (about 65–130 yen). However, because of the need to use multiple minibuses for transfer, the total commuting cost accounts for 20% of a user’s disposable income, posing a problem. In addition, the wait time and travel time are long due to severe road congestion. A minibus can accommodate 8 to 25 people but many of the vehicles are wagon type. The interior of the vehicle is narrow and not comfortable, affecting the service. Security onboard the minibus is also a concern because of the pickpockets. Maintenance of the vehicles is poor. Even if repair is needed, only partial repair is made in some cases.

Table 5-3 Comparison of Lagos and Metropolitan Areas in Asia

Item	Lagos	Jakarta	Tokyo metropolitan area	Osaka metropolitan area
Population (10,000 people)	2,100	2,800	3,500	1,820
Area (km ²)	3,568	6,400	13,572	11,701
Population density (person/km ²)	5,885	4,367	2,629	1,604
No. of trips (10,000 trips/day)	2,200	3,050	8,430	3,790
Length of urban railway (km)	42	235	2,308	1,456

Source: Compiled by Study Team based on the Tokyo metropolitan area and Osaka metropolitan area person-trip data, and information materials from JICA and LAMATA



Source: Photographed by Study Team
Figure 5-6 Minibus



Source: Photographed by Study Team
Figure 5-7 BRT

The first BRT line was opened in 2007. By reducing the waiting time and travel time of the users and lowering the fare, BRT has improved urban public transport to some extent. However, according to our interviews with employees of Japanese companies working in Nigeria, the BRT users still have issues with the commuting time and fare. Further improvement to urban transport in the future is desired.

There are also other problems. Three-wheeled taxis and motorbike taxis are used as feeder transport. Their stopping on the roads and aggressive driving are causing road congestion and accidents.

5.2.2 Issues of Urban Transport

(1) Road Congestion

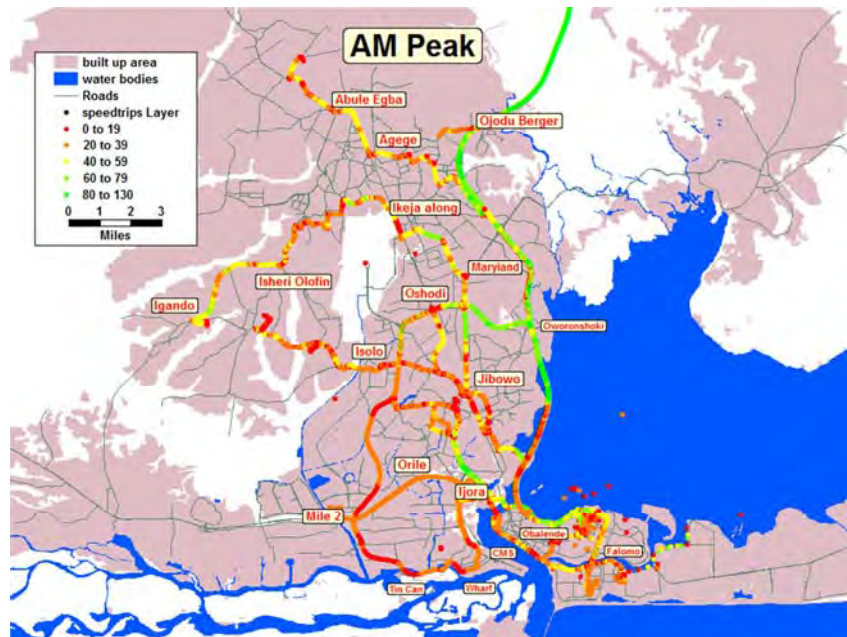
In Lagos, car ownership has increased 234% between 2001 and 2009. As shown in the previous section, congestion occurs in various parts of Lagos (Figure 5-8) because of insufficient road network

in the Lagos metropolitan area. In the northern part, in particular, the roads connecting to the main roads are also congested. The existing roads do not have enough capacity. Since all the major roads in the metropolitan area are congested during rush hours, considerable time is needed for commuting to and from work. The average speed during the morning rush hour is as low as 18 km/h. The congestion is especially severe at the Third Mainland Bridge, which connects the mainland and Lagos Island, and in the area from the Lagos Island bridge portion of the mainland (Ijira) to Isolo, Jibowo area in the north and to the Mile 2 direction in the west. The speed is less than 40 km/h in the western part (CMS) and the northern part (Ikoyi) of Lagos Island (Figure 5-9).

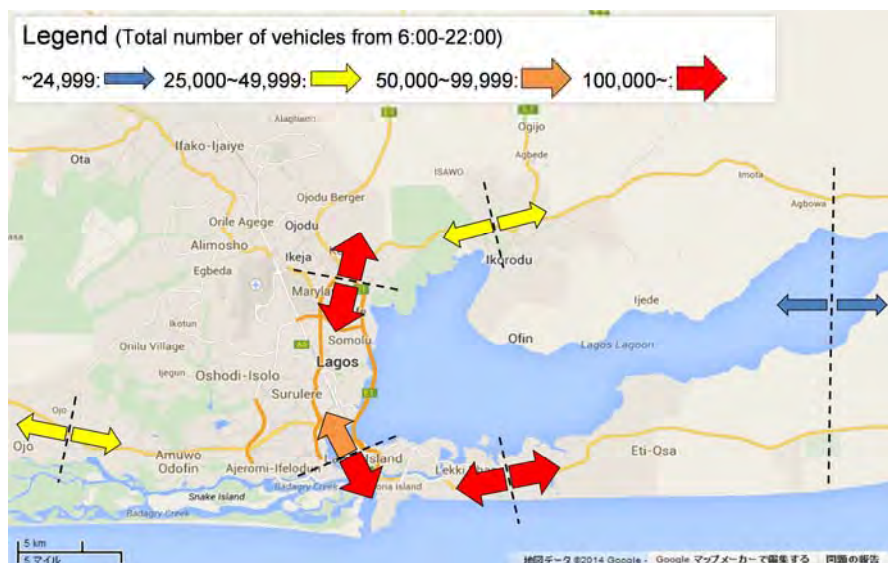
Figure 5-10 shows the traffic volume by the major screen line of the Lagos metropolitan area. The figure shows that traffic gravitates toward Lagos Island and Victoria Island in the morning rush hours and the traffic volume is high from Lagos Island toward the Lekki direction and the Ikeja direction in the north in the evening rush hours. The traffic volume exceeds 100,000 cars per day. Lagos Island and Victoria Island have little through traffic. They are the origins and destinations of most traffic.



Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)
Figure 5-8 Congestion in Lagos Metropolitan Area



Source: “The Proposed Strategic Transport Master Plan for Lagos Metropolitan Area” (Final Report)
 Figure 5-9 Travel Speeds in Lagos Metropolitan Area (morning rush hours)



Source: Compiled by Study Team based on LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Figure 5-10 Transport Volume of Lagos Metropolitan Area by Screen Line (6 a.m.– 10 p.m.)

Table 5-4 shows the case (Do-Minimum) of minimum development of transport infrastructure based on the future traffic volume estimated in the revised Master Plan. In the future, the number of trips made by private cars and trucks will increase. With 2017 as the base year, the vehicle kilometers of private cars and trucks will increase 45% in 2022 and 235% in 2032, compared to 2017. Therefore, development of appropriate transport infrastructure is desired.

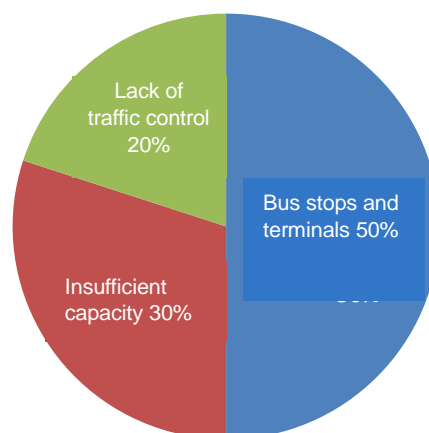
Table 5-4 Estimate of Future Transport Volume according to the Revised Master Plan (Do-minimum vehicle kilometers)

Mode		2017	2022	2032
Private vehicle	Vehicle km (vehicle km/day)	46,705,855	67,835,208	109,750,476
	Percentage (2017 as the base line100)	100%	145%	235%
Truck	Vehicle km (vehicle km/day)	5,189,539	7,537,245	12,194,497
	Percentage (2017 as the base line100)	100%	145%	235%
Bus	Vehicle km (vehicle km/day)	351,158	351,158	351,158
	Percentage (2017 as the base line100)	100%	100%	100%
BRT Light	Vehicle km (vehicle km/day)	86,697	86,697	94,876
	Percentage (2017 as the base line100)	100%	100%	109%
BRT	Vehicle km (vehicle km/day)	373	373	94,876
	Percentage (2017 as the base line100)	100%	100%	25436%
Minibus	Vehicle km (vehicle km/day)	2,656,828	2,656,828	2,656,828
	Percentage (2017 as the base line100)	100%	100%	100%

Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

(2) Challenges for Traffic Control

Traffic congestion occurs in the whole Lagos metropolitan area. Bus stops and terminals (Figure 5-11), boarding and alighting on the roads, and disorganized bus terminals (bays) are the most common causes of congestion. Some main roads have roundabouts at the intersections. When traffic volume increases, a roundabout may not have sufficient capacity to process the traffic, as compared to an intersection with signal control. The lack of traffic control exacerbates traffic congestion. Broken-down vehicles on the highways are also causing traffic congestion.



Source: Compiled by Study Team based on Dr. Frederic Oladeinde “Transportation Planning in Developing Countries— A Presentation Made to University of Lagos Students”

Figure 5-11 Causes of Congestion in Lagos Metropolitan Area



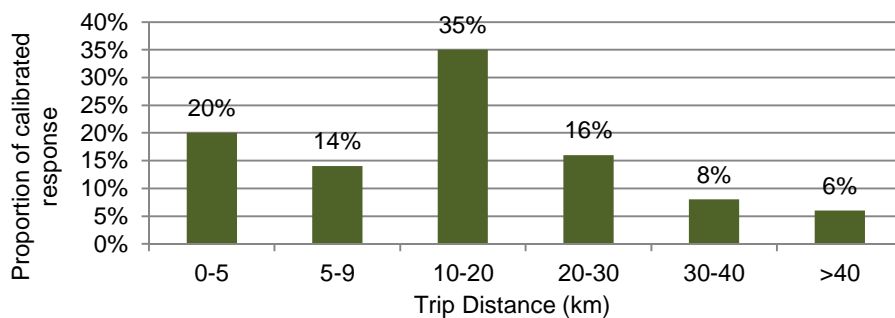
Source: Photographed by Study Team
 Figure 5-12 Minibus Stop and Boarding and Alighting on the Road



Source: Photographed by Study Team
 Figure 5-13 Roundabout on the main road

(3) Issues pertaining to Residents' Commute and Other Daily Activities

Most of the trip distances for commuting in Lagos are in the 10–20 km range, accounting for 35% of the total (Figure 5-14). This is approximately the distance from the suburbs to the city center. Without congestion, the travel time is about one hour. However, because of the congestion, commuting to and from work can take up to 2-3 hours. The daily activities of many citizens are restricted by the congestion. They often have to leave home early (at 5 or 6 a.m.) in the morning to go to work and then leave work early (around 4 p.m.) to go home.



Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)
 Figure 5-14 Distribution of Trip Distances in Lagos Metropolitan Area

(4) Increase in Environmental Burden

With the increased use of automobile in recent years, CO₂ emissions are on the rise (Figure 5-15). Nigeria as a whole had an emission amount of 80 million tons in 2000 and 100 million tons in 2008, showing an increase of 25%.



Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)
 Figure 5-15 CO₂ Emissions in Nigeria (unit: kiloton)

5.2.3 Challenges in Urban Planning

The Lagos metropolitan area experienced rapid urbanization. Since no urban development has been carried out systematically to date, few areas, even in the central business districts (CBD) of Lagos Island and Victoria Island, have fully utilized the land. The alleys are still lined with stalls. The city center shall be revitalized through re-development in the future. In addition, since land use on the west side of the Lagos Lagoon and along the Lagos-Badagry Express Way on the west side of the mainland is inefficient, appropriate development shall be made to utilize the land and to build cities. New development is being carried out in the Lekki district along the Lekki-Epe Express Road. There is plenty of land. However, there is concern that haphazard development over wide area at low density may worsen the sprawling of the Lagos metropolitan area.



Source: Photographed by Study Team
 Figure 5-16 Central Commercial Area on Lagos Island



Source: Photographed by Study Team
 Figure 5-17 Newly Developed Area in Lekki

5.3 Review of Measures for Mitigating Congestion in Lagos City

5.3.1 Overview of Measures for Mitigating Congestion

As shown in Table 5-1, the revised Master Plan proposed seven measures. The congestion mitigation measures include the development of roads and railways (LRT, monorail, and cable car). Plans have also been made for the related transportation nodes and non-motorized transport.

For the project period (2017–2032), goals and related measures have been set up in three phases: short term, medium term, and long term. The short-term (2017) goal is to launch Lagos’ first LRT line (Blue Line), the medium-term (2022) goal is to expand the LRT network, and the long-term (2032) goal is to complete the LRT network (six lines). Table 5-5 shows the goal for each phase, the status of urban development, and related measures.

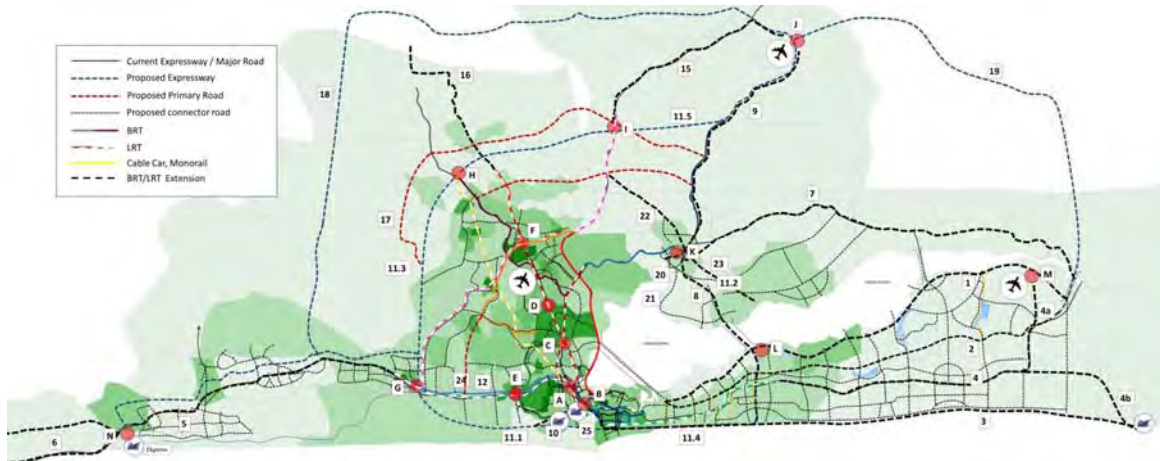
Table 5-5 Goal by Phase, Urban Development, and Related Measures of the Revised Master Plan

Item	Overview		
	Short term (2017)	Medium term (2022)	Long term (2032)
Main goal	Smooth introduction of a new LRT line	Expansion of the LRT network	Completion of the LRT network
Urban development	<ul style="list-style-type: none"> • Continue to expand and improve city functions in areas with urgent needs • Develop areas along the LRT lines that have been completed or that will be completed soon 	<ul style="list-style-type: none"> • Restore and revitalize city centers • Carry out new developments in city centers and form transportation nodes • Develop new ports to the Lekki and Badagry areas and free trading zones (FTZ) 	<ul style="list-style-type: none"> • Strengthen the city center areas developed in 2022 • Develop LRT lines to link the Badagry, Lekki, and OfunDPA new city centers • Develop terminals • Open the new Shagamu airport
Related measures	<ol style="list-style-type: none"> 1) Provide accessibility to pedestrians <ul style="list-style-type: none"> • From residential areas to the LRT stations and station vicinities 2) Traffic management <ul style="list-style-type: none"> • Traffic calming, improve intersections, and install signals 3) Parking management <ul style="list-style-type: none"> • Reduce street parking • Set hourly parking rate 4) Conduct activities to raise awareness <ul style="list-style-type: none"> • Raise awareness for LRT use 	<ol style="list-style-type: none"> 1) Capacity building <ul style="list-style-type: none"> • Raise the awareness of businesses, government agencies, and users for public transportation 2) Marketing by providing travel information <ul style="list-style-type: none"> • Use websites and cell phones, etc. 3) Use ITS <ul style="list-style-type: none"> • Set up information center • Provide onboard information and real time information 4) Unify fares <ul style="list-style-type: none"> • Unify the fares of various LRT lines 	<ol style="list-style-type: none"> 1) Integrate the LRT network <ul style="list-style-type: none"> • Develop terminal stations (transfer between LRT and other transportation modes) • Develop P&R and K&R facilities • Develop commercial facilities 2) Pursue public transport-oriented development (TOD) <ul style="list-style-type: none"> • Develop the areas along the LRT lines • Pursue multi-purpose land use along the line (commercial, business, and residential)
Budget	4,188 million USD	6,775 million USD	8, 236 million USD

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region Presentation to EXCO”

In addition, the revised Master Plan also takes into consideration the development plans of the metropolitan area, as listed in Table 5-5. It includes the development plans for the new airport (Lekki, Shagamu), ports (Lekki, Apapa, Tin Cam Island, and Badagry), and new city centers.

Figure 5-18 shows the projects under the long-term plan and their locations.



Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Figure 5-18 Projects in the Revised Master Plan (Long-term Plan: 2032)

5.3.2 Plans for Various Transportation Modes

(1) Road Plan

Planning of urban facilities is closely related to the urban development plans. Furthermore, it is also related to the road network plan. Thus, the road network plan of the Lagos metropolitan area has two objectives: roads for commuter traffic that radiate outward from the Lagos city center and roads for crossing the city to facilitate long-distance traffic and transit between areas on either sides of Lagos State. Specifically, there is a road plan for the Lekki area on the south side of the lagoon where development is to be carried out in the near future (including the surrounding areas of Lekki phase 1, the 4th Mainland Bridge and other bridges that connect to the mainland, an east-west highway, and a north-south road), improvement of highways in the Badargy area, and so on. It has been pointed out that in addition to road development, it is also necessary to review concurrently how to increase road capacity, enhance accessibility to various areas, structure a road network in phases (sharing of road functions), control traffic, and put in place a parking policy.

Looking at the road plan in phases, we can see that the road network will be expanded gradually. In the short term (2017), roads will be built to connect the west side and Lekki with the central part of Lagos Lagoon and the mainland. In the medium term (2022), roads in the Lekki area and roads to connect to the radial roads in the west will be constructed. In the long term (2032), roads will be constructed to connect the 4th Main Bridge and the outer periphery of the Lagos metropolitan area.

(2) Public Transportation Plan

The 2009 Master Plan will develop seven LRT lines and two monorail lines (Victoria Monorail and the Butterfly Monorail in the Ikeja area). In the revised Master Plan, a review was conducted, resulting in the elimination of duplicated lines, change of route alignment, and proposal of new lines for the airport on the east side of Lekki and the free trading zone, which were taken into consideration in the original Master Plan, as well as the construction of 14 BRT lines, six LRT lines, one monorail line, and one cable car line (rope way) (Table 5-6, Table 5-7, Figure 5-19).

Fourteen transportation nodes will be set up in the metropolitan area. The National Theatre Station connecting the Blue Line and the Yellow Line will be positioned as the central station. In addition, other city terminals (Yaba, Oshdoi, Mile2, and Marina), new terminals outside of the existing urban areas (Agegem Ojo, Ikorodu, and Langbasa), and inter-city terminals (Otta, Ibafo, Shagamu, Lekki Airport, and Badagry) are planned.

Table 5-6 Public Transportation Plan (BRT) in the Revised Master Plan

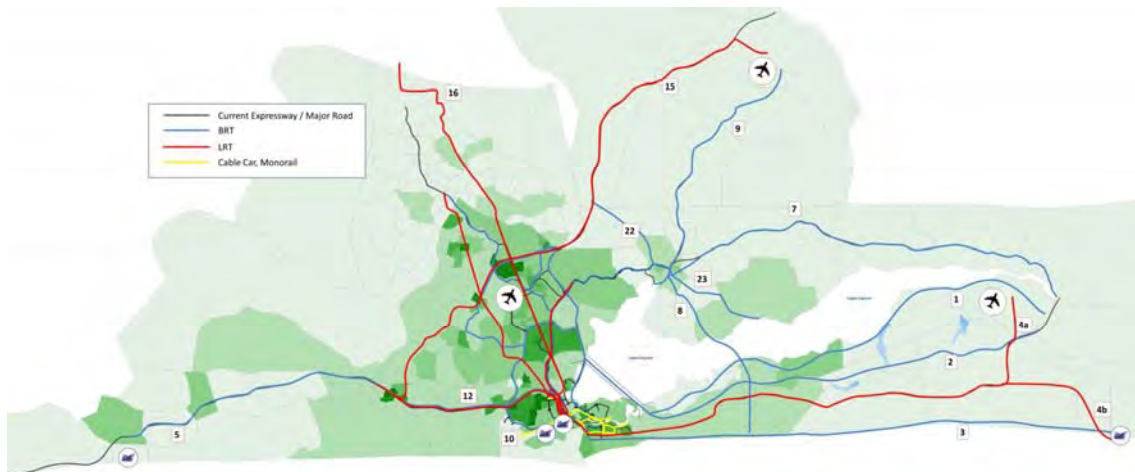
Item	Section	Remarks
BRT	1. Berger ~ TBS	
	2. Oworonshoki ~ Apapa	
	3. Berger ~ Iyana Isolo (via Ikotun)	
	4. Berger ~ Local airport	
	5. Maryland ~ Otta	
	6. TBS ~ Ikorodu	The TBS–Mile12 section will be switched to the Brown Line in the future
	7. TBS ~ Okokomaiko ~ Ijaniki	BRT in parallel with the Blue Line
	8. Along the new Lekki coastal road	
	9. Along the new corridor: Lekki’s New Lagoon Road	
	10. Along the new corridor: Lekki’s Green Corridor	
	11. Okun ~ Aja ~ Ikorodu Roundabout (4th Mainland Bridge)	
	12. Majidun/Ipakodo ~ Shagamu (via Ikorodu)	
	13. Ijede ~ Isawo (via Ikorodu)	
	14. Ikorodu Roundabout ~ Epe (via Agbowo)	

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Table 5-7 Public Transportation Plan in the Revised Master Plan (LRT, Monorail and Cable Car)

Item	Name of line	Section
LRT	1. Blue Line	TBS ~ Okokomaiko
	2. Red Line	Marina-Agbado~ Iddo
	3. Green Line	Marina ~ Ajah ~ Lekki Airport ~Free Trade Zone
	4. Purple Line	Ojo ~Redeemed ~ Segamu
	5. Brown Line	Marina ~Mile 12
	6. Yellow Line	Otta/MMA ~ Iddo
Monorail	7. Victoria Island Monorail	(on Lagos Island and Victoria Island)
Cable car	8. Lagos State Cable Car	(on Lagos Island, Victoria Island ~ mainland)

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)



Source: LAMATA, “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Figure 5-19 Public Transportation Plan in the Revised Master Plan (Long-term Plan: 2032)

(3) Timing for the Development of Public Transport

The construction of various routes is divided into phases (short term, medium term, and long term). In the short term, two BRT lines, two LRT lines (one line will be constructed in phase 1), and one cable car line will be constructed. In the medium term, three BRT lines, two LRT lines (one line will be constructed in phase 1), and one monorail line will be constructed. In the long term, nine BRT lines and four LRT lines (two lines will be developed in phase 2) will be constructed. Of the LRT lines, the Red Line and Green Line will be constructed gradually in two different phases.

Table 5-8 Timing for Developing the BRT in the Revised Master Plan

Phase	Name of section
Short-term (2017)	6. TBS ~ Ikorodu (The TBS ~ Mile12 section will switch to LRT Brown line in 2032)
	7. TBS ~ Okokomaiko-Ijaniki (runs in parallel with the LRT Blue Line)
Medium-term (2022)	2. Oworonshoki ~ Apapa
	3. Berger ~ Iyana Isolo (via Ikotun)
	5. Maryland ~ Otta
Long-term (2032)	1. Berger ~ TBS
	4. Berger ~ Local Airport
	8. Along the new Lekki coastal road
	9. Along the new corridor: Lekki’s new Lagoon Road
	10. Along the new corridor: Lekki’s Green Corridor
	11. Okun ~ Aja ~ Ikorodu Roundabout (4th Mainland Bridge)
	12. Majidun/Ipakodo ~ Shagamu through Ikorodu
	13. Ijede ~ Isawo through Ikorodu
14. Ikorodu Roundabout ~ Epe through Agbowo	

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

Table 5-9 Timing for Developing LRT, Monorail, and Cable Car in the Revised Master Plan

Phase	Name of line	Section (Remarks)
Short-term (2017)	1. Blue Line	TBS ~ Okokomaiko (Whole section)
	2. Red Line	Marina ~ Agbado (Phase 1 development)
	8. Lagos State Cable Car	(Development of whole section)
Medium-term (2022)	3-1. Green Line	Marina ~ Ajah (Phase 1 development)
	4. Purple Line	Ojo ~ Redeemed ~ Segamu (Development of whole section)
	7. Victoria Island Monorail	(Development of whole section)
Long-term (2032)	2-2. Red Line	Agbado ~ Ifo (Phase 2 development)
	3-2. Green Line	Ajah ~ Lekki Airport ~ Free Trade Zone (Phase 2 development)
	5. Brown Line	Marina ~ Mile 12 (Switch from BRT)
	6. Yellow Line	Otta/MMA ~ Iddo

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

5.3.3 Observations and Challenges of Congestion Mitigation Measures

(1) Insufficient Road Development

The development of new roads is concentrated in the Lekki area (Figure 5-18). It will be a problem because few radial roads are planned toward the established urban areas in the north. One of the reasons may be that the highways have already been developed to some extent. However, since traffic congestion is already occurring frequently at this time, construction of new roads or road expansion in that direction is needed.

Because of urbanization, the area is built up. Road development is most likely difficult due to the difficulty to secure land. In this case, the current demand for private vehicles can be shifted to public transportation means to reduce the road traffic volume. It is desirable to implement a policy package that combines several measures to promote the use of public transport and to reduce the use of automobile. For example, limiting the number of parking spaces in the CBD can curb the flow of vehicles going into the city center. At the same time, park and ride facilities shall be constructed near suburban railway stations and railways shall be built.

(2) Specific Measures for Mitigating Traffic Congestion

Short-term measures include traffic calming, intersection improvement, installation of signals, and parking management. However, there are concerns because the revised Master Plan has not provided any specific contents about the measures or locations, and the measures in the revised Master Plan are not well structured. We summarized these measures, especially the latter, in the following:

1) Review Measures for Area Traffic

In general, traffic calming is a measure to improve the residential environment of an area and to improve the safety of pedestrians by restricting the speed of traffic passing through the area. It is important as a traffic safety measure. Currently, the road capacity is insufficient. Although the effect of limiting the speed of passing traffic can be expected, the original effect of the measure, which is to improve the environment of the area, cannot be expected. Furthermore, due to the limited number of alternative routes, congestion of the main roads may worsen (Figure 5-20).

2) Improve Intersections and Install Signals

As is also shown in “5.2 Current State of Urban Transport and Issues,” since roundabouts are used at the main roads, cars are intersecting each other when the traffic volume is high, resulting in a

reduction of traffic capacity and increased risk of traffic accidents. Thus, it is desirable to install signals or crossovers when upgrading the intersections in the future. In addition, the close proximity of intersections and roundabouts to the parking of commercial facilities and bus terminals is a main cause of congestion. Efforts shall be made to find a better way to set up these intersections and roundabouts.

Since the long link of a main road to the suburbs may be forced to detour into an area of the opposite lane or into the parking of a building, an intersection shall be added.

3) Implement Parking Measure and Minibus Boarding-and-Alighting Measure

Roadside parking zone and installation of bus bay are measures for parking and for preventing traffic congestion at minibus stops. However, these measures shall be considered in conjunction with securing passageways for the pedestrians. Because of the large number of buses, the roadside cannot accommodate all of them. Setting up a bus pool at an area away from the main road is necessary (Figure 5-21).



Source: Photographed by Study Team

Figure 5-20 Road Condition in the District



Source: Photographed by Study Team

Figure 5-21 Minibus Stop along the Main Road

(3) Public Transport

1) Revise Duplicated Road Development Plans

The public transportation plan shows the development of BRT, LRT, and others in various phases, from short term to long term. The short-term plan focuses on the LRT Blue Line in the west, the LRT Red Line in the north, and the development of BRT in the Ikorodu direction in the northeast, in addition to the cable car in the central part. The medium-term plan focuses on forming a network that radiates out in various directions, including the monorail on Victoria Island, the LRT Green Line in the east, and the LRT Purple Line from the west to the north, as well as strengthening their connection. The long-term plan focuses on completing and extending the radial network.

Among the BRTs for the TBS–Ikorodu section in the short-term plan, the TBS–Mile12 section, which is parallel to the LRT Brown Line, will be transferred to LRT in the long-term plan. On the other hand, the BRT line for the TBS–Okokomaiko– Ijaniki section in the short-term plan is parallel to the LRT Blue Line, which is to be developed in the same short-term plan. Normally, such plans would not be made because the lines would be competing with each other for users. However, dedicated lanes for both the LRT and BRT have already been constructed on the Lagos–Badagry Expressway (Figure 5-22).

According to our local interviews, although duplication of the LRT and BRT was not brought to light in the planning stage, the duplication has been viewed as problematic recently. Development of the BRT west of Okokomaiko shall be halted and land utilization method in the east TBS direction shall be reviewed.

2) Revise Systems to be Introduced to Victoria Island and Lagos Island

Cable car (ropeway system) is planned for Victoria Island and Lagos Island in the short term and monorail in the medium term. The cable car structure itself is inexpensive. For reference, the Hakone Ropeway has capacity to transport 1440 passengers per hour. The transport capacity is extremely low as an urban transportation mode. In view of the need for securing an evacuation route in an emergency, we do not think that cable car is suitable as an urban transportation means. Monorail also has the challenge of securing an evacuation route in an emergency.

3) Revise Station Locations and Alignment

In terms of the monorail route plan for Victoria Island, the route is set alongside the main road at the coast in the southern part of Lagos Island. The route was probably selected because of the ease to secure the space for entry. Although Marina, which is along the coast of Lagos Island and is the transfer station to LRT, is a good location for setting up the terminal, one side of the route is the ocean. Thus, the areas that can be served by the line are reduced to half (Figure 5-23). In addition, since Marina is far from the central business district, TBS and other customer facilities, and the minibus terminal in front of TBS, the line alignment is undesirable from the viewpoint of demand. The curves at intersections on the island are also expected to become problematic because they interfere with private land.



Source: Photographed by Study Team

Figure 5-22 Parallel Sections of LRT and BRT



Source: Photographed by Study Team

Figure 5-23 Example of a Monorail Section

5.4 Collection of Information and Analysis of Demand for Urban Railway

5.4.1 Collection and Analysis of Data as a Prerequisite for Demand Forecast

(1) Method for the Collection and Analysis of Data

The 4-step estimation method is used for our study of the revised Master Plan. It is used generally for studies of urban transport master plans conducted in Japan or in studies supported by Japan, in the form of urban transport modeling for traffic demand forecast. The OD data are estimated using five criteria: major spot traffic volume, average number of passengers, road survey, household survey (person trip survey), and constant traffic volume data. Sufficient basic data are believed to have been collected for the OD estimation in the formulation of the Master Plan.

Since the Trans-CAD mentioned earlier can perform inverse estimation of OD for the estimation of future transport volume, a smaller number of samples can be used for household study than the conventional master plan study. The target number of households is approximately 17,000 and the number of effective samples is approximately 37,200. (In the 5th Tokyo metropolitan area person trip survey conducted in 2008, the effective sample number of households is 322,600. It is obvious that the sample size versus the size of the population is extremely small in comparison.)

Large-scale person trip surveys are carried out in Japan on the assumption that the number of samples is statistically significant. However, time and cost constraints may make it difficult to conduct a large-scale survey, as in the case of the Hiroshima metropolitan area. For these reasons, large-scale surveys are not necessarily desirable even in Japan. In addition, small sample size has been used for urban traffic surveys in Germany and other countries in recent years. From such viewpoint, it is acceptable to use such efficient survey method to conduct master plan studies.

In our interview with AEC, the company responsible for the revised Master Plan, we learned that a Stated Preference Survey has been conducted in conjunction with a household survey to find out people’s preference for using the new transportation modes, such as the LRT and monorail. We can conclude that appropriate methods have been used in the analysis of the basic data for building the transportation mode selection model and that the collection of data for the Master Plan is deemed appropriate.

(2) Prerequisites for Demand Forecast Analysis

The analysis of future OD forecast is conducted based on the future frame setting described earlier, including future population (Chapter 4 Section 6, Table 4-16) and future development plans (“5.3 Review of Measures for Mitigating Congestion in Lagos City”).

A relatively high population growth rate (3–4%) has been used from the northern region (such as Ikeja, which has a population growth rate of less than 2%), an area that has become urbanized from long time ago; to the western region where the Blue Line is being constructed; the eastern region (Lekki) where construction of the Green Line has been planned; and the areas outside of the city from the west to the northeast that are connected by the Purple Line. We consider the setting of this growth rate appropriate since it clearly shows that urbanization will spread to areas that have not even been developed at this time.

Table 5-10 shows the population along the various lines (within 500 m of each line). From the central business area to the Red Line and Brown Line in the north, and the Blue Line, which is currently under construction, in the west, the population along these lines is high, at approximately 2.3 to 4 million people because these lines pass through built-up areas. Although potential demand can be expected, there is also a high risk of not being able to acquire land due to the existing roads and railway sites. Population growth along the Green Line and Purple Line indicated above will increase the potential demand, which shall be taken into consideration in future plans. Urban facilities, including development of the new airport, ports, and city centers described in “5.3 Review of Measures for Mitigating Congestion in Lagos City,” will be developed in a radial pattern, ranging from Ikeja and Ota in the north, Shagamu in the northeast, Lekki in the east, and Ojo and Badagry in the west.

Table 5-10 Population along Various Lines (within 500 m of the line)
Unit: 10,000 persons

Line	Population (2014)
1. Blue Line	231
2. Red Line	409
3. Green Line	99.2
4. Purple Line	176
5. Brown Line	283
6. Yellow Line	191
7. Victoria Island Monorail	149
8. Lagos State Cable Car	NA

Source: Compiled by Study Team based on interviews with LAMATA

5.4.2 Transportation Demand of Target Lines

Table 5-11 shows the demand forecast results of urban transport (long term: 2032). The Purple Line has the highest demand with 1.66 million users/day, followed by the Red Line (the whole line) with 1.45 million users/day, the Blue Line with 1.35 million users/day, and the Green Line with 1.3 million users/day. The population growth and increase in facilities due to development along the Purple Line and the Green Line are expected to increase the number of users. Although demand of a little fewer than 600,000 users per day is expected for the Victoria Island Monorail, this route can also be used for feeder transport on Victoria Island from the suburban areas. If not for the feeder transport, the demand of the monorail line may fall substantially below forecast.

Table 5-11 Demand Forecast of LRT, Monorail, and Cable Car in the Revised Master Plan

Line		No. of users per day (both directions) Unit: 10,000 persons/day	
1. Blue Line		135	
2. Red Line	Main Line	124	145
	Airport Branch	20.7	
3. Green Line	Lekki Airport	89.4	130
	Lekki FTZ	41.0	
4. Purple Line		166	
5. Brown Line		57.5	
6. Yellow Line		115	
7. Victoria Island Monorail		57.9	
8. Lagos State Cable Car		19.0	

Source: Compiled by Study Team based on the LAMATA “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)

5.4.3 Selection of Lines for Assistance from the Viewpoint of Transport Planning

Table 5-12 and Table 5-13 show the conditions of various lines described up to the previous section.

From the viewpoints of land acquisition risk and transit-oriented development (TOD), which is one of the characteristics of Japanese railway in which the areas along the railway line are developed together with the railway, the current state shows that the areas along these LRT lines are not yet developed. The Green Line, where the development of urban facilities is underway and population growth is expected to be high in the future, has the potential to be eligible for Japanese assistance.

Both the cable car and the monorail will pass through built-up areas. In our review of their validity as an urban transportation mode, the line for which monorail is planned has the greatest potential to be eligible for Japanese assistance.

5.4.4 Observation about Demand Forecast

From the methods of collecting data and the methods of setting the prerequisites, the demand forecast of the revised Master Plan can be interpreted as demonstrating a reasonable trend in general. However, the demand numbers shall be confirmed before the start of the project through implementation of a feasibility study to verify the basis for setting the population growth rate, which is the prerequisite of demand forecast, setting of the LRT service level, and bias in the SP survey. (Although many people indicate desire to switch to the new public transportation modes in the survey, the number of people who actually switch tends to be lower than the SP survey results.)

Table 5-12 Demand Forecast Results (LRT) of the Revised Master Plan

Line	Current state		Future		
	Population along the line	State of development	Population growth rate	Urban facilities development plan	Demand
1. Blue Line	A	C	A	B	A
2. Red Line	A	C	B	B	A
3. Green Line	B	A	A	A	A
4. Purple Line	A	B	A	B	A
5. Brown Line	A	C	B	C	B
6. Yellow Line	B	C	B	C	A

Legend

- Current population along the line: Population along the line: over 2 million “A”, Population along the line: under 2 million “B”
- Current development situation: Areas along the line are mostly undeveloped “A”, Some areas along the line are developed “B”, Areas along the entire line are developed “C”
- Future population growth rate: Population growth of more than 3% “A”, Population growth of less than 3% “B”
- Plan for the development of urban facilities: Development of more than 2 facilities “A”, Development of 1 facility “B”, No facility development “C”
- Demand: Demand of more than 1 million users/day “A”, Demand of fewer than 1 million users/day “B”, Demand of fewer than 500,000 users/day “C”

Source: Compiled by Study Team

Table 5-13 Demand Forecast Results (Cable Car and Monorail) of the Revised Master Plan

Line	Current state		Future		
	Population along the line	State of development	Population growth	Urban facilities development plan	Demand
7. Victoria Island Monorail	B	C	B	C	B
8. Lagos State Cable Car	-	C	B	C	C

Legend

- Current population along the line: Population along the line: over 2 million “A”, Population along the line: under 2 million “B”
- Current development situation: Areas along the line are mostly undeveloped “A”, Some areas along the line are developed “B”, Areas along the entire line are developed “C”
- Future population growth rate: Population growth of more than 3% “A”, Population growth of less than 3% “B”
- Plan for the development of urban facilities: Development of more than 2 facilities “A”, Development of 1 facility “B”, No facility development “C”
- Demand: Demand of more than 1 million users/day “A”, Demand of fewer than 1 million users/day “B”, Demand of fewer than 500,000 users/day “C”

Source: Compiled by Study Team

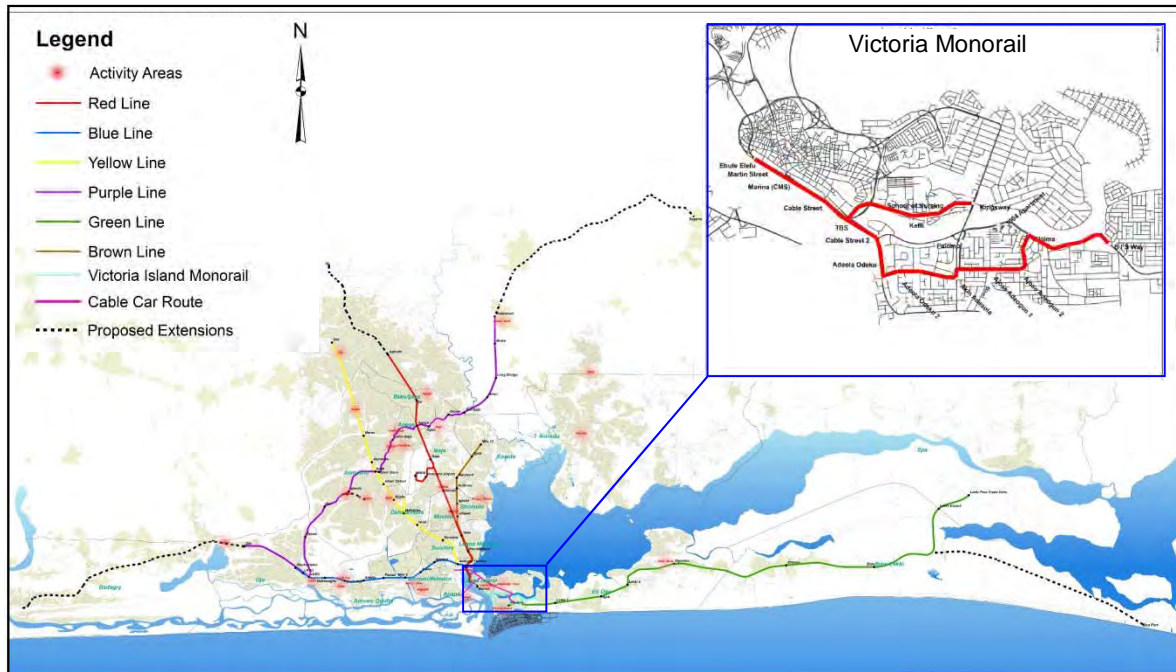
Chapter 6
Review and Selection of Route Options
for Assistance

Chapter 6 Review and Selection of Route Options for Assistance

6.1 Verify the Priorities of the Lagos State Government for the Planned Lines for Development and the Progress of the Projects

6.1.1 Urban Railway Development Plan of Lagos

In the revised Master Plan, six LRT lines (Blue Line, Red Line, Green Line, Purple Line, Yellow Line, and Brown Line) and one monorail line (Victoria Monorail) are planned for Lagos (Figure 6-1). The revised Master Plan designates 2017 (short term), 2022 (medium term), and 2032 (long term) as the target years for the development plan. Table 6-1 shows the target years for the development of the various lines.



Source: LAMATA materials

Figure 6-1 Planned Lines in Lagos State

Table 6-1 Target Years for the Development of Various Lines in the Revised Master Plan

Line		Section	Length (km)	Target year for development
LRT	Blue Line	TBS~Okokomaiko	29	2017
	Red Line	Marina~Agbado	29	2017
		Agbado~Ifo (extension)	23	2032
	Green Line	Marina~Ajah	22	2022
		Ajah~Lekki Airport • FTZ (extension)	62	2032
	Purple Line	Ojo~Redeem	48	2022
		Redeem~Sagamu (extension)	32	2022
Yellow Line	Otta~Iddo	34	2032	
	Brown Line	Mile 12~Marina	19	2032
Monorail	Victoria Monorail	Lagos Island~Victoria Island	24	2022

Source: Compiled by Study Team based on the “Consultancy Services for the Extension of the Strategic Transport Master Plan and Travel Demand Model to Cover the Mega City Region” (Draft Final Report)



6.1.2 Verify the Progress of the Planned Lines for Development

We verified progress of the planned lines for development based on interviews with relevant organizations and field surveys. In addition to the Blue Line, which is currently under construction, we also conducted field surveys of the other planned lines that are of high priorities for development, including the Red Line, Green Line, and Victoria Monorail.

Among the planned lines to be developed, the Blue Line has made the most progress. It is being constructed by the Chinese construction company CCECC, in preparation for the first phase opening in 2016. The feasibility study of the Red Line is expected to be updated. The pre-feasibility study of the Purple Line is completed. The feasibility study will start from September 2014. On the other hand, feasibility studies for the Green Line, Yellow Line, Brown Line, and the Victoria Monorail have not been implemented yet.

(1) Blue Line


Item	Contents
Line overview	<ul style="list-style-type: none"> • It is a 27-km line linking Marina and Okokomaiko. It is currently being constructed by CCECC, a Chinese construction company. • The plan for west of Okokomaiko in the future is to extend the line up to Badagry near the Benin border. • Since no existing roads run parallel to the planned line in the Marina–Iganmu section and it is a marshland, elevated structure will be used. The Iganmu–Okokomaiko section will use ground structures. • The car depot will be near Okokomaiko. Thirty-three hectares were allocated originally; however, the site was reduced to 27 hectares due to social consideration. <div data-bbox="525 1093 1267 1424" style="text-align: center;"> </div> <p data-bbox="525 1429 826 1456" style="text-align: center;">Source: LAMATA materials</p> <p data-bbox="635 1460 1158 1491" style="text-align: center;">Figure 6-2 Route Map of the Blue Line</p>
Condition along the line	<ul style="list-style-type: none"> • The areas along the planned line are dense residential areas. The Iganmu–Okokomaiko section will utilize the road space (Lagos Badagry Express).
Project scheme	<ul style="list-style-type: none"> • A vertical separation scheme is used for the project. The Lagos State government is responsible for the infrastructure and tracks (issuance of state bond). In the case that the Lagos State government cannot make all the payments, the Export-Import Bank of China guarantees payments to CCECC. The private sector (Eko Rail) provides funds for the E&M (rolling stock, signals, electric power, and O&M). • Eko Rail (and investors of Eko Rail, including banks, and railway engineering companies, etc.) plans to pay the Lagos State government a certain portion (percentage) of the fare revenue. If the fare revenue of the Blue Line is lower than the cost of O&M, the Lagos State government will not give subsidies. • The concessionaire Eko Rail is made up of seven companies, including investment companies, banks, and railway engineering companies.

	<ul style="list-style-type: none"> In addition to the design and construction of car depots, operation systems, station-building facilities and their interior, and the procurement of rolling stock and maintenance equipment and materials, Eko Rail is also responsible for the O&M for 25 years. 																
<p style="text-align: center;">Table 6-2 Construction Plan of the Blue Line</p> <table border="1" data-bbox="403 501 1342 759"> <thead> <tr> <th>Phase</th> <th>Section</th> <th>Length (km)</th> <th>State of progress</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>National Theater~Mile 2</td> <td>7</td> <td>90% complete</td> </tr> <tr> <td>2</td> <td>National Theater~Marina</td> <td>5</td> <td>Under construction (Started construction in December 2013)</td> </tr> <tr> <td>3</td> <td>Mile 2~Okokomaiko</td> <td>15</td> <td>Construction not started</td> </tr> </tbody> </table> <p>Source: Compiled by Study Team based on LAMATA materials</p> <ul style="list-style-type: none"> The Marina–Mile 2 section (12 km) is slated to open for operation in 2016 (Phase 1). Bidding for the rolling stock is scheduled for 2015. When Phase 1 starts operation, the roads in the section west of Mile 2 will be widened to put in storage tracks to store trains. <div style="display: flex; justify-content: space-around;"> <div data-bbox="416 965 836 1279">  <p>Source: Photographed by Study Team Figure 6-3 State of Construction (Elevated Track)</p> </div> <div data-bbox="880 965 1300 1279">  <p>Source: Photographed by Study Team Figure 6-4 State of Construction (Ground Level)</p> </div> </div>	Phase	Section	Length (km)	State of progress	1	National Theater~Mile 2	7	90% complete	2	National Theater~Marina	5	Under construction (Started construction in December 2013)	3	Mile 2~Okokomaiko	15	Construction not started	<ul style="list-style-type: none"> The line is being constructed by the Chinese construction company CCECC. Currently, Phase 1 and Phase 2 are under construction.
Phase	Section	Length (km)	State of progress														
1	National Theater~Mile 2	7	90% complete														
2	National Theater~Marina	5	Under construction (Started construction in December 2013)														
3	Mile 2~Okokomaiko	15	Construction not started														
<p>Others</p>	<ul style="list-style-type: none"> CCECC is awarded the Blue Line construction project through international bidding. 																


(2) Red Line

Item	Contents
Line overview	<ul style="list-style-type: none"> • It is a 52-km line linking Marina and Ifo (including the extension section). A branch line is inserted in the middle to connect to Lagos International Airport. <div data-bbox="655 389 1086 1032" data-label="Image"> <p>The map shows a route starting at Ifo in the north, heading south through various stations to Lagos International Airport, and then continuing south to Marina. A branch line connects the main route to Lagos International Airport. The map includes geographical features like rivers and other infrastructure.</p> </div> <p data-bbox="639 1039 1158 1099">Source: LAMATA materials Figure 6-5 Route Map of the Red Line</p>
Condition along the line	<ul style="list-style-type: none"> • The Red Line will use the NRC land (30 m in width). The existing NRC line will be moved to the west side (15 m in width) and the Red Line will be laid on the east side (15 m in width).
Project scheme	<ul style="list-style-type: none"> • A PPP scheme using the DBOT method (Design, Build, Operation, and Transfer) is planned. • The private sector provides 100% of the funds while the public sector provides land for the railway. • Marina Express Consortium is the concessionaire. • The concession period is 25 years from the start of service. • The concessionaire is responsible for relocating the existing NRC line. • Although the Red Line will share the railway land with NRC, the operation and maintenance will be carried out by the operators separately.
State of progress	<ul style="list-style-type: none"> • After conclusion of the MOU (Minutes of Understanding) between LAMATA and NRC, the feasibility study is expected to be updated.
Others	<ul style="list-style-type: none"> • Since the MOU approval process of the NRC takes time, the Blue Line is being developed first.


(3) Green Line

Item	Contents
Line overview	<ul style="list-style-type: none"> • It is an 84-km line linking Marina and Deep Sea Port/Free Trade Zone (including the extension section). The line will extend into the eastern region, which is expected to have new developments in the future. • Part of the line will be built to reach Eco Atlantic Island.  <p>Source: LAMATA materials</p> <p style="text-align: center;">Figure 6-6 Route Map of the Green Line</p>
Condition along the line	<ul style="list-style-type: none"> • The road space will be utilized (main roads, some local roads). • The north side of the line in the Lekki area is densely populated. • Commercial facilities, street stalls, parking, and a concrete block manufacturing facility line the road from Victoria Island to the Lekki 2 area (on both the ocean side and the mountainside). However, since all the reinforced concrete structures (buildings, etc.) have setbacks from the road, there is space along the roads to set up railway structures. • The number of structures along the road on the east side of Eluju declines substantially. The area is almost in a green field condition.
Project scheme	<ul style="list-style-type: none"> • A PPP scheme using the DBOMT method (Design, Build, Operation, Maintain, and Transfer) will be used. • City Metro is the concessionaire.
State of progress	<ul style="list-style-type: none"> • The feasibility study has not been implemented yet. Whether to start the city center side of the line from Victoria Island or from Marina on Lagos Island will depend on the results of the feasibility study.
Others	<ul style="list-style-type: none"> • In addition to passenger transport, freight transport from Deep Sea Port is planned.

(4) Purple Line

Item	Contents
Line overview	<ul style="list-style-type: none"> • It is an 80-km line linking Ojo and Sagamu (including the extension section). It straddles Lagos State and Ogun State.  <p>The map shows the Purple Line route starting at Ojo in Lagos State, heading east through Alimosho, Mushin, and Surulere, then crossing into Ogun State through Abeokuta, Sagamu, and ending at Sagamu. The route is marked with a purple line and includes an extension section shown as a dashed line.</p> <p>Source: LAMATA materials Figure 6-7 Route Map of the Purple Line</p>
Condition along the line	<ul style="list-style-type: none"> • Although the planned line is in densely populated areas, the land of the existing roads will be utilized (Isheri LASU Expressway, Egbeda Idimu Road, etc.).
Project scheme	<ul style="list-style-type: none"> • A PPP scheme using the DBOMT method (Design, Build, Operation, Maintain, and Transfer) will be used. • NET ZONE Engineering is the concessionaire. The MOU with the concessionaire is renewed every six months.
State of progress	<ul style="list-style-type: none"> • The pre-feasibility study has been completed. The feasibility study is slated to start from September 2014.


(5) Yellow Line

Item	Contents
Line overview	<ul style="list-style-type: none"> It is a 34-km line linking National Theater and Ota. The Yellow Line will connect to the Blue Line at National Theater.  <p>The map shows the Yellow Line route starting at Ota in the north and ending at National Theater in the south. The route passes through several areas including Ifako/Ijesa, Anago, Ibeja, Alimosho, Oshodi/Island, and Mushin. Other lines like the Blue Line and Purple Line are also visible on the map.</p> <p>Source: LAMATA materials Figure 6-8 Route Map of the Yellow Line</p>
Condition along the line	<ul style="list-style-type: none"> The areas along the planned line are densely populated.
Project scheme	<ul style="list-style-type: none"> A PPP scheme using the DBOMT (Design, Build, Operation, Maintain, and Transfer) method will be used. The concessionaire is International Transit Development.
State of progress	<ul style="list-style-type: none"> The alignment plan only has an outline. The feasibility study has not been implemented yet.

(6) Brown Line

Item	Contents
Line overview	<ul style="list-style-type: none"> • It is a 19-km line linking Marina and Mile 12. A certain section of the Brown Line will run parallel to the Red Line but it will have its own tracks. • Currently, a BRT route linking Mile 12 and Ikorodu is being constructed through co-financing by the World Bank and AFD. It is slated to start service in December 2014. <div data-bbox="668 472 1098 965" data-label="Image"> <p>The map shows the Lagos coastline with various districts labeled: Ikeja, Kosofe, Mushin, Surulere, Lagos Island, and Eti-Osa. The Brown Line is shown as a red line starting from Marina on Lagos Island and extending north to Mile 12. A blue dashed line labeled 'BRT' connects Mile 12 to Ikorodu in the north. Other lines in yellow, green, and purple represent other transit routes.</p> </div> <p data-bbox="668 974 970 1003">Source: LAMATA materials</p> <p data-bbox="624 1005 1171 1037">Figure 6-9 Route Map of the Brown Line</p>
Condition along the line	<ul style="list-style-type: none"> • Although the planned line is in dense residential areas, the road space (main roads) will be utilized.
Project scheme	<ul style="list-style-type: none"> • A PPP scheme using the DBOMT method (Design, Build, Operation, Maintain, and Transfer) will be used. The concessionaire has not been decided yet.
State of progress	<ul style="list-style-type: none"> • The feasibility study has not been implemented yet.
Others	<ul style="list-style-type: none"> • It may be changed to a BRT route.

(7) Victoria Monorail

Item	Contents
Line overview	<ul style="list-style-type: none"> • It is a 24-km line that originates in the Marina area and passes through Lagos Island and Victoria Island. The Victoria Monorail will connect to the Red Line and Blue Line at the Marina.  <p>The map shows the proposed monorail route in red, starting at the Marina area, crossing the Lagos Island Monorail, and ending at Bisway Station on Victoria Island. Key locations labeled include Marina area, Lagos Island, and Victoria Island. Specific streets like Cable Street 1, Cable Street 2, and Abiodun Odudu are also marked.</p> <p>Source: LAMATA materials Figure 6-10 Route Map of the Victoria Monorail</p>
Condition along the line	<ul style="list-style-type: none"> • It is a business area with the offices of major companies, such as banks and oil companies. • Elevated tracks will be built on existing roads. Some sections do not have center dividers and some sections are narrow. Therefore, the construction methods for these sections shall be reviewed carefully. • There is space for a car depot near Bisway Station, the terminal station.
Project scheme	<ul style="list-style-type: none"> • The project scheme has not been decided yet.
State of progress	<ul style="list-style-type: none"> • A monorail line has been proposed in the draft final report of the “Lagos Mass Transit Alternative Study” (SYSTRA). • The feasibility study has not been implemented yet.
Others	<ul style="list-style-type: none"> • The land price of the central business district on Victoria Island is extremely high (the highest in Africa). Monorail was chosen as the urban transport system because no land acquisition and relocation of buildings (demolition of buildings) are necessary. Monorail can be built using the road space and it can handle sharp curves in the alignment.

6.2 Feasibility of Participation by Japanese Companies

Technical uniqueness and superiority will be the necessary conditions for Japanese companies to participate in the Lagos urban railway project if a yen loan is granted. We will propose systems that can demonstrate the uniqueness and superiority of Japanese companies based on the current state of the railway sector in Nigeria shown in Chapter 3 and the construction status of the Blue Line.

6.2.1 AGT (Automated Guideway Transit) System

In the transportation master plan of Lagos State, monorail lines (total length 24 km) are planned for Lagos Island and Victoria Island. Although the detailed route plan has not been decided yet, the plan is to connect the major points on Lagos Island and Victoria Island to the marina (CMS) on Lagos Island and use it as a base to connect to the LRT lines. Lagos Island and Victoria Island are the two largest business areas in Lagos State where major companies, including banks and oil companies, have their offices. Due to the constraint that any new urban railway lines being developed cannot interfere with the existing buildings and road viaducts, the Lagos State government envisions the use of monorail to develop routes within the existing roads.

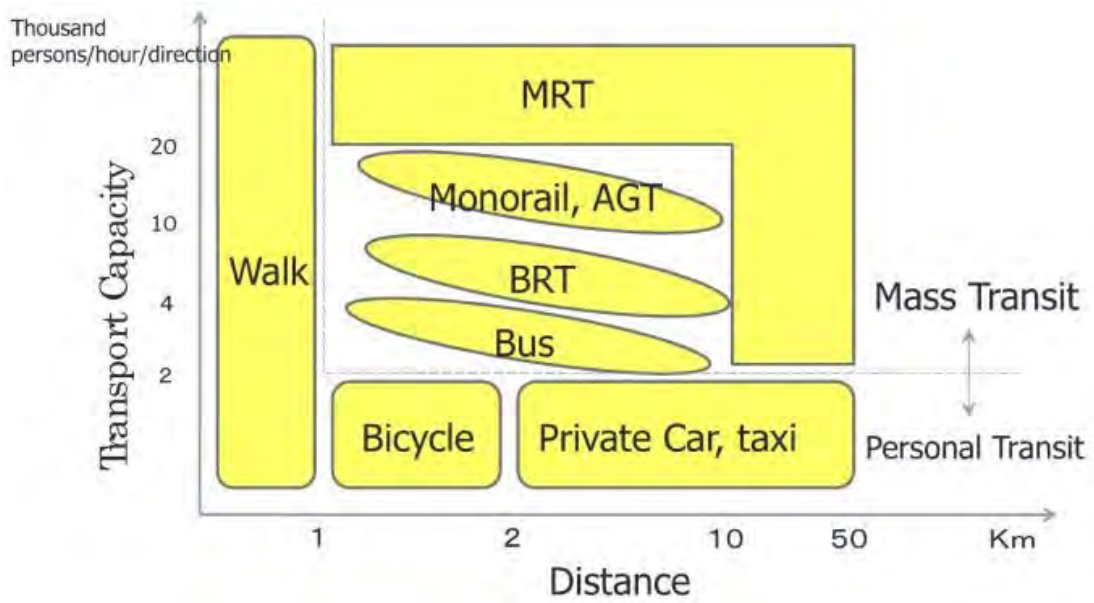
The AGT system, which has greater flexibility than the monorail in route alignment, can offer a more favorable plan to the planned monorail routes. The AGT system is a mid-size urban transportation system. Its vehicles have rubber tires and operate on guideways. Electricity, which provides the motive power, is supplied via a third rail on the side of the guideway. Currently ten AGT lines (total route length: 87 km) are operating in eight cities in Japan. Outside of Japan, twelve lines utilize the Japanese AGT technology.

Table 6-3 Examples of AGT Lines in Japan

City	Route length (km)	No. of stations	Average interval between stations (km)	No. of users (persons/day)
Tokyo Yurikamome	14.7	16	0.98	110,000
Kobe	15.3	18	0.90	100,000
Osaka	7.9	10	0.88	72,000
Tokyo Nippori-Toneri Liner	9.7	13	0.81	55,000
Hiroshima	18.4	21	0.92	51,000
Saitama	12.7	13	1.06	47,000

Source: Compiled by Study Team based on various information materials

The AGT system, which can negotiate small curve radius and steep slope, is especially suitable for addressing the constraints of Lagos Island and Victoria Island (Table 6-4). Since the axle load of AGT is smaller than that of the monorail, the production of girder is not as complicated as monorail, and the turnouts and car depots are more compact, the AGT is more cost effective. AGT also has lower running cost because the rail and other track structures do not require maintenance. It can be operated unmanned with command from the control center. As shown in Figure 6-11, although the AGT system and monorail have similar transport capacity, the newly developed AGT vehicles are larger. Therefore, depending on the number of cars, seating arrangement, and occupancy, AGT can have transport capacity of more than 20,000 PPHPD (Passenger Per Hour Per Direction).



Source: Compiled by Study Team

Figure 6-11 Transport Capacity by Transportation Mode



Source: Photographed by Study Team
Figure 6-12 AGT rolling stock

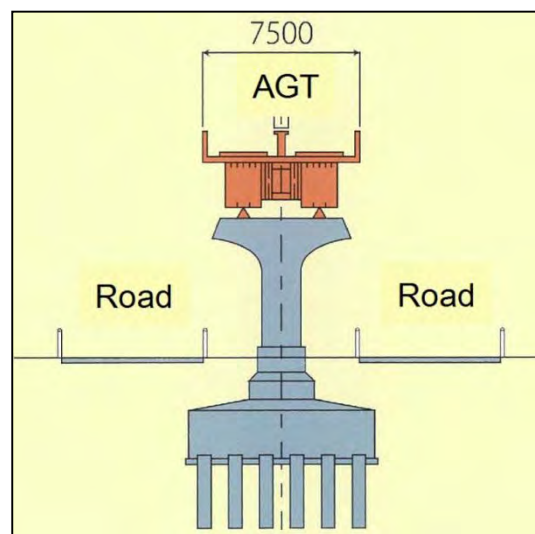


Source: Photographed by Study Team
Figure 6-13 AGT Curved Structure



Source: Photographed by Study Team

Figure 6-14 AGT Structure Inside Road



Source: Technical Information of Yurikamome-Line



Source: Photographed by Study Team
Figure 6-15 AGT Track Structure



Source: Photographed by Study Team
Figure 6-16 Platform Screen Door

Table 6-4 Comparing the Performance of AGT and Monorail

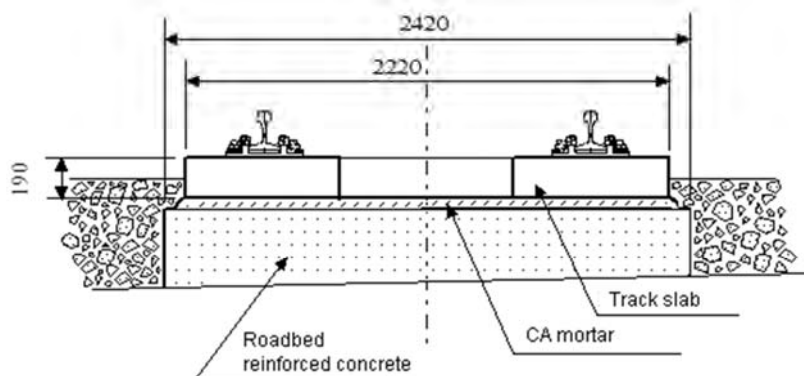
	AGT	Monorail (Straddled-type)
Minimum curve radius	30 m	50 m
Maximum gradient	59 ‰ (100‰)	60 ‰
Maximum speed	63 km/h (120 km/h)	80 km/h
Axle load	Smaller than monorail	—
Turnout	The blade moved by a single driving device (smaller scale than the monorail)	The beam moved by multiple driving devices (larger scale than the AGT)
Evacuation of passengers during emergency	Passengers can walk off the road to evacuate	Evacuation by emergency rescue train or by using device to climb down the elevated track

*The figures are real figures. (The figures inside brackets are figures of the recently developed new model trains.)

Source: Compiled by Study Team based on various information materials

6.2.2 Maintenance-free Track

Maintenance-free track (slab track, etc.) is used for many urban railway lines in Japan to save labor. However, ballast track (thickness 300 mm) is used for tracks owned by NRC, the railway operator in Nigeria, and for the Blue Line being constructed currently. The initial cost of the ballast track is lower but the running cost is high due to the need for maintenance. Examples in Japan show that maintenance-free tracks will have lower lifecycle cost than ballast track after about nine years. When we were inspecting the various NRC facilities, we found that the infrastructure facilities in Nigeria had not been maintained properly. Using laborsaving tracks that do not require maintenance will bring tremendous benefit. Maintenance-free track can be used for all the planned LRT routes in Lagos.



Source: Compiled by Study Team based on information materials
Figure 6-17 Overview of Slab Track Structure

6.2.3 EMU (Electric Multiple Unit)

Today electricity supply in Nigeria is poor. Power failure occurs frequently. On the other hand, the price of oil, especially the diesel fuel cost, is high. Use of diesel vehicles is not preferred from an environmental point of view. In this backdrop, it was determined that the Blue Line currently under construction would use EMUs. A power generation facility of 25MW is also being built at the same time.

Several companies in Japan are making EMUs. High quality can be ensured. The electrical components made in Japan are efficient and have excellent quality. Many overseas rolling stock manufacturers are using them. The collaboration between Japanese rolling stock manufacturers and electric component manufacturers enables the production of extremely lightweight vehicles with strong car body and long service life, making it possible for Japan to offer rolling stock that is eco-friendly and excellent in quality. In addition, offering of maintenance service as a package will ensure that Japan’s high quality maintenance technology and component parts will be used in the long term and a consistently high quality level can be maintained. Because spare parts can be kept to a minimum and the maintenance works and cost can be reduced, the overall lifecycle cost, which includes the initial cost and running cost, is favorable. Use of rolling stock made by Japanese companies offers great benefits.



Source: Photographed by Study Team
Figure 6-18 Japanese EMU (1)



Source: Photographed by Study Team
Figure 6-19 Japanese EMU (2)

6.2.4 Electricity Storage Equipment

In Nigeria where the electricity supply situation is poor, launch of an electric railway, which uses considerable power, necessitates implementation of measures to secure power supply. In train operation, in particular, electricity is needed not only for powering the vehicles but also for signaling, communication, and station equipment. Ensuring stable power supply is vital for the safe operation of trains.

Constructing a power plant is one of the effective measures. However, as the power supply situation improves, the power plant may become an unnecessary facility in the future. In addition, the initial cost for building a power plant is high. Measures are also needed to address the environmental aspects of the construction site.

For these reasons, we propose use of electricity storage equipment that is being employed in Japan in recent years. The power storage equipment was introduced in Japan mostly for utilizing the regenerative power generated during braking of the vehicles. Other benefits have also been identified, such as providing backup power supply during a power failure, reducing the power demand at substation facilities by cutting electric power consumption in rush hours, and so on. These effects will be highly beneficial to the new lines to be constructed in Nigeria from now on. In the future, even if the power supply situation improves, the regenerative power can still be utilized effectively, thus providing long-term benefit to the environment. Japanese companies excel in the technology of

manufacturing highly efficient storage battery—an area that will give Japanese companies advantage when making entry to Nigeria.

6.2.5 Traffic Control System

Urban railways in Japan require accurate operation at high frequency. A highly reliable traffic control system is essential. In Nigeria, Lagos State plans to build several railway lines in the future and operate many trains. As demand rises steadily, a highly reliable traffic control system will be essential. The traffic control system made by Japanese companies has a wide variety of functions, including not only train operation but also monitoring of station equipment and security management at stations and onboard trains, and so on. We can combine the various systems into a traffic control system that matches the circumstances in Nigeria. Given the electricity situation in Nigeria, it is possible to have backup power and switch instantly to it in the event of a power failure. Through these, safe and reliable transportation, which is the core appeal of the railway, can be achieved. Therefore, traffic control system is an area in which Japanese technologies can be utilized.

6.2.6 Automatic Train Protection (ATP)

The number one condition for a public transportation mode that transports many passengers is safe operation. Since the probability of human error increases as the number of trains in operation increases, installation of safety devices is essential in order to prevent accidents. The probability of accidents of the Japanese railways is extremely low even viewed internationally. The signaling and security systems manufactured by Japanese companies have the functions to prevent accidents and to ensure passenger safety. In addition, the trains in Japan are very punctual and reliable despite the high frequency of train operation in Japan. The safety and reliability of the ATP system made by Japanese companies make it a potential area for utilizing Japanese technologies.



Source: Photographed by Study Team
Figure 6-20 ATP Facility (1)



Source: Photographed by Study Team
Figure 6-21 ATP Facility (2)

6.3 Review the Possible Undesirable Effects on Nature and Society

6.3.1 Environmental Impact Assessment System in Nigeria

In Nigeria, the Environment Impact Assessment Decree 86 of 1992 requires all projects that may affect the environment to conduct environmental impact assessment (EIA). Urban railway, which is the subject of this Study, will be a project that requires implementation of EIA based on this Act. The EIA is required to cover not only all the environmental effects from the implementation of the project but also analysis of mitigation measures and other alternative measures, as well as the following items at the minimum:

- Overview of the proposed project
- Overview of the environment that may be affected (including specific information for the understanding and assessment of the environmental effects caused by the proposed project)
- Overview of existing projects (if applicable)
- Assessment of potential environmental effects that may result directly or indirectly from the proposed project or alternatives (including short-term and long-term effects, and cumulative effects)
- Identify and assess measures to mitigate the negative environmental effects of the proposed project
- Assess the uncertainty of study contents, including the environmental effects, mitigation measures, etc.
- Determine if the proposed project or alternatives have any effects on the environment of other districts or countries
- Non-technical summary of the contents shown above

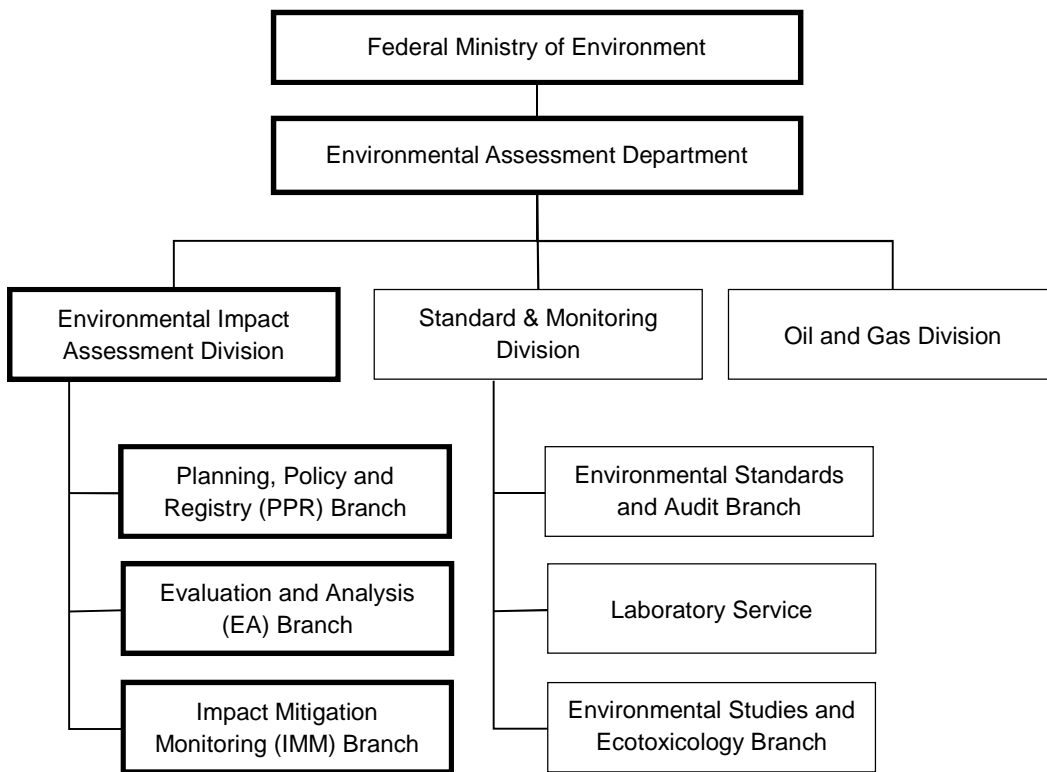
The following explains the related organizations of environmental impact assessment and the EIA process:

(1) Related Organizations

The Environmental Impact Assessment Division under the Federal Ministry of Environment is in charge of environmental impact assessment (EIA) in Nigeria. Figure 6-22 shows the structure of related organizations. The legal system, procedures, and approval of EIA review is carried out by the Environmental Impact Assessment Division. The functions of the various branches of the Environmental Impact Assessment Division are as follows:

- Planning, Policy and Registry (PPR) Branch: In charge of the EIA of newly registered projects, collection and management of registration fees, training, workshops, conferences and seminars, accounting, and site inspection of new projects, etc.
- Evaluation and Analysis (EA) Branch: In charge of the EIA scoping, risk assessment, Terms of Reference (TOR), and the review and evaluation of EIA reports
- Impact Mitigation Monitoring (IMM) Branch: In charge of the monitoring of EIA-approved projects, auditing, and post-project evaluation, etc.

Rather than being the authority to approve EIA, the State Ministry of Environment participates in the technical reviews and review committees of the EIA approval process described in (2), and provides advice to businesses in the project formation stage. Currently, the State Ministry of Environment is considering setting up its own EIA system while continuing to maintain consistency with the Federal system.

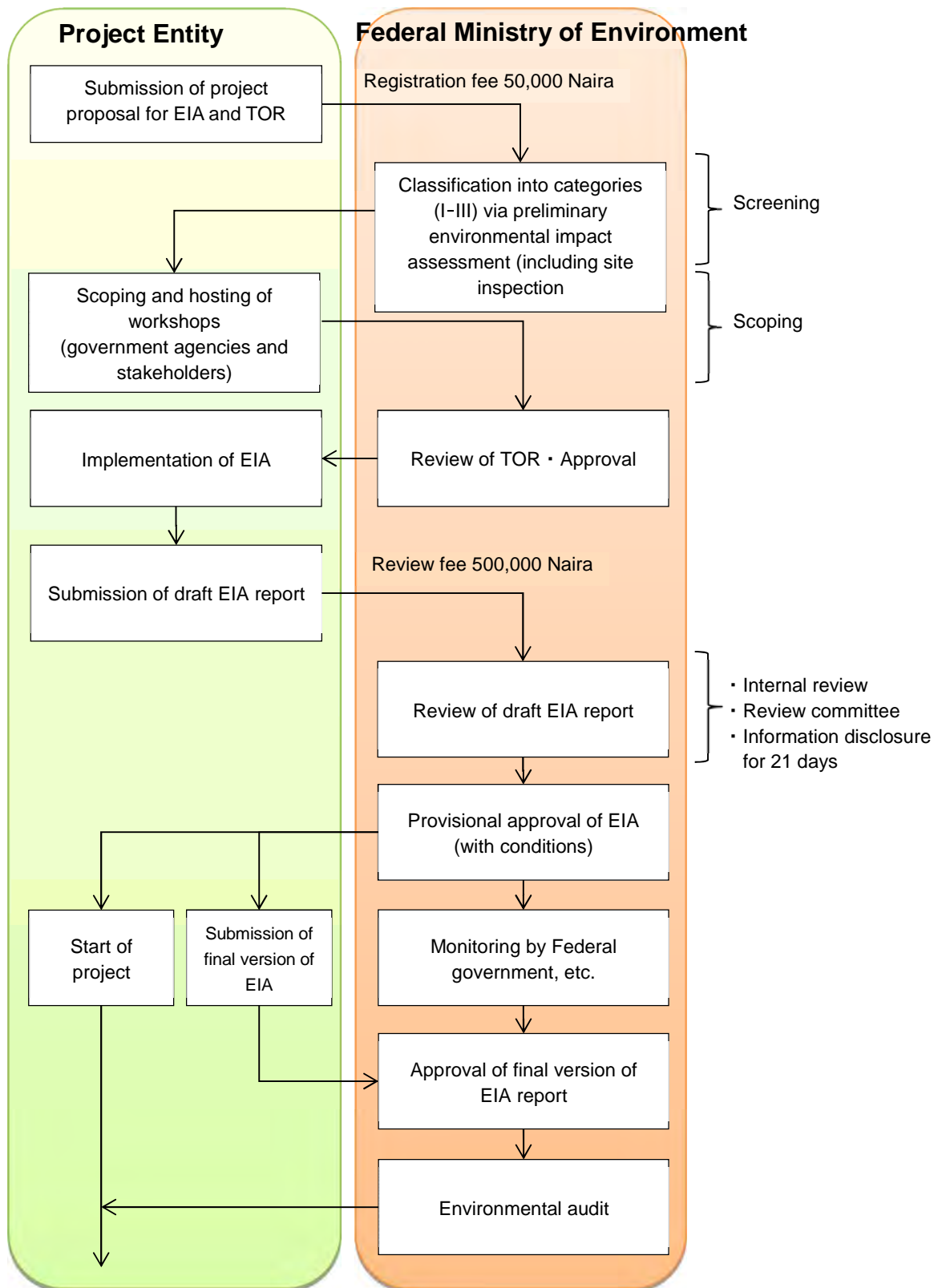


Source: Compiled by Study Team based on the Federal Ministry of Environment materials

Figure 6-22 Organization Chart of the Federal Ministry of Environment for Environmental Impact Assessment

(2) EIA Process

Figure 6-23 shows a flow chart of the EIA process in Nigeria. Depending on the characteristics of the project, the period from submitting the draft EIA report to the Federal Ministry of Environment to the provisional approval is generally about 7 months to 1 year. The consultants involved in the EIA must register with the Federal Ministry of Environment. LAMATA, the project entity, prepared the EIA for the Blue Line project and obtained a provisional approval in March 2011.



Source: Compiled by Study Team based on the Federal Ministry of Environment materials
 Figure 6-23 EIA Process in Nigeria

6.3.2 Legal System for Land Acquisition and the Actual Situation

Land acquisition in Nigeria is based on the Land Use Act enacted of 1978. The Act states that all national land belongs to the state governments. An individual can use the land upon obtaining a right of occupancy.

(1) Related Organizations

Land administration in Lagos State is implemented by the Lands Bureau, which is under the direct control of the state governor. It carries out mainly land registration, land management, and land surveys. Basically, the Lands Bureau does not get involved in the land transactions of the private sector. However, when land acquisition is required for a project that will contribute to the public interest, the Lands Bureau will acquire the land revocation of the right of occupancy.

The Land Service Directorate at the Lands Bureau is responsible for land acquisition and compensation. The Land Service Directorate is responsible for the following functions:

- Procedure to obtain the governor's approval for land expropriation
- Expropriate land and give compensation
- Procedure of the private developers' scheme in which public land is leased to a private entity
- Consulting services to government agencies and public enterprises

In addition, in accordance with the Act, the Land Use and Allocation Committee has been established at the Lands Bureau to offer advice to the governor regarding land expropriation and compensation. The Land Allocation Advisory Committee is established to provide advice to the local administrative districts about land management related to the relocation of residents affected by the loss of rights of occupancy.

From our interviews with the Lands Bureau, we confirmed that the Lands Bureau will be involved with land acquisition for urban railway projects due to their highly public nature.

(2) Land Acquisition Process

The expropriation of land for a project that contributes to the public good requires the governor's approval. Land owners and land occupants have the rights to receive compensation for the revocation of rights of occupancy. The compensation amount is based on land appraisal performed by the staff of the Lands Bureau. It is determined by the rent that has been paid, crops, buildings, and facilities. At the discretion of the governor or the local administrative district, an appropriate compensation method, such as the provision of alternative housing, can be offered in urban areas. However, the cost of the compensation is to be paid by the project entity. From a legal standpoint, it is not necessary to formulate a Resettlement Action Plan (RAP).

(3) Land Acquisition Situation of Existing Projects

1) Blue Line Project (Figure 6-24)

In the Mile 2–Okokomaiko section, the Lands Bureau expropriated some land in accordance with the laws and regulations of Lagos State as part of the Lagos-Badagry Expressway expansion project, which runs parallel to the Blue line. According to our interview with the Lands Bureau, most of the land to be expropriated is the setback portion or open space, shops, and agricultural land. Almost no relocation of residents took place and no big problem has occurred so far. LAMATA was not involved much initially in land expropriation. However, it gradually got involved, such as by giving advice, etc.

Currently LAMATA is leading the effort to acquire land for the Marina–National Theater section and the car depot to be constructed in Okokomaiko. LAMATA has high awareness of environmental and social considerations. It is working with the Lands Bureau in land acquisition in accordance with the World Bank's Safeguard Policies. The land acquisition situation at the time of our surveys is as follows:

➤ Marina–National Theater Section

This is an elevated section connecting Lagos Island and the mainland. LAMATA has been consulting with local residents. The concept of compensation is "land-for-land," rather than monetary compensation. So far, agreements have been reached on the relocation of mosques and shops. The number of residents who will be affected is not clear at this stage. According to interviews with the Lands Bureau, it is not involved at this stage, but it is sharing information with LAMATA.

➤ Okokomaiko Car Depot

The target site is about 28 hectares. A greater part is abandoned factory sites. However, some of the residential areas have to be acquired. LAMATA is leading the land acquisition process. LAMATA estimated the need to relocate 100 households in the original plan. After consultation with the Lands Bureau, it changed the design and about 40 households are subject to relocation. Currently detailed studies and consultation with local residents are being carried out.

In line with the legal system, LAMATA, the project entity, bears the cost of the compensation. The National Theater–Mile 2 section will be constructed within the existing road sites, land acquisition is not required. However, since the roadside is used as a regular road during construction, traffic congestion will be severe depending on place and time.



Source: Photographed by Study Team

Figure 6-24 Alaba Station Vicinities

2) BRT Project

Since the World Bank is involved in the BRT project, LAMATA implemented the project complying the World Bank OP4.12 for the resettlement of the local population. The basic principles and process for land acquisition and resettlement before the detailed decision stage are defined in the Resettlement Policy Framework (RPF) and RAP is prepared in the detailed decision stage. Since the BRT project includes 13.5-km extension of the existing roads and the construction of flyovers, the following have been implemented in the preparation of RAP:

- Conduct a census to identify the residents who will be affected (issue ID cards to affected residents)
- Offer consultation to affected residents and unions, etc.
- Conduct socio-economic survey of affected residents living along the line
- Identify open spaces along the line for the relocation
- Conclude compensation agreements (financial compensation, etc.) associated with the land acquisition (including non-licensed businesses)
- Form RAP promotion teams consisted of the minibus union (NURTW), related state governments,

and female unions in the market

Although there is no relocation of residents in the Mile 12–Ikorodu section of the BRT project, 1488 stores will be affected (112 commercial structures to be demolished, 1171 residents to relocate their stores, and 205 residents to relocate within the site). LAMATA has allocated approximately 2 million USD for the compensation.

6.3.3 Evaluate Consistency with JICA Guidelines for Environmental and Social Considerations

(1) Consistency with JICA Guidelines for Environmental and Social Considerations

In a comparison of the environmental impact assessment legislation of Nigeria and the JICA Guidelines for Environmental and Social Considerations, despite differences in the detailed items, methods, and so on, the main items are included and no major differences are found between the two. In addition, the EIA process in Nigeria also mandates information disclosure and consultation with stakeholders. In terms of information disclosure and other aspects, no major discrepancy is seen.

In terms of land acquisition and resettlement, although Nigeria has different land acquisition regulations for compensation when compared to the World Bank’s Safeguard Policy (OP4.12), they do not contain items in contrast to OP4.12 and there is no major discrepancy.

(2) Classification of Category according to the JICA Guidelines for Environmental and Social Considerations

No matter which line in this project is selected, it will be in a sensitive sector of the JICA Guidelines for Environmental and Social Considerations and it will be classified as Category A. Some lines may be more susceptible due to their relevant characteristics.

(3) Environmental and Social Effects from the Implementation of the Project

Based on the information obtained as of the current stage and our field surveys, we conducted scoping based on the Guidelines for Environmental and Social Considerations to find out the environmental and social effects from the implementation of this project. Table 6-5 shows the results. Depending on the line, the scoping results show significant effects on the protected areas, ecosystems, employment of relocated residents, means of livelihood and other aspects of the local economy.

Table 6-5 Environmental and Social Effects from the Implementation of the Project

Subject	No	Impact item	Assessment		Reasons for the assessment
			During construction	During services	
Anti-pollution measures	1	Air pollution	B-	A+	<p>During construction: Use of construction equipment and machinery is expected to worsen air quality temporarily.</p> <p>During service: Development of urban transport systems will mitigate traffic congestion by automobile and improve air quality along the line. Significant positive effect is expected.</p>
	2	Water contamination	B-	C	<p>During construction: There is concern that works at the construction sites and passing of heavy machinery and vehicles may contaminate the water temporarily.</p> <p>During service: There is concern that effluent (especially oily water) from</p>

Subject	No	Impact item	Assessment		Reasons for the assessment
			During construction	During services	
					stations and car depots may contaminate the water.
	3	Soil contamination	B-	C	During construction: Oil released from heavy machinery and vehicles may contaminate the soil. During service: Oil outflow from the car depots may contaminate the soil.
	4	Waste	B-	C	During construction: Waste soil and construction waste will be generated. During service: Wastes will be generated from stations and car depots.
	5	Noise and vibration	B-	A-	During construction: Operation of construction machinery may generate noise temporarily. During service: Passing of vehicles may generate noise and vibration.
	6	subsidence	D	D	No works or facilities may cause significant withdrawal of groundwater or land subsidence.
	7	Odor	D	D	No works may cause odor.
	8	Sediment	D	D	No works may have impact on sediment.
	Natural environment	9	Protected areas	B-/D	B-/D
10		Ecosystem	B-/D	B-	During construction: Although this project is not new development from natural forests, road expansion for the lines may affect the ecosystems along the lines. During service: The laying of track may interrupt the migration path of wild animals.
11		Hydrology	D	D	No major change to the terrain is planned. Impact on hydrology is not anticipated.
12		Topography and Geography	D	D	No large-scale cutting and embankment is planned. Impact on the topography and geography is not anticipated.
Social Environment	13	Resettlement	A-/B-	D	During construction: Depending on the line, large scale to small scale land acquisition and resettlement are

Subject	No	Impact item	Assessment		Reasons for the assessment
			During construction	During services	
					anticipated. During service: No resettlement is expected after a line starts service.
	14	The poor	C-	B+/C-	During construction: The subjects of resettlement may include the poor. During service: Introduction of the urban railway system is expected to have positive effect on the poor. It will facilitate their access to social services and others. However, depending on the fare, the poor may not be able to enjoy the benefits of the project.
	15	Ethnic minorities and Indigenous peoples	C-	C-	The target areas are urbanized areas. No ethnic minority and Indigenous peoples who require special considerations are believed to exist. However, further investigation is needed.
	16	Regional economy, including employment, means of livelihood, etc.	B+	B+/C-	During construction: Local residents are expected to be hired during the construction. The effect is positive. During service: Vibrant economic activities around the station areas will have positive effect; however, there is concern that the street vendors and minibuses that have conducted businesses along the line until now may lose their means of livelihood or have lower income.
	17	Land use and utilization of regional resources	D	C-	Depending on the line, new influx of population and development of commercial areas are anticipated. Changes in land use to residential areas and commercial areas are anticipated; however, the degree of impact is not known.
	18	Water use	D	D	This project does not affect water use.
	19	Existing social infrastructure and social services	B-	A+	During construction: Depending on the location, the construction area may temporarily experience more traffic congestion than usual. During service: Introduction of urban transportation systems is expected to mitigate traffic congestion.

Subject	No	Impact item	Assessment		Reasons for the assessment
			During construction	During services	
	20	Social capital and social organizations, such as local decision-making entities	B-	B-	The activities of labor unions for the minibuses and shops along the lines may be affected.
	21	Uneven distribution of damage and benefits	B-	B-	The uneven distribution of damage and benefits may occur to the passengers and residents around the project areas.
	22	Conflict of interest in the region	C-	C-	This project is not expected to cause any conflict of interest within the region. However, the uneven distribution of damage and benefits may lead to conflicts.
	23	Cultural heritage	C-	C-	There is no clear information on historical buildings around the project areas.
	24	Landscape	D	D	Major scenic overlook spots and landscape resources do not exist in project areas and their surroundings. However, efforts shall be made to maintain harmony with the surrounding scenery.
	25	Gender	C-	C-	This project does not anticipate any special effects on gender but verification is needed.
	26	Children's rights	C-	C-	This project does not anticipate any special effects on children's rights but verification is needed.
	27	Communicable diseases, such as HIV/AIDS, etc.	B-	D	The influx of construction workers may widen the scope of communicable diseases.
	28	Occupational environment (including occupational safety)	B-	B-	During construction: Considerations for the working environment are needed during the construction. During service: Full attention to the working environment, sanitation, safety education for the workers engaging in maintenance works is needed.
Others	29	Accidents	B-	B±	During construction: Due to the operation of construction equipment and machinery, there is the danger of

Subject	No	Impact item	Assessment		Reasons for the assessment
			During construction	During services	
					accidents during construction. During service: Decrease in road traffic volume is expected to reduce road traffic accidents. However, there is the danger of train accidents and accidental contacts with users.
	30	Climate change	D	B+	During construction: No special impact on climate change is anticipated. During service: Implementation of the project will reduce car traffic volume and mitigate traffic congestion. CO ₂ emissions will decrease, generating positive effect on the global warming problem.

A± : Item expected to have significant positive or negative effect

B± : Item expected to have positive or negative effect

C± : Item requiring additional studies because the degree of effect is not known

D : Item determined to have no effect or extremely small effect

Source: Compiled by Study Team

6.3.4 Forecast of Effects on Nature and Society by Line

Among the impact items in 6.3.3, we focused on “9. Protected Area,” “10. Ecosystems,” and “13. Resettlement,” which experience significant impact due to differences in the location. We summarized the observation and evaluation findings of the various lines from the viewpoint of environmental and social considerations under three topics: “land acquisition,” “effect on the residents (relocation of residents, loss of livelihood, etc.),” and “natural environment (protected areas, ecosystems)” (Table 6-6). As a result, except for the Blue Line and Red Line that are currently in progress, the Green Line and the Victoria Island Line are expected to have less negative impact on the social and natural environments than the other lines.

Based on our field surveys and information obtained so far, we explain in detail below the various items expected to have effects.

Table 6-6 Observation and Assessment of the Various Lines from the Perspective of Environmental and Social Considerations

Line	Surrounding condition	Social environment			Natural environment (protected areas, ecosystems)		
		Land acquisition		Effects on residents (resettlement, loss of livelihood, etc.)			
Red Line	<ul style="list-style-type: none"> The line will be constructed on NRC sites shared by MOU between LAMATA and NRC . Shops and street vendors are conducting businesses along the route. There are also stores (plant stores, etc.) that have officially leased the land from NRC. 	C	<ul style="list-style-type: none"> The NRC sites are used. Almost no land acquisition is needed. 	B	<ul style="list-style-type: none"> There are many shops and street vendors along the route. 	C	<ul style="list-style-type: none"> Since the Red Line will share the same bridge with the Blue Line when crossing the Lagos Lagoon, the effect on the environment is expected to be small.
Blue Line	<ul style="list-style-type: none"> The line is being constructed using the road space (main roads). The surrounding areas have many shops, markets, factories, etc. When the roads for the National Theater– Mile 2 section were first constructed, they were wide enough. However, the roads west of Mile 2 will have to be widened. 	B	<ul style="list-style-type: none"> Road expansion/ acquisition of ROW land are needed. Land acquisition for the National Theater– Marina section and car depots are in progress. 	B	<ul style="list-style-type: none"> Shops along the route are compensated. Since the roads on Lagos Island are used, few residents are expected to be relocated. 	B	<ul style="list-style-type: none"> Because the Blue Line will pass the Lagos Lagoon, the effect on the ecosystems is a concern.
Green Line	<ul style="list-style-type: none"> Road space (main roads and some local roads) will be used. The Victoria Island–Lekki 2 section is a newly developed area. As the Green Line goes farther away from Lagos City, the surroundings are not developed. The Lekki Conservation Center is near the main road. 	C+	<ul style="list-style-type: none"> Road expansion and acquisition of ROW land are expected. However, since the existing roads are wide, the scale of land acquisition is expected to be relatively small. 	B	<ul style="list-style-type: none"> Since the existing roads will be used, resettlement is expected to be at a medium level. Since the areas are newly developed, the shops and street vendors are expected to be in a medium range. 	B	<ul style="list-style-type: none"> The areas covered with vegetation will be developed. The existence of nature reserves in the surrounding areas is a concern.

Line	Surrounding condition	Social environment			Natural environment (protected areas, ecosystems)		
		Land acquisition	Effects on residents (resettlement, loss of livelihood, etc.)				
Yellow Line	<ul style="list-style-type: none"> The line is in dense residential areas. 	A	<ul style="list-style-type: none"> Since the line will cross dense residential areas, large scale land acquisition is expected. 	A	<ul style="list-style-type: none"> The number of residents who need to be relocated is expected to be high. The number of shops and street vendors along the route is expected to be high. 	C	<ul style="list-style-type: none"> The line is in dense residential areas. Effects on the natural environment are expected to be small.
Brown Line	<ul style="list-style-type: none"> The road space (main roads) will be used. They are roads of high traffic volumes. There are many shops, markets, and factories in the surrounding areas. 	C	<ul style="list-style-type: none"> The Brown Line is expected to use the existing BRT lanes. Land acquisition is mostly not required. 	C+	<ul style="list-style-type: none"> The Brown Line is expected to use the existing BRT lanes. Relocation of residents is mostly not required. There are many shops and street vendors along the route. 	C	<ul style="list-style-type: none"> Since the Brown Line will share the same bridge with the Blue Line when crossing the Lagos Lagoon, impact on the environment is expected to be small.
Purple Line	<ul style="list-style-type: none"> The line is in dense residential areas. 	A	<ul style="list-style-type: none"> Since the line will cross dense residential areas, large scale land acquisition is expected. 	A	<ul style="list-style-type: none"> Many residents are expected to be relocated. There are many shops and street vendors along the route. 	C	<ul style="list-style-type: none"> The line is in dense residential areas. The effects on the ecosystems are expected to be small.
Victoria Monorail	<ul style="list-style-type: none"> The road space will be used. The line is in the city center, an expensive area with many commercial buildings. 	B	<ul style="list-style-type: none"> Road expansion and acquisition of ROW land are expected. 	B	<ul style="list-style-type: none"> The existing road space will be used. The number of residents to be relocated is expected to be small. The number of shops and street vendors along the route is in the medium range. 	C	<ul style="list-style-type: none"> The line is in the city center. The effects on the ecosystems are expected to be small.

A: Significant negative effect, B: Medium-level negative effect, C: Little negative effect

(1) Social Environment

1) Land Acquisition

The Yellow Line and the Purple Line will cross dense residential areas. The scale of land acquisition is expected to be large. The other lines will be constructed on main roads or NRC railway sites. Large scale land acquisition for the construction is not anticipated.

2) Effects on Residents

Itinerants and street vendors are all over the roadside, especially near the intersections and markets. During our field surveys, we noticed that itinerants and street vendors are using the setback portions and open spaces along the main roads to do business. There are many commercial facilities along the roads and not too many roadside structures are residential housing. Therefore, with the exception of the Yellow Line and Purple Line, resettlement of the residents is not expected to have great impact. On the other hand, stores, itinerants, street vendors, minibuses, and other private transportation means might lose their livelihood. However, itinerants, street vendors, minibuses, and private transportation means that can relocate easily can continue their livelihood at other locations.

Except for the Blue Line and the Red Line currently in progress, we compared the other five lines based on the above. The Green Line is in a newly developed area. It is far away from the Lagos center. In addition to low population, the commercial areas are also small and spread out. The Victoria Island Line is in the business district. Stores and street vendors are concentrated at the bus stops and intersections. Therefore, residents who will be affected are expected to be fewer than those at the other lines.



Source: Photographed by Study Team

Figure 6-25 A Street Vendor on the Side of the Road
(Near Planned Site for Victoria Island Line)



Source: Photographed by Study Team

Figure 6-26 Street Vendors on the Side of the Road
(Near Planned Site for the Green Line)

(2) Nature Reserve

1) Protected Areas

Lagos State has two nationally designated protected areas, as shown in Table 6-7 and Figure 6-27. Although none of the planned lines is located in the protected areas, the Green Line will pass near the Lekki Strict Nature Reserve. Details of the Lekki Strict Nature Reserve are not known. However, impact of the Green Line construction on the protected areas shall be monitored.

Table 6-7 Protected Areas in Lagos State

Protected area	IUCN protected area classification	Area	Current state
Lekki Strict Nature Reserve	Ia	0.78 km ²	- Strict nature reserve - Being maintained
Ogun River Forest Reserve	-	52.20 km ²	- Managed nature reserve, wildlife habitat - partially deteriorated

Source: Compiled by Study Team



Source: Compiled by Study Team based on Protected Planet

Figure 6-27 Nature Reserves in Lagos State

2) Ecosystem

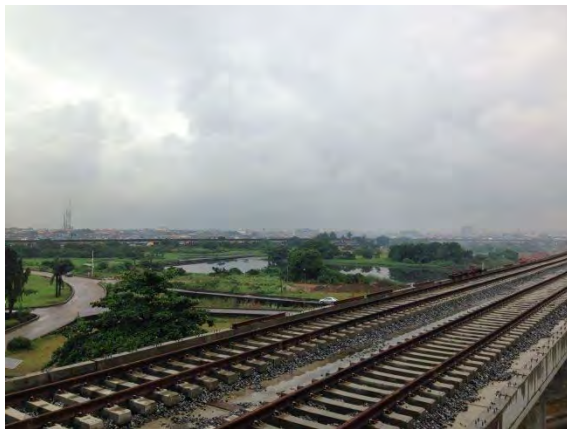
The Lekki area, where the Green Line is planned, is a newly developed area. Compared to the other lines, the area is expected to have still lush vegetation and a relatively rich ecosystem. The protected species of Nigeria are listed in the "Endangered Species (Control of International Trade and Traffic) Act." In addition, Lagos State also lists important species of plants (except timber species), animals, and birds. It is not clear if such flora and fauna inhabit the areas along the lines but effects of the Green Line construction on the ecosystem is a concern.

The coastal area of the Lagos Lagoon is marshland. In particular, wild birds such as herons can be seen at the waterways between the mainland and Lagos Island. In Lagos State, it is necessary to obtain permit from the State Ministry of Environment for use of the marshland, such as construction. For the Blue Line, a permit has already been issued for the construction of a bridge at the Lagos Lagoon. The Red Line and the Brown Line will also cross the Lagos Lagoon but they will use the bridge of the Blue Line. Therefore, construction of these two lines is expected to have almost no effect on the marshland.



Source: Photographed by Study Team

Figure 6-28 Scenes along the Green Line (Vegetation)



Source: Photographed by Study Team

Figure 6-29 Lagos Lagoon (Marshland)

6.4 Using Evaluation Indicators to Analyze Target Lines and Selecting Lines for Assistance

6.4.1 Analyzing using Evaluation Indicators

The six LRT lines and the Victoria Island Line planned currently are analyzed using evaluation indicators (progress of project, project cost, natural condition, social condition, benefit to Japanese companies, and other risks).

(1) Progress of Projects

The following describes the progress of the six LRT lines and the Victoria Island Line:

- The Blue Line is under construction. The project is in progress. (Phase 1 is slated to open for service in 2016).
- After the MOU with NRC has been concluded, the feasibility study of the Red Line will be updated.
- The pre-feasibility study of the Purple Line has been completed. The feasibility study will start in September 2014.
- Feasibility studies for the Green Line, Yellow Line, Brown Line, and the Victoria Island Line have not been implemented yet.

(2) Project Costs

1) Six LRT Lines

The revised Master Plan shows the total amounts of each line. However, it does not have the breakdown of the cost of each sub-system, the cost of rolling stock, the cost for land acquisition, and other costs. Based on the characteristics of each line, we analyzed the rationale of the project cost (Table 6-7). According to the analysis, the project cost per km for all the lines is approximately 30 million USD/km, which does not show any difference among the lines because of their different characteristics. However, the project cost for the Blue Line, which is currently in progress, is 20% higher.

Table 6-8 Analyzing the Project Costs of the Planned LRT Lines

	Route length (km)	Project cost (million USD)	Project cost per km (million USD)
Red Line (Marina–Agbado)	29	898.5	31.0
	<ul style="list-style-type: none"> ➤ The NRC land will be used, no land acquisition cost will be incurred. However, payment of land usage fee to NRC may be required. ➤ The structures will be at the ground level. The construction cost is low. ➤ Relocation of the NRC tracks (single track) will incur cost. 		
Blue Line (TBS–Okokomaiko)	29	1100.0	37.9
	<ul style="list-style-type: none"> ➤ The Blue Line will pass through densely populated areas. Since road space (Lagos Badagry Expressway) will be used, the costs for land acquisition and relocation of houses are not expected to be high (the sharing of cost with road development is not clear.) ➤ West of Mile 2 will have ground-level structures; the construction cost will be low. East of Mile 2 will have elevated structures; the construction cost will be high. A relatively large bridge over the waterway will be constructed between the mainland and Lagos Island. The construction cost will be high. 		
Green Line (Marina – Ajan)	22	686.9	31.2
	<ul style="list-style-type: none"> ➤ If the Green Line is constructed along the Lekki-Epe Expressway, the land is already available. Land acquisition cost and resettlement cost are expected to be small. ➤ If the Green Line is to be connected to the Marina Station of the Blue Line or if the Green Line enters the densely populated areas on Victoria Island, the land acquisition cost and resettlement cost will increase. 		

	<ul style="list-style-type: none"> ➤ Due to the soft ground, the elevated structures will need long piles. The construction cost will be high. (The inland part may be able to have ground-level structures.) 		
Yellow Line (Otta/MMA – Iddo)	34	1107.4	32.6
	<ul style="list-style-type: none"> ➤ Since the Yellow Line will pass through densely populated areas and no existing road is available, the land acquisition cost and resettlement cost are expected to be high. ➤ The structures will be elevated. The construction cost will be relatively high. 		
Brown Line (Mile12 – Marina)	19	582.7	30.7
	<ul style="list-style-type: none"> ➤ Although the Brown Line will pass through densely populated areas, it will use the existing road (A1). Therefore, the land acquisition cost and resettlement cost are expected to be small. ➤ The structures will be elevated. The construction cost will be relatively high. 		
Red Line (Extension)	23	639.1	27.8
	<ul style="list-style-type: none"> ➤ Since the Red Line extension will be in the rural area, the land acquisition cost is expected to be small. ➤ The construction cost for ground-level structures is low. Since the extension is inland, the pile length of elevated structures will be short. The cost may be relatively low. 		
Green Line (Lekki Airport and FTZ)	62	1796.8	29.0
	<ul style="list-style-type: none"> ➤ The land acquisition cost is expected to be small because of the rural area. ➤ The construction cost for ground-level structures will be low. In the case of soft soil, however, elevated structures will be used and the construction cost will be high. 		
Purple Line	48	1330.8	27.7
	<ul style="list-style-type: none"> ➤ Because the Purple Line will pass through densely populated areas, the land acquisition cost and the resettlement cost will be high. Although the plan is to use the Isheri Olofin Road, the road is not wide enough. ➤ The structures will be elevated. The construction cost will be relatively high. 		
Purple Line (Extension to Shagamu)	32	877.0	27.4
	<ul style="list-style-type: none"> ➤ Since the Purple Line extension will be in the rural area, the land acquisition cost is expected to be small. ➤ The construction cost for ground-level structures is low. Since the extension is inland, the pile length of elevated structures will be short. The cost will be relatively low. 		
Total	298	9019.2	30.3

Source: Compiled by Study Team

According to “the Purple Line Pre-Feasibility Study” (FAO 2014), the project costs (including rolling stock) will be approximately 54 million USD/km for ground structures (stations not included) and approximately 100 million USD/km for elevated structures (stations not included). These project costs are very different from those in the revised Master Plan. The Purple Line Pre-Feasibility Study is conducted taking into consideration the status of the Blue Line currently under construction. It is believed to have better reflected the current state. It should be noted that the construction cost of stations (approximately 590,000 USD/station) stated in the Purple Line Pre-Feasibility Study may have been estimated much lower than the construction costs in other countries.

According to interviews conducted in the first field survey, the construction cost in Nigeria is found to be higher compared to the developed countries because Nigeria is dependent on imports for materials, one must transport one’s own materials because distribution in Nigeria is not well developed, the lack of skilled workers causes low productivity, and safety management is needed. Depending on the pier height and foundation type, the construction cost in Nigeria is found to be higher than even the construction cost of girder bridge in Japan (civil engineering alone is 3.5–4 billion yen/km).

From the above data, we decided to use the following unit prices to estimate the project costs.

Table 6-9 Setting Unit Prices for the Review of Project Costs

Item	Sub-system	Construction cost
Construction cost per km (ground structure)	Civil engineering, track, rolling stock, electric power, signaling	54 million USD/km
Construction cost per km (elevated structure)	Civil engineering, track, rolling stock, electric power, signaling	100 million USD/km
Station	Construction	590,000 USD/station

Source: Compiled by Study Team

2) Victoria Island Line

Although the revised Master Plan shows the total project cost of the Victoria Island Line, it does not have the breakdown of the cost of each sub-system, cost for land acquisition, and other costs. Calculating from the project cost shown in the revised Master Plan, the project cost per km is 68.8 million USD/km, which is estimated at a higher cost than that of the LRT (approximately 30 million USD/km). However, because this cost aligns generally with the approximately 100 million USD/km of the Purple Line’s Pre-Feasibility Study at the 70% level, we decided to use 70 million USD/km to estimate the project cost.

If AGT is adopted, the project cost can be lower than the monorail in general. However, since the ratios that can be reduced differ depending on the vehicle weight and land barriers, we estimated the project cost of AGT in this study using the same unit price (70 million USD/km) as the monorail.

It should be noted that the project cost of monorail in the revised Master Plan is too high in comparison with the project cost in other countries. Efforts shall be made to increase the accuracy of the project cost in the preliminary study.

Table 6-10 Analyzing the Project Cost of the Victoria Island Line

	Route length (km)	Project cost (million USD)	Project cost per km (million USD)
Victoria Island Line	24	1651.2	68.8
	<ul style="list-style-type: none"> ➤ It is in a business area. However, since the existing road space will be used, the land acquisition cost is expected to be small. ➤ The elevated structures will use long piles. The construction cost will be high. 		

Source: Compiled by Study Team

(3) Natural Conditions

The following are the natural conditions along the six LRT lines and the Victoria Island Line:

Table 6-11 Natural Conditions along the Planned Lines

Item	Contents
Ground condition	<ul style="list-style-type: none"> ➤ Many coastal areas in Lagos State where the Victoria Island Line and the Green Line are planned are reclaimed land from the lagoon. The support layer is deep underground and the ground soil is soft. ➤ The pile length of the Blue Line currently under construction is 20–40 m. ➤ The pile length of road viaducts on Victoria island is about 35 m. Records show that the pile length of some large-scale buildings on Victoria island is 70 m. ➤ The pile length is about 35 m at the Lekki district where the Green Line is planned. Because the ground soil is soft, embankment structures may have land subsidence. The ground conditions of other lines are not clear; the inland lines probably do not require long piles as in the cases of the Blue Line and the Green Line.
Topographical condition	<ul style="list-style-type: none"> ➤ Blue Line (Red Line) : Bridges are needed because there is a waterway between the mainland and Lagos Island. ➤ Victoria Island Line: Bridges are needed because there is a waterway between Lagos Island and Victoria Island.
Natural environment	<ul style="list-style-type: none"> ➤ Since the Blue Line passes through the Lagos Lagoon, there is potential impact on the natural environment. ➤ The Red Line and the Brown Line will pass through the Lagos Lagoon. Because they are sharing the bridges with the Blue Line, their impact on the natural environment is expected to be small. ➤ The areas along the Yellow Line and the Purple Line are densely populated. Their impact on the natural environment is expected to be small. ➤ Development of the vegetation zones along the Green Line is necessary. Due to the existence of protected areas in the vicinities, there is potential impact on the natural environment. ➤ The Victoria Island Line is located in the city center. The impact on the natural environment is expected to be small.

Source: Compiled by Study Team

(4) Social Conditions

The following are the social conditions along the six LRT lines and the Victoria Island Line:

Table 6-12 Social Conditions along the Planned Lines

Item	Contents
Land acquisition	<ul style="list-style-type: none"> ➤ The Blue Line requires road expansion and acquisition of ROW land. However, since the existing road space is used, the scale of land acquisition is believed to be small. ➤ The Red Line will use NRC land. No land acquisition is needed for almost the entire section. ➤ The Yellow Line and the Purple Line will pass through densely populated areas. The scale of land acquisition is expected to be large. ➤ Road expansion and acquisition of ROW land is expected for the Green Line. However, since the existing road site is wide, the scale of road expansion and land acquisition is estimated to be relatively small. ➤ The existing roads will be used for the Brown Line. The scale of land acquisition is expected to be small. ➤ The existing roads will be used for the Victoria Island Line. The scale of land acquisition is expected to be small.
Resettlement, loss of livelihood, etc.	<ul style="list-style-type: none"> ➤ Compensation was given to roadside shops along the Blue Line. Since the existing roads on Lagos Island will be used, few residents need to be relocated. ➤ There are many shops and street vendors along the Red Line. ➤ The Yellow Line and the Purple Line are in densely populated areas. The number of residents, shops, and street vendors to be relocated are expected to be high. ➤ The Green Line is expected to use the existing roads. Resettlement is expected to be moderate. In addition, since the areas are newly developed, the number of shops and street vendors in the vicinities are also expected to be moderate. ➤ The Brown Line will use the existing roads. Resettlement is not necessary. The number of shops and street vendors along the line is expected to be high. ➤ The Victoria Island Line will use the existing roads. Resettlement is expected to be low. The number of shops and street vendors along the line is in the medium range.

Source: Compiled by Study Team

(5) Other Risks

The following are the other risks along the six LRT lines and the Victoria Island Line:

Table 6-13 Other Risks related to the Planned Lines

Item	Contents
Change of project plan	<ul style="list-style-type: none"> ➤ The Brown Line may change to a BRT line.

Source: Compiled by Study Team

6.4.2 Select Target Lines

Based on the evaluation indicators (progress of project, project cost, natural condition, social condition, and other risks) described in 6.4.1, The Study Team selected the target lines. Table 6-14 (next page) shows the assessment of various lines. Among these lines, the Victoria Island Line is the potential candidate if Japan were to participate in the projects. Table 6-14 shows the applicable technologies for the line if Japan were to participate in the projects.

Table 6-14 Applicable Japanese Technologies to the Selected Line

Line	Applicable Japanese Technologies
Victoria Island Line	<ul style="list-style-type: none"> • AGT system • Electricity storage facilities • Traffic control system • ATP • AFC (IC card) system

Source: Compiled by Study Team

If the Victoria Island Line were to be developed using yen loan, it would be difficult to develop the whole line due to the scale of the yen loan (tens of billions of yen). The construction shall be carried out in phases.

Table 6-15 Assessment of the Six LRT Lines and the Victoria Island Line

Line (Length)	Target year for development in the revised master plan	Project cost (USD) ^(Note)	Demand (Number of passengers)	Natural Environment (Protected areas and ecosystem) *1	
Blue Line (29km)	2017	2 billion	1.35 million/day	Impact on ecosystem should be considered because of crossing Lagos Lagoon.	B
Red Line (52km)	2017	2.8 billion	1.45 million/day	Impact on ecosystem will be minimum.	A
Green Line (84km)	2022	5.1 billion	1.30 million/day	Impact on ecosystem should be considered because of the existence of the protected area near the line.	B
Purple Line (80km)	2022	4.8 billion	1.66 million/day	Impact on ecosystem will be minimum.	A
Yellow Line (34km)	2032	2.6 billion	1.15 million/day	Impact on ecosystem will be minimum.	A
Brown Line (19km)	2032	1.3 billion	0.58 million/day	Impact on ecosystem will be minimum.	A
Victoria Island Line (24km)	2022	1.7 billion	0.58 million/day	Impact on ecosystem will be minimum.	A

*1 A: Minimal Adverse Impact, B: Medium Adverse Impact, C: Significant Adverse Impact

(Note) Project costs are calculated based on the unit-costs in Figure 6-8 and 6-9, assuming total elevated lengths and ground-level lengths of each line.

Source: Compiled by Study Team

Line (Length)	Land acquisition *1	Resettlement *1	Applicable Japanese railway technology	Remarks
Blue Line (29km)	Road expansion is involved.	B The scale of resettlement is small.	B <ul style="list-style-type: none"> Electric Multiple Unit (EMU) Operation control system Automated Fare Collection system (IC card) 	<ul style="list-style-type: none"> The project is in progress.
Red Line (52km)	No land acquisition is expected. Negotiation with NRC is necessary.	B No resettlement is expected.	A <ul style="list-style-type: none"> Electric Multiple Unit (EMU) Operation control system Automated Fare Collection system (IC card) 	<ul style="list-style-type: none"> Negotiation with NRC is necessary for the land use.
Green Line (84km)	The scale of land acquisition is small.	B The scale of resettlement is medium.	B <ul style="list-style-type: none"> Electric Multiple Unit (EMU) Operation control system Automated Fare Collection system (IC card) Station-centered development approach along railway 	<ul style="list-style-type: none"> Urban development along the railway is expected.
Purple Line (80km)	The scale of land acquisition is large.	C The scale of resettlement is large.	C <ul style="list-style-type: none"> Electric Multiple Unit (EMU) Operation control system Automated Fare Collection system (IC card) 	<ul style="list-style-type: none"> The project risk is high due to the large-scale land acquisition and resettlement although the demand is large.
Yellow Line (34km)	The scale of land acquisition is large.	C The scale of resettlement is large.	C <ul style="list-style-type: none"> Electric Multiple Unit (EMU) Operation control system Automated Fare Collection system (IC card) 	<ul style="list-style-type: none"> It's ranked as low priority, and the project risk is high due to the large-scale land acquisition and resettlement.
Brown Line (19km)	The scale of land acquisition is small.	B The scale of resettlement is small.	B <ul style="list-style-type: none"> Electric Multiple Unit (EMU) Operation control system Automated Fare Collection system (IC card) 	<ul style="list-style-type: none"> It's ranked as low priority, and may be changed to BRT.
Victoria Island Line (24km)	No land acquisition is expected.	A No resettlement is expected.	A <ul style="list-style-type: none"> Electric Multiple Unit (EMU) Operation control system Automated Fare Collection system (IC card) Transit center development approach 	<ul style="list-style-type: none"> The project cost can be reduced with installation of AGT.

Chapter 7

Understanding and Analyzing the Current State for Japanese Companies to Participate in Projects

Chapter 7 Understanding and Analyzing the Current State for Japanese Companies to Participate in Projects

7.1 Situation in Nigeria and Lagos State

Many hurdles are expected to deter Japanese companies from participating in projects in Nigeria, such as Nigeria's long distance from Japan, cultural differences, poor security situation in Nigeria and so on. We will analyze risk factors related to the implementation of railway projects in Nigeria and Lagos State.

7.1.1 Security

If the political situation becomes unstable or if the security situation deteriorates in the country or region where the railway project is being implemented, the project may stop, it may be delayed, or it may be cancelled, resulting in the contractor not being able to recover the construction cost and other project costs. If a system integrator or a construction company responsible for the construction of civil engineering structures participates in the project, it will have to set up an office in Lagos for an extended time to carry out the construction works. Terrorist activities and the general crime situation (robbery, theft, kidnapping, etc.) will be the major factors for Japanese companies to determine whether to participate in the project or not.

According to interviews with Japanese companies, many companies make decision on whether to participate or not based on the overall situation, including the local condition, the presence of partner companies or not, rather than just the travel information provided by the Ministry of Foreign Affairs. In Nigeria, although terrorist groups like Boko Haram and the Movement for the Emancipation of the Niger Delta (MEND) are active, no terrorist activities have been reported in Lagos State to date. However, the rampant crime is a problem. Even within Lagos State, security related to the occurrence of general crime varies depending on the area within the Lagos State.

The following are analyses of the general crime and security situation in the vicinities of the planned Victoria Island Line, the prospective project for Japanese companies.

➤ Victoria Island Line

Lagos Island and Victoria Island, for which the Victoria Island Line is planned, are where the headquarters of major banks, insurance companies, and oil companies are located. Many of the Japanese residents are also holding residence there. These areas in Lagos State have relatively good security. However, Area Boy, a group feared even by the local people, is active there (theft, robbery, and kidnapping). Security can be bad depending on the place and time. (In general security is poor at night.)

Minibus junctions and some stalls are seen in vicinities from Ebute Elefu to Marina (CMS) where the stations of the Victoria Island Line will be located. If Nigeria can relocate these junctions and stalls, the construction sites can be secured with construction fences and a certain safety level can be ensured.



Source: Photographed by Study Team
 Figure 7-1 Condition of Ebute Elefu and vicinities



Source: Photographed by Study Team
 Figure 7-2 Condition of Marina (CMS) and vicinities

7.1.2 Climate

Lagos has Savannah climate. The average maximum temperature for the year is 30.7 °C and the average minimum temperature is 22.7 °C. The rainfall is about 1500 mm and there are two rainy seasons in a year. Since there are no extremely high or extremely low temperatures, processes that require temperature control, such as concrete placement, will not have problem.

7.1.3 Electric Power

The power supply in Lagos State is poor. Power failure occurs multiple times in a day. The Blue Line, which is under construction, will have its own power generation facility for train operation.

Currently, Nigeria as a whole, is estimated to have potential power demand of 10,000 MW. The power generation capacity is 6000 MW. The current power generation capacity can no longer be explored due to shortage in gas supply, constraint in power transmission, and the need to reserve power. Nigeria is making plans to increase power supply to resolve these problems. However, there is no guarantee that the situation will improve by the time the Victoria Island Line starts operation. Therefore, Victoria Island Line shall also be planned with the assumption that they will have to set up their own power generation facilities, similar to the Blue Line.

7.1.4 Language

Since English is the official language of Nigeria, the preparation of documents in the contract/bidding stage and various drawings, specification, and as-built drawings will be relatively easy.

7.1.5 Partner Companies

Japanese companies that do not have experience in Nigeria can reduce risks by entering into joint ventures with local companies at the various stages of design, estimation, and construction.

The construction industry in Nigeria is described in detail in 3.6 of this Study. At this time, Julius Berger is the company that will most likely enter into joint ventures with Japanese companies.

Julius Berger started operation in Nigeria in 1965 and has been listed in Nigeria's stock exchange market (NSE) since 1980. It has 17,000 employees, including 1,000 German and foreign employees and 16,000 Nigerian employees. The parent company is Bilfinger Berger SE of Germany (33.4%). The government has also contributed funds as a shareholder. Julius Berger receives about 60% of its orders from the private sector and 40% from the public sector. In 2013, it had revenue of 212.7 billion Naira (approximately 140 billion yen) and profit (before tax) of 16.2 billion (approximately 10.8 billion yen). It manufactures construction materials in-house, including concrete, asphalt, pre-stressed products, precast products, concrete block, and pipes, etc. However, it relies on imports for the reinforcing bars

and heavy construction equipment. Julius Berger uses its own ocean and land transportation means to transport materials. It has established its own transportation network in Nigeria. Julius Berger has similar approach to quality, scheduling of construction period, bidding price, and so on as Japanese construction companies. It is a promising candidate as a business partner.

In terms of other partner companies besides the Nigerian ones, Indian companies that have worked with various Japanese companies so far are also conceivable candidates. They include Indian construction companies and equipment installation companies. Information shall be collected from Japanese companies that have worked with them to find out if these Indian companies have any experiences in Nigeria. It shall be noted that even if a Japanese company enters into a joint venture with a local partner company, it still has to set up a local company in order to take part in the project in Nigeria.

7.1.6 Relationship with Other Transportation Modes

Currently, BRT, minibus, 3-wheeled taxi, and two-wheeled taxi are the main public transportation means in Lagos city. Among them, the minibus route network covers wide areas. Minibus is used by many citizens and it has many stakeholders. If a new urban railway is to be built, the impact on these stakeholders will be significant. Opposition movement may occur, affecting the progress of the project. The minibuses are managed by a union. The Nigerian side shall consult with the union to negotiate dividing the service areas to ensure smooth transition.

7.2 Design, Construction and Production Stage

Upon understanding the various risks related to the construction of infrastructure and development of E&M, we analyze measures that can facilitate the participation of Japanese companies in projects in Nigeria.

7.2.1 Land and Building Interference

Delay in land acquisition and unexpected increase in land acquisition cost can affect progress of the project as a whole.

The land for the Blue Line, the construction of which is currently underway, is prepared by the Nigerian side. If the same approach is used for the development of the Victoria Island Line, no problem is foreseen. However, contracts shall be prepared taking into consideration possible delays from land acquisition. In addition, detailed surveys and land demarcation works shall be carried out in advance.

➤ Victoria Island Line

Since the construction will take place inside the existing road sites, the problem of land acquisition will be small. If the AGT system is adopted, the alignment will have greater flexibility than the monorail. The obstacles related to land sites and buildings can be minimized. Depending on the section, bridges shall be installed above the narrow roads. The necessary measures shall be put in place to enable use of a certain portion of the car lanes or some of the sidewalks on the left and the right as car lanes during the construction. Certain private land may also need to be acquired. Since there are minibus junctions and stalls on the planned route, the Nigerian side shall take care of the relocation and compensation.



Source: Photographed by Study Team
Figure 7-3 Road that has Sufficient Space for Monorail
 (Ring Road (south coast) on Lagos Island)



Source: Photographed by Study Team
Figure 7-4 Road that requires works to build the Monorail
 (Ahmadu Bello Way on Victoria Island)



Source: Photographed by Study Team
Figure 7-5 Road that requires works to build the Monorail
 (Awolowo Road on Lagos Island)



Source: Photographed by Study Team
Figure 7-6 Vicinity of the Planned Line
 (Near Marina (CMS) on Victoria Island)

7.2.2 Ground Condition

The foundation type and the pile length of civil engineering structures, and the scale of soil improvement work will have great impact on the construction cost. If the foundation type and pile length are not estimated appropriately in the feasibility study stage, the construction cost may not be estimated appropriately.

Because the coastal areas of Lagos State, where the Victoria Island Line is planned, have many areas reclaimed from the lagoon, the support layer is deep down in the ground and the soil is soft. According to our interviews with LAMATA, local consultants, and local construction companies, the pile length of the Blue Line currently under construction is 20–40 m and the pile length of road viaducts on Victoria Island is about 35 m. There are also records showing that large-scale buildings on Victoria Island use piles 70 m in length.

Since ground changes in general are expected to be significant, high-density ground surveys (boring surveys) shall be conducted at an early stage in order to draw up a detailed plan for structures and to calculate the project cost accurately.

7.2.3 Utilities

There is the risk that utilities buried under the construction site may not have been taken into consideration due to a lack of information and other reasons and that during the implementation of the

project, these utilities may need to be relocated, thus incurring cost. In the case of an urban railway, in particular, discovery of unforeseen utilities underground during the detailed design stage or during construction will result in not only high relocation cost but also significant delay in the construction.

Since Victoria Island and Lagos Island are the biggest business areas in Lagos State, many utilities, including electricity, water, and communication lines, are expected to be buried underground. In addition to obtaining information materials from the utility companies in advance, relocation shall be carried out if necessary. Such measures can prevent increase in project cost and construction delays later on.

7.2.4 Contract

Construction of the Blue Line infrastructure, which is currently underway, uses the DB (Design-Build) method, which is close to the contents of the Yellow Book in FIDIC. Although the contract price in the Yellow Book is a lump sum, the contractor is guaranteed the right to receive additional payment if additional cost is incurred. Thus, the ordering party is responsible for any unforeseen physical conditions (utilities, etc.).

Use of the DBB (Design-Bid-Build) method, the Red Book, or the Yellow Book will be the acceptable condition for Japanese construction companies to participate in the project. On the other hand, the Silver Book is a full turnkey (FTK) contract. The contract price is a lump sum. The contractor is responsible for any unforeseen physical conditions. Since many of the Silver Book contents are unilateral and require the contractor to shoulder the responsibilities, use of the Silver Book shall be avoided if Japanese construction companies are to take part in the project.

7.2.5 Estimation

It is difficult to obtain information on the estimated unit prices of an overseas project from a partner country that will have the same levels of accuracy as the estimated unit prices in Japan. In addition, since the labor cost, the skill levels of the engineers, and the unit prices of materials are different, it is difficult to ensure the accuracy of estimation even after the local unit prices (labor cost and material costs) and exchange rate are used to adjust the Japanese estimated unit prices.

In particular, because Japanese construction companies do not have any experience of construction projects in Nigeria, it is very difficult for them to estimate the unit costs of equipment and labor, import, transport, taxation, and others costs accurately. When making entry to a new country, it is customary to take on a small project to verify risks first and to gain experience in preparation for bigger projects later on. In the case of Nigeria, such approach does not seem to be possible. Therefore, it is advisable to utilize local consultants and construction companies in Nigeria to increase the accuracy of estimation. Julius Berger, a German construction company that we interviewed for this Study, has been in Nigeria for nearly fifty years from 1965. Since it has carried out various construction works in Nigeria, it can estimate the project cost more accurately. If Japanese construction companies are to make entry, they shall enter into joint ventures with such local construction companies to reduce the risk in estimation.

7.2.6 Transport and Delivery of Materials and Equipment

No special problem is foreseen because the existing roads can be used for the transport and delivery of materials and equipment. The local partner companies can arrange the trucks for delivery.

7.3 O&M Stage

By finding out the potential risks in train operation and in the maintenance of infrastructure facilities, we analyzed measures to facilitate the participation of Japanese companies.

7.3.1 Demand and Project Scheme Type (PPP Project)

In the demand forecast performed during project formation and feasibility study, if the traffic flow data and socio-economic data, which are the premises for the demand forecast, are insufficient; if the accuracy of the data is low; or if the forecast method has problem, there is the risk that the demand forecast values will be overestimated. As a result, the actual demand in the O&M stage may become lower than expected and the railway operator will have to bear the risk (ridership risk) of operating in the red.

In a PPP project, the railway operator bears the ridership risk. It does not have any guarantee if the operation goes into the red. If both the railway operator and the public entities can shoulder a certain portion of the difference between the demand forecast and the actual number of users by setting an appropriate risk-sharing project scheme between the public and private sectors, then the risk can be reduced. For example, a PPP project with ridership guarantee is ideal. The approach to include the right to develop station vicinities, which leads to increase in revenue, shall also be considered. Among the LRT lines planned for Lagos State, one line adopted the PPP scheme. However, since the concessionaire did not perform, the project has been delayed significantly. Therefore, public works project shall be considered as one of the project scheme options.

In the O&M stage, the demand may fluctuate due to various factors other than the scientific methods, such as the demand forecast. Given the conditions specific to Lagos State, measures to enhance the understanding of railway use, to ensure safety onboard the trains, in stations, and in station vicinities, and so on shall also be considered.

7.3.2 Maintenance and Procurement of Spare Parts

Railway operation has challenges: the lack of operation and maintenance technologies makes it impossible to maintain rolling stock, track, and other sub-systems properly. The failure to procure spare parts required for the subsystems makes it impossible to perform maintenance. Even though products made by Japanese manufacturers have high quality, since only genuine spare parts can be used, the cost is high. The lead-time for procuring the spare parts is long. Some overseas railway operators have pointed out that the after-sale service of Japanese manufacturers is not sufficient because no local representatives are stationed in their countries. For these reasons, Japanese companies shall make efforts to improve the availability of spare parts and staffing system.

7.3.3 Security (Onboard, in Stations, and on Roads in Station Vicinities)

Currently, the railway lines operated by NRC in Nigeria cannot maintain the minimum level of safety and sanitary environment onboard. Nigerian citizens in general have the impression that “railway is a transportation means for the poor people.” Such image must be changed in order to ensure demand. It is necessary to improve safety not only onboard the trains but also in the stations and on roads near the stations.

The security technologies of Japanese manufacturers, such as high-performance camera and face recognition technology, can be utilized to enhance safety. Besides facilities, stationing guards onboard each car and other measures shall also be taken to improve the safety of passengers.



Source: Photographed by Study Team
Figure 7-7 Interior of an NRC Suburban Train



Source: Photographed by Study Team
Figure 7-8 A Street near a Blue Line Station

Chapter 8

Hosting of Workshops and Seminar in Nigeria

Chapter 8 Hosting of Workshops and Seminar in Nigeria

To enhance the understanding of our Nigerian counterparts about the Japanese urban railway system, to improve communication, and to share useful information, we offered two workshops in Lagos, one at the beginning of our first field survey and one at the end. We also offered a seminar in Lagos during our second field survey.

Through these two workshops and the seminar, we were able to report the results of this Study, deepen the understanding of the Nigerian side about the Japanese urban railways and Japanese railway technologies (especially the AGT system), and accomplish our original objective.

8.1 First Workshop

8.1.1 Workshop Overview

The first workshop was held to explain the objectives and contents of this Study to the concerned organizations in Nigeria, request their cooperation for the Study, explain the effectiveness in introducing public transportation means, and introduce Japanese urban railways. Table 8-1 gives an overview of the workshop.

Table 8-1 Overview of First Workshop

Date	Venue	Organizations in attendance ^(Note)	No. of participants ^(Note)
August 18, 2014 (Monday), morning	LAMATA conference room	<ul style="list-style-type: none"> ➤ LAMATA ➤ Lagos State Ministry of Economic Planning and Budget 	10 people

(Note) Nigerian side
Source: Compiled by Study Team



Source: Photographed by Study Team

Figure 8-1 Scenes from the First Workshop

8.1.2 Contents

The following shows the program of the first workshop:

10:00-10:05	Opening Remarks (1) Mr. Dotun Olusoga, Transportation Planner/Engineer, LAMATA
10:05-10:15	Opening Remarks (2) Mr. OISHI, Kensuke, Representative, JICA
10:15-10:35	Presentation (1) “The Second Data Collection Survey on Mass Rapid Transit in the Federal Republic of Nigeria” Mr. AKIYAMA, Yoshihiro, Team Leader, Japan International Consultants for Transportation
10:35-10:50	Presentation (2) “Countermeasures for Traffic Congestion in Metropolitan Areas” Dr. TAKEUCHI, Ryusuke, Japan International Consultants for Transportation
10:50-11:00	Video “Introduction of Japanese Urban Railway Systems”
11:00-11:15	Coffee Break
11:15-11:30	Presentation (3) “Urban Transport Systems in Japan” Mr. SAKON, Yoshimasa, Deputy Team Leader, Chuo Fukken Consultants
11:30-12:00	Discussion / Q&A session

8.1.3 Opinions of Participants, Q&A

(1) Opinions of Participants

- Opinions for the first workshop 【Speaker: Mr. Awolesi Olumide, Lagos State Ministry of Economic Planning and Budget】
- The Nigeria Railway Corporation (NRC) and State government agencies (Lagos State Ministry of Transport, Lagos State Ministry of Works and Infrastructure, Lagos State Lands Bureau, etc.), which are the relevant stakeholders, did not attend this workshop. The scale of the workshop seems small. I recommend engaging the stakeholders from an early stage.

(2) Q&A (Q: Questions from the Nigerian side, A: Answer from the Study Team)

1	Q	What does JICA think of involuntary relocation and land acquisition?
	A	Acquiring land in urban areas is very difficult. JICA has Guidelines for Environmental and Social Considerations. For this Study as well, we think that it is important to take into consideration the relocation of residents and other issues when we select routes.
2	Q	As I understand, this is a study to collect data. What level of study will be conducted? (Will a cost-benefit analysis be performed?) Please explain the JICA financing standards and policies.
	A	In this Study, we try to find out which routes have the potential to be eligible for assistance. If the Nigerian side agrees with the results of this Study, then we will carry out a feasibility study.
3	Q	Can Japanese companies take part in the project?
	A	This Study is carried out also to find out the interest of Japanese companies in making entry to Nigeria. Japanese companies can provide experts in many fields.
4	Q	LAMATA is hoping that investors will also get involved. Will JICA also provide assistance as an investor? Can Japan take part in a PPP?
	A	This Study collects various information, on the assumption that Japanese companies will also participate. We are reviewing projects in Nigeria that have used the PPP scheme.

5	Q	Does JICA also promote projects for other transport sectors?
	A	This time our focus is on the railway. If there is strong interest on the Nigerian side, JICA may take part in projects for other transport sectors in the future.

8.2 Second Workshop

8.2.1 Workshop Overview

The study team hosted the second workshop to report the results of the first field survey, to introduce Japanese railway technologies (AGT, EMU, and AFC) applicable to Lagos State, and to give examples of urban planning with the focus on railway stations. Table 8-2 gives an overview.

At the workshops, the Nigerian side was especially interested in AGT, among the Japanese railway technologies introduced at the workshops. There were lively discussions and exchange of opinions.

Table 8-2 Overview of Second Workshop

Date	Venue	Organizations in attendance ^(Note)	No. of participants ^(Note)
September 3, 2014 (Wednesday), morning	LAMATA conference room	<ul style="list-style-type: none"> ➤ LAMATA ➤ Lagos State Ministry of Economic Planning and Budget ➤ NRC ➤ Lagos State Ministry of Physical Planning and Urban Development ➤ Lagos State Ministry of Environment ➤ Lands Bureau 	21 people

(Note) Nigerian side

Source: Compiled by Study Team



Source: Photographed by Study Team

Figure 8-2 Scenes from Second Workshop

8.2.2 Contents

The following shows the program of the second workshop:

10:30-10:35	Opening Remarks (1) Prof. Olukayode Taiwo, Deputy Director (Safeguards), LAMATA
10:35-10:40	Opening Remarks (2) Mr. Agidani Gabriel. O., Consultant, JICA
10:40-10:55	Presentation (1) “The Findings of the Second Data Collection Survey on Mass Rapid Transit in the Federal Republic of Nigeria” Dr. LIM, Poh Soon, Infrastructure investment, Mitsubishi Research Institute
10:55-11:05	Presentation (2) “AGT system ~ Smart Solution for Urbanization ~” Mr. YAMAMOTO, Naohisa, Railway Technology (Infrastructure), Japan International Consultants for Transportation
11:05-11:15	Presentation (3) “EMU (Electrical Multiple Unit) in Japan” Mr. ENOMOTO, Akira, Railway Technology (E&M), Japan International Consultants for Transportation
11:15-11:30	Coffee Break
11:30-11:45	Presentation (4) “Passenger Convenience Oriented Solution ~ AFC~” Mr. YAMAUCHI, Yasuhiro, Urban Transport, Yachiyo Engineering
11:45-11:55	Presentation (5) “Urban Terminal Development ~ Toward Urban Development ~” Dr. TAKEUCHI, Ryusuke, Demand Forecast, Japan International Consultants for Transportation
11:55-12:30	Discussion / Q&A Session
12:30-12:40	Closing Remarks Dr. Frederic Oladeinde, Technical Advisor, Transport Planning, LAMATA

8.2.3 Opinions of Participants, Q&A

(1) Opinions of Participants

1) Comments on Presentation Materials

- Presentation 1 (Study report) Slide 6 “Decision Mechanism for State Rail Sector”: The main advisory organizations include also the Lands Bureau and the State Ministry of Environment. **【Speaker: Land Bureau】**

2) Comments on the Second Workshop **【Speaker: Dr. Frederic Oladenle, LAMATA】**

- It is a fantastic workshop participated by many relevant State government agencies. The Lagos State has just completed the Strategy Transport Master Plan. This workshop is held at the right time. The Plan lists BRT, LRT, cable car, and water transport as the means of transportation. The State is reviewing how to integrate these transportation modes in the future. In fact, a common ticketing system was introduced in a small scale nine months ago. It will be nice if the technology introduced recently can be successful.

- LAMATA is working closely with the Ministry of Physical Planning and Urban Development on development that integrates land use and transportation (especially the Lekki area). The development also includes the real estate near stations so that passengers can enjoy the benefits from using public transport.
- The Japanese experience in urban transport will be very helpful to Lagos as it is currently pursuing transportation projects. This marks the beginning of cooperation between JICA, Japan, Nigeria, and Lagos State.
- A workshop such as the one held today where important stakeholders are brought together to exchange opinions, share ideas, and make plans provides a very good opportunity for the government agencies because they have plans that impact each other. This approach has taken hold in Lagos State these days. I would like to see more discussion in the future.
- Participation of the private sector in the project is being promoted. Prior to that, the collaboration of relevant ministries and agencies is essential. The Lagos State government performs demand forecast so that the private sector can determine whether to participate in the project or not based on the results. If the targets of the private sector match those of the State government, then they can work together on the project.

(2) Q&A (Q: Questions from the Nigerian side, A: Answer from the Study Team)

1	Q	<ol style="list-style-type: none"> 1) Please comment on the safety of AGT (measures for handling emergency and accidents). 2) Do you plan to evaluate the effectiveness of and future impact from the introduction of the AGT system using data analysis, such as setting the scale of AGT based on the anticipated number of users, etc.? 3) The presentation is based generally on the experience and accomplishment of Japan. For example, what do you think of local issues specific to Lagos? 4) You explained that Japan (Tokyo) has approximately 16 million railway users per day. Have you set a target number of users for the AGT in Lagos? 5) What is your thought on an intermodal transport system using water transport, BRT, LRT, and others (including the ticketing system for transfers, etc.)?
	A	<ol style="list-style-type: none"> 1) Unlike the monorail, AGT can be used its own track as an evacuation route in an emergency. 2) We are currently reviewing the KPI (main performance indicator) and are planning to carry out an evaluation in the future. 3) We recognized that power supply is a problem and we believe that the Battery Power System and DEMU introduced in our presentation on EMU are two solutions. However, it may be difficult to introduce DEMU because diesel fuel is expensive. The Federal government has set 2020 as the target to improve electric supply. The situation will improve in the future. The Study Team will also continue to look for solutions. 4) We used Tokyo as an example of the solutions this time. We plan to set up targets from now on based on the situation in Lagos. 5) AFC can be used as a common ticket for all transportation modes. In addition, it is highly convenient because it can also be used in a variety of situations, such as for shopping. Japan had to pay the price for introducing this system. If individual ticket system is used at the introduction of each transportation mode, unifying them after 15 years will incur considerable cost. Therefore, it is advisable to adopt the AFC from the beginning.
2	Q	What is the reason that the “Potential for Cooperation” on the Red Line is low?
	A	The Red Line is in the built-up areas. From the viewpoint of environmental and social considerations, introducing the Japanese technologies is difficult. On the other hand, the Green Line is in newly developed areas. We think that there are many opportunities for development using new technologies. A feasibility study shall be conducted.
3	Q	What happens when an AFC card is stolen?
	A	Personal information is registered in the card. The user also pays about 5 USD as registration fee (in Japan). If the card is stolen and if the cardholder reports the loss immediately, the card’s functions up to that point will be stopped and a new card will be issued. It is a very reliable system and it provides convenience to users.

4	Q	What is the accident rate of the transport system that you presented?
	A	In Japan, a system is introduced after measures to stave off all conceivable accidents have been considered. For example, the shinkansen has had zero accident after its launch in the 1960s. The accident rate of the railway in Japan is very low, compared to those of the automobiles and airplanes.

8.3 Seminar

8.3.1 Overview

A seminar was held, as shown in Table 2, to report the results of this Study, present measures for mitigating congestion in cities, and introduce the AGT system. After the presentation of these themes, the seminar was divided into the planning team and the technical team for group discussion and exchange of opinions. LAMATA also gave a presentation on the revised master plan.

Table 8-3 Overview of Seminar

Date	Venue	Participating Organizations ^(Note)	No. of participants ^(Note)
October 28, 2014 (Tuesday)	PROTEA HOTEL IKEJA	<ul style="list-style-type: none"> ➤ LAMATA ➤ Lagos States Ministry of Economic Planning and Budget ➤ NRC ➤ Lagos States Ministry of Physical Planning and Urban Development ➤ Lagos States Ministry of Environment ➤ Land Bureau ➤ Lagos States Ministry of Transportation ➤ Lagos State PPP Office ➤ Debt Management Office ➤ Ajinomoto West African Seasoning Co. Ltd. ➤ Mitsubishi Shoji Kaisha (Nigeria) Ltd. ➤ Marubeni Nigeria Ltd. 	50 people

(Note) Nigerian side (including Japanese companies in Nigeria)



【Opening Remarks by LAMATA Managing Director】



【Presentation by Dr. Fred of LAMATA】



【Seminar】



【Group Discussion】

Source: Photographed by Study Team

Figure 8-3 Scenes from the Seminar

8.3.2 Contents

The seminar program is shown below.

9:30-10:00	Registration
10:00-10:05	Opening Remarks (1) Dayo Mobereola (Dr.) MD, Lagos Metropolitan Area Transport Authority (LAMATA)
10:05-10:10	Opening Remarks (2) Kensuke Ohishi (Mr.) Representative, JICA Nigeria Office
10:10-10:40	Presentation (1) “The Extension of the Strategic Transport Master Plan” Frederic Oladeinde (Dr.) Technical Adviser, Transport Planning, Lagos Metropolitan Area Transport Authority (LAMATA)
10:40-11:20	Presentation (2) “The Second Data Collection Survey on Mass Rapid Transit in the Federal Republic of Nigeria” Yoshihiro Akiyama (Mr.) Team Leader, Japan International Consultants for Transportation
11:20-11:40	Coffee Break
11:40-12:00	Presentation (3) “Countermeasures for Traffic Congestion in Metropolitan Area” Ryusuke Takeuchi (Dr.) Japan International Consultants for Transportation
12:00-12:45	Video “Introduction of Japanese Urban Railway Systems and AGT” Presentation (4) “Urban Transport Systems in Japan” Yoshimasa Sakon (Mr.) Deputy Team Leader, Chuo Fukken Consultants
12:45-12:50	Closing Remarks Ryo Yamaura (Mr.) Country Officer, Africa Division 1, Africa Department, JICA
12:50-13:30	Refreshment
13:30-14:45	Group Discussion

8.3.3 Questions and Answers regarding the Presentation

The following are the main questions and answers regarding the contents presented by the Study Team:

(Q: Questions from the Nigerian side, A: Answers from the Study Team)

1	Q	1) Confirmation as to whether Federal Ministry of Finance or Lagos State Ministry of Finance will be appropriate authority that would request for the financing loan? 2) What is the cost of the AGT project as against the cost of the monorail?
	A	1) Federal Ministry of Finance. 2) Further studies would reveal the actual cost of AGT project. However it is much cheaper than the monorail by at least 20%.
2	Q	What are the challenges for developing Mass Transit for movement of people in an congested area of cities?
	A	There are obvious challenges in such development in congested areas. The challenges would be amongst others the relocation of human activities from the area under development.
3	Q	1) How long will it take to construct the AGT for use? 2) Is the choice of the Victoria Island AGT route alignment arbitrary? 3) How do you intend to power the AGT scheme?
	A	1) After land acquisition, it is expected that the construction period would take between 2- 4 years depending on the soil situation of the area. 2) LAMATA gave alignment but it is subject to modifications or adjustment during further feasibility studies and construction. 3) It will be through separate power generations i.e generators. However when the power situation in Nigeria is stable and constant, the AGT scheme would be connected to the National grid.

8.3.4 Group Discussion

(1) Planning Team

1) Participating Organizations

State Ministry of Transport, State Ministry of Environment, State Ministry of Economy Planning and Budget, Land Bureau, and Mitsubishi Shoji Kaisha (Nigeria) Ltd.

2) Summary of Discussion

- Lagos has a transportation problem, which requires 3 to 4 hours for people to travel from residential areas to the city center during congestion. Three issues shall be considered: 1) the need for setting up terminals to connect the AGT with other lines, 2) six LRT plans, and 3) the way to move the project forward.
- LAMATA is implementing the transportation plan of the Lagos metropolitan area. Information of past plans (the Metroline that was abolished in 1985, etc.) shall be made available.
- The next step is for the Federal Ministry of Finance to request Japan to conduct a feasibility study. The Lagos State shall send a letter to the Federal Ministry of Finance.
- With regard to the participation of Japanese companies, given the project risks at this time, it is desirable to proceed on an ODA basis, rather than for the private sector to bear the risks on its own.

(2) Technical Team

1) Participating Organizations

LAMATA, Ministry of physical Planning and Urban Development, Ministry of Environment, Land Bureau, Nigerian Railway Corporation, Debt Management Office, Ministry of Transport, and Mitsubishi Shoji

2) Summary of Discussion

Discussion on the technical aspect of AGT was carried out. The following are the comments and questions from the participants:

- a) Comments on the seminar
 - This seminar was extremely interesting and informative. If this project materializes, it will contribute tremendously to the development of public transportation in Lagos.
- b) Cost of AGT (question)
 - Detailed review is needed; however, the cost of AGT is expected to be about 10–20% lower than that of the monorail.
- c) Construction period (question)
 - The construction works will take about 3–4 years.
- d) Collaboration with local companies during the construction of AGT (question)
 - Rather than for a Japanese construction company to undertake the project on its own, it is effective for it to enter into a joint venture with a local company (e.g. Julius Berger).
- e) Electricity supply for AGT (question)
 - Given the electricity supply situation in Nigeria, a power generation plant shall be set up for the AGT operation.
- f) Operation staff of AGT (question)
 - AGT is basically unmanned. It is operated by a few staff members at the Operation Control Center (OCC). There are also station workers at the stations and kiosks.
- g) Use of AGT for inter-city transport (question)
 - The Victoria Island Line is expected to operate inside the city. In the future, it can also be used as an inter-city railway line.
- h) Human resources development for AGT operation (question)
 - To enable technology transfer, Nigeria can send personnel to training facilities in Japan to receive training for about one year.

8.3.5 Summary of the Seminar

There were many questions and lively exchange of opinions during the presentation in the morning and group discussion in the afternoon. The Lagos State government agencies, in particular, showed great interest in the AGT. The superiority of AGT, in comparison with the monorail, was successfully conveyed.

Chapter 9

Recommendations and Challenges

Chapter 9 Recommendations and Challenges

9.1 Recommendations to Japanese Companies for Participating in Urban Railway Projects in Nigeria

From among the urban railways planned for Lagos, this Study selected the Victoria Island Line as potential route for cooperation between Japan and Nigeria in the future.

Since the Victoria Island Line requires an urban railway system that has little need for land acquisition and relocation or demotion of buildings during construction, AGT is the most suitable. AGT can negotiate sharp curves and offers flexibility in alignment planning. Japan leads AGT technology and the Victoria Island Line is a prospective candidate for AGT. The line shows great promise for Japanese companies to introduce Japan's cutting-edge urban railway technologies into Nigeria and establish Japan's presence there.

However, this Study has also identified issues that must be addressed in order to bring the line into reality. We recommend performing a feasibility study, on the premise of using yen loan, as the next step to pave way for Japanese companies to participate in the urban railway projects.

9.2 Main Focus of the Preliminary Study

The following are the main points of the feasibility study :

(1) Review Demand Forecast

The revised Master Plan has calculated the demand of each line in the long-term plan. The methods for data collection and for setting the preconditions show a reasonable approach in general. However, the rationale for the population growth rate, which is the premise of the demand forecast, as well as the setting of service level and the validity of the questionnaire survey have not been sufficiently examined. Therefore, the preliminary study shall verify the premise of the demand forecast and perform a Stated Preference Survey.

(2) Estimate Project Cost

This Study finds a big discrepancy in the per-km project cost between the revised Master Plan and the pre-feasibility study of the Purple Line and a possible overestimation of the project cost of the Victoria Island Monorail. A detailed estimation of the project costs shall be performed.

In the feasibility study, detailed interviews shall be conducted to find out from the Nigerian side the basis for estimating the project costs. Local construction companies and consultants shall be used to increase the accuracy of the project costs. In addition, officials at government agencies shall also be interviewed to collect data on the project costs of the existing facilities (road viaduct, Blue Line) in order to verify the validity of the project costs.

(3) Verify Ground Condition

Although we were able to establish a general understanding of the ground condition of the areas along the lines through interviews of local construction companies and consultants, we were not able to obtain detailed ground data. Since these target lines are generally prone to considerable ground changes, boring surveys shall be conducted frequently at an early stage so that detailed facilities plans can be made and project costs can be calculated accurately. It is also important to collect ground survey data of the neighboring areas.

(4) Review Facilities Plan

The social circumstances of Nigeria shall be taken into consideration when reviewing the facilities plan. In particular, since the power supply is not sufficient, the facilities shall be planned keeping in mind Nigeria's power plans and the need for installing the line's own power generation facility. Information materials on utilities shall be obtained from utility companies and field surveys shall be

conducted to estimate the buried pipes not indicated in the materials.

(5) Evaluate the Technical and Operational Levels of the Railway

The current railway technical level requires training from the basic level. For this reason, continued support is needed after the construction and the delivery of machinery and equipment. In the preparatory survey, the level of education and training required for each area (contents, staff level, duration, etc.) shall be researched. The operation of railway requires knowledge acquired from experiences. Since the Blue Line is still in the construction stage, Nigeria does not have any operation experience to use as reference. This is the biggest concern for Japanese companies if they were to make entry. A detailed study is needed.

(6) Policy for Land Acquisition, Establishment of a System

The implementation policies and systems for land acquisition are found to be very different between the Blue Line and the BRT projects, both of which are existing LAMATA projects. In the case of the Blue Line, although the implementation contents are based on the laws of Nigeria and the policies of the State government, certain parts of the implementation system and the process, such as the Resettlement Policy Framework (RPF) and the Resettlement Action Plan (RAP), are to be clearly identified as World Bank projects stipulate.

In the preparatory survey, LAMATA shall be consulted to discuss in detail the implementation system and policy for land acquisition of the selected routes. LAMATA has safeguard experts in residence. It is believed to have the capacity to implement environmental and social considerations in line with international good practices through World Bank projects. It is important to work closely with LAMATA in future studies.

(7) Relocation of Residents, Anticipated Scale and Degree

No matter whether they are legal or illegal, many shops, stalls, vendors, minibuses, and taxi bikes are conducting businesses along the various routes. In the case of the Blue Line, illegal shops and vendors are not eligible for compensation according to the legal system. On the other hand, the illegal shops and vendors are eligible for compensation in the case of the BRT projects according to OP4.12. In addition, it cannot be denied that non-residents may exist in the project areas.

In the future, as we proceed to conduct a study on environmental and social considerations, it is important to determine if there will be resettlement of residents at the selected route and anticipate the scale and degree. Therefore, a socio-economic survey shall be performed to identify the scope of stakeholders to be compensated. A resettlement plan shall be prepared, if necessary.

(8) Verify Project Components

Similar to the Blue Line, the State government will undertake any road expansion associated with the construction of the selected route as a separate project. From the viewpoint of the JICA environmental and social considerations, resettlement and land acquisition are integral parts of the project. Therefore, resettlement and land acquisition shall be undertaken with environmental and social considerations. According to interviews with LAMATA, car depots are expected to be constructed for each line. Due to the power supply situation, possibility of the need to install a power generation facility for each line cannot be denied. Thus, these project components and related projects shall be examined thoroughly and their environmental and social effects shall be considered in the feasibility study.

(9) Review Project Scheme and Perform Economic Analysis

From the exchanges of opinions with Japanese companies, the Study finds the condition for Japanese companies to make entry into Nigeria with a Japanese yen loan project. An ideal project scheme will be to use yen loan for both infrastructure and E&M. However, the requirement for infrastructure projects on the Nigerian side is PPP. In the feasibility study, the project scheme shall be worked out with the Nigerian side. Since there is an example of a PPP project being delayed significantly because of the concessionaire and the possibility of not having the companies with the necessary technologies participate in the project due to concern of ridership risk after the start of service, implementing the

project as a public works project shall also be considered as one of the alternatives.

In addition, an economic analysis shall be conducted to show a financial analysis based on an appropriate project scheme and the social validity of the project.

(10) Analyze the Risks for Japanese Companies to Participate in the Project

The security situation in Nigeria will be a major factor for Japanese companies to determine whether to make entry or not. In the feasibility study, construction companies that are carrying out construction in Nigeria shall be interviewed to find out the security issues. In particular, it is necessary to inquire about the specific security measures, safety measures, theft prevention measures, and so on in order to clarify issues regarding the entry of Japanese companies into Nigeria.

9.3 Challenges for Future Review

9.3.1 Collaboration with the Federal Government

The Federal Ministry of Finance holds the key to the process, from the decision to take out an external debt (borrowing of yen loan) to the approval of “The Borrowing Plan” . If the project entity is the State government, it is required to obtain an informal consent from the Federal Ministry of Finance in advance. This step is a key factor.

The approval process of “The Borrowing Plan” that we verified in this Study is only a general process. The actual process is not limited to this. Depending on the person in charge at the Federal Ministry of Finance and the timing, the situation may vary substantially. In fact, the actual process is not transparent at all.

In order to facilitate implementation of the proposed contents, a route development proposal shall be prepared as soon as possible in the preliminary study, which is to be implemented next, based on the contents of this Study. After that, a forum shall be set up for the state agencies cited in this Study and the Federal government (Federal Ministry of Finance and Federal Ministry of Transport) so that they can hammer out the contents and form consensus.

The project entity (LAMATA) and the State government (Governor Office, etc.) shall make contact with the Federal Ministry of Finance as early as possible and continue to approach the Ministries. In this case, it is also effective to have the Federal Ministry of Transport to act as a go-between.

9.3.2 Promote Understanding of the AGT System

This Study recommends the AGT system as the most suitable public transportation system for the Victoria Island Line. Compared to the monorail, the AGT system 1) can negotiate small curve radius and steep gradient, giving it an advantage in the alignment plan; 2) has small load (axle load) and the production of girders is not complicated, giving it an advantage in construction cost; and 3) provides a convenient evacuation route in an emergency. Therefore, AGT is a more suitable public transportation system than the monorail.

In the workshops and seminar, when we introduced the AGT technology, the Nigeria side showed a great deal of interest. However, since AGT is a new technology to the concerned parties in Nigeria, they may not have developed a full understanding of the technology. Efforts shall be made to enhance the understanding of the Nigerian side about the technical aspect of AGT in order to facilitate adoption of the AGT.

9.3.3 Enhance Understanding of the Superiority of the Japanese Urban Railway Systems

In the two workshops held in the first field survey and the seminar held in the second field survey, we presented the Japanese urban railway systems and we believe that the Nigerian side has gained certain understanding of the superiority of the Japanese urban railway systems. In the future, training programs in Japan shall be offered through JICA to enhance further the understanding of Nigerian railway personnel about the superiority of the Japanese urban railway systems.

