

Kenya National Highways Authority (KeNHA)

PREPARATORY SURVEY  
ON  
MOMBASA CITY ROAD DEVELOPMENT PROJECT  
IN  
THE REPUBLIC OF KENYA

FINAL REPORT

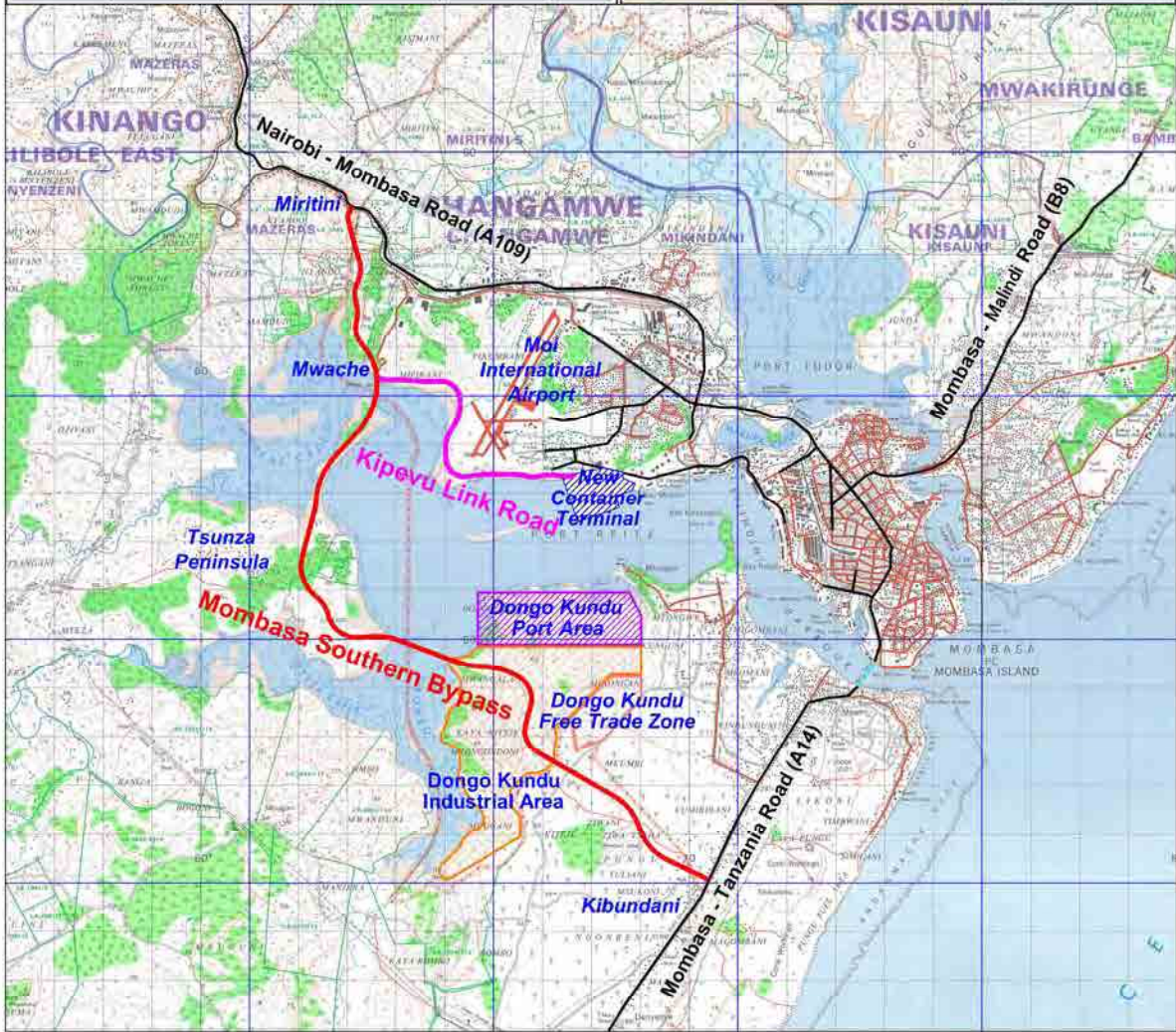
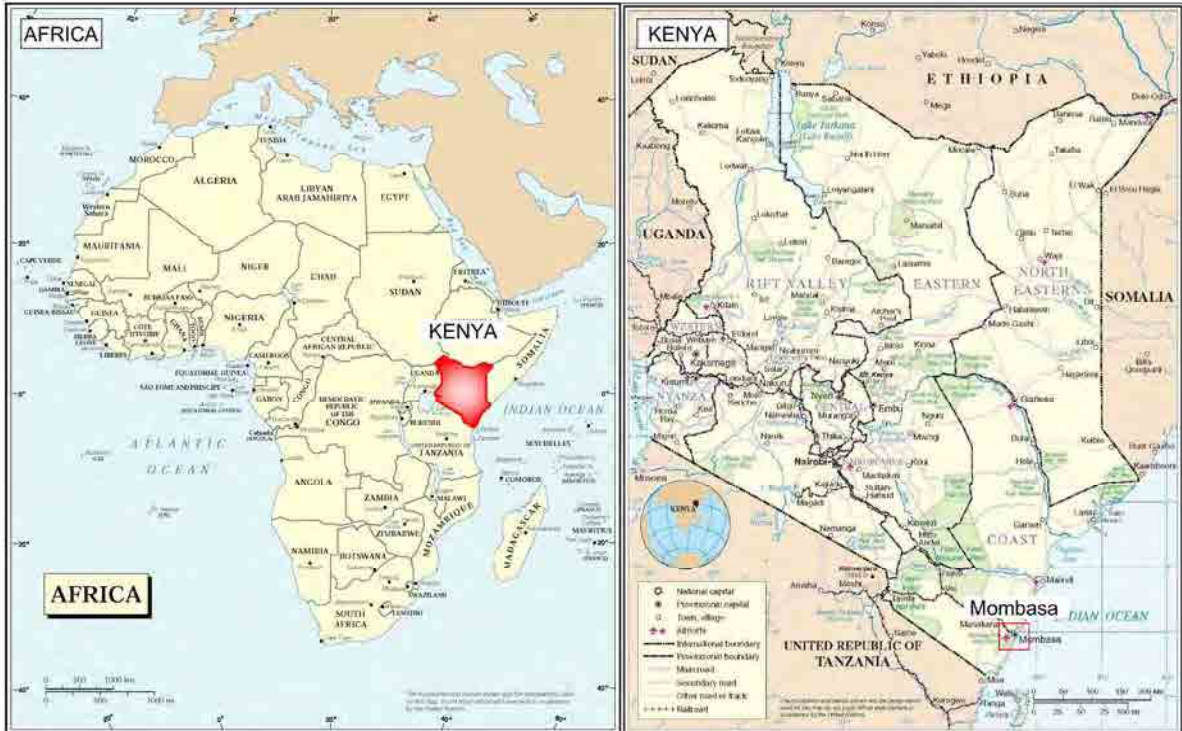
NOVEMBER 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

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KATAHIRA & ENGINEERS INTERNATIONAL

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Location Map



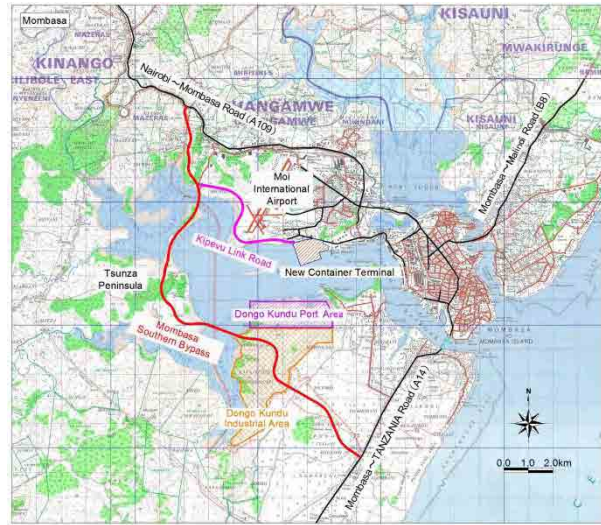
## SUMMARY

### Outline of the Project

The Project is to construct Mombasa Southern Bypass (19.8km) and Kipevu Link Road (5.7km) to facilitate transportation of goods and passengers in Kenya and neighbouring countries for achieving economic and social development in Kenya and neighbouring countries.

### Objectives of the Preparatory Survey

To review the project data currently available from the viewpoints of environmental and social consideration, engineering appropriateness, and financial and economic feasibility; to conduct supplemental survey to facilitate formation of the Project.



Source: JICA Survey Team

**Figure 1 Project Road Location**

### Socio-economic Condition of Kenya and Neighboring Countries

GDP and GDP per capita in Kenya and the neighboring countries have steadily grown in recent years (Table 1).

**Table 1 GDP and GDP Per Capita**

Country	GDP (US\$ Million)			GDP Per Capita (US\$)		
	2000	2005	2010	2000	2005	2010
<b>EAC Counties</b>						
Kenya	12,316	18,739	32,163	399	547	809
Uganda	6,196	9,223	17,011	253	321	501
Tanzania	9,550	13,724	22,671	284	366	548
Burundi	709	801	1,489	110	106	180
Rwanda	1,718	2,590	5,602	214	286	562
<b>Other Neighboring Countries</b>						
Ethiopia	8,176	12,307	39,717	124	165	350
Sudan	12,365	27,386	68,441	397	776	1,705
DR. Congo	4,303	7,183	13,125	79	118	186

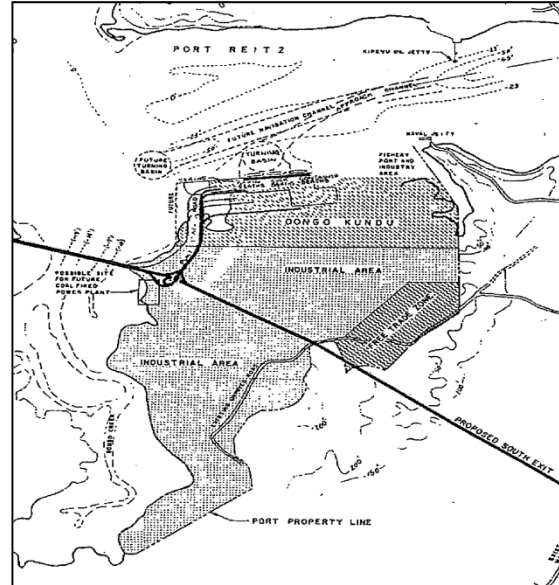
Source: World Economic Outlook Database, Oct. 2010, IMF

### Development Plans in the Project Area

The First Medium Term Plan (2008-2012) is the first phase of “Kenya Vision 2030”. The Plan includes the strengthening of the institutional framework for infrastructure development; raising the efficiency and quality of infrastructure as well as increasing the pace of implementation of infrastructure projects. The major targets are as follows:

- To have 64,599 km of well-maintained and motor-able roads with a total of Ksh. 186 billion for road construction and upgrade during 2008-2012 period.
- Over the same period, the Government will grant concession to many toll roads to be built by the private sector.

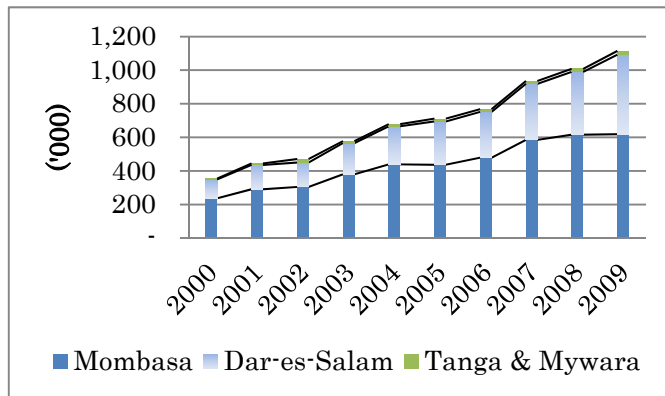
- A new transport corridor linking Lamu, Ethiopia, Sudan and Somalia through constructing second port at Lamu will be developed and implemented through Build Own, Operation and Transfer (BOT) arrangement at a cost of US\$ 15-20 billion while a free port at Dongu Kundu in Mombasa will also be developed (Figure 2).
- Other major transport infrastructure projects will be Rapid Bus Project and Light Rail System in Nairobi Metropolitan area.



Source: Dongo Kundu Development by Van Houten, 1989  
**Figure 2 Dongo Kundu Development Plan**

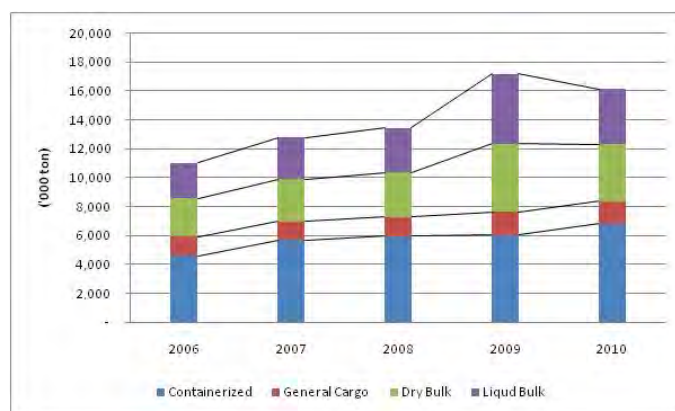
**Freight Transportation Condition**

Figure 3 show the regional container port demand. Among these ports, the Mombasa Port can be identified as regional hub port. However, taking into account of recent growth of Dar-es-Salam, it is urgently needed to strengthen Mombasa Port with its related infrastructure.



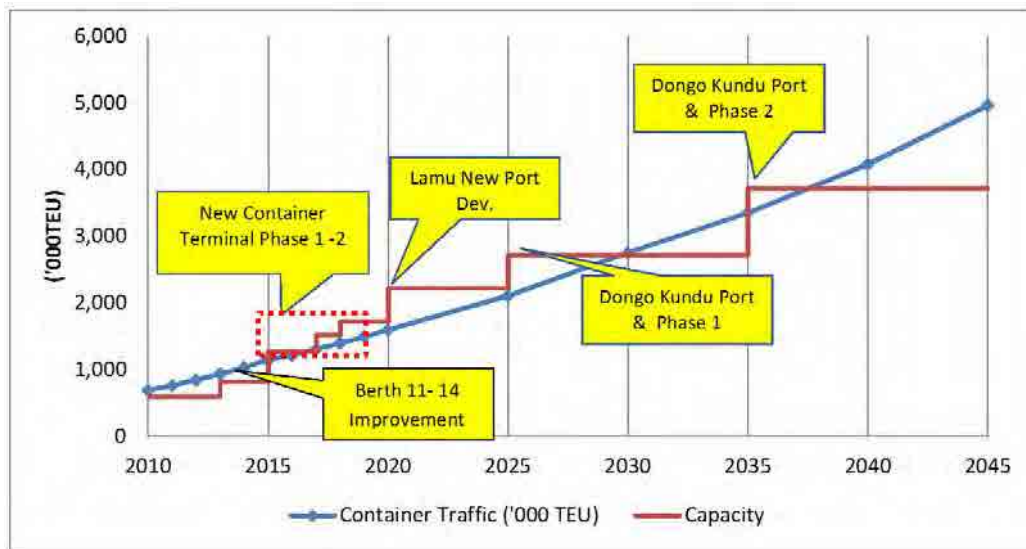
Source: Port of Mombasa Strategic Review, Dec. 2010  
**Figure 3 Regional Container Port Demand**

Mombasa Port handles containerized cargoes, general cargoes, dry bulk and liquid bulk. In 2010, total throughput of the port was 18.8 million ton, which has been growing at average annual growth rate of 9.6 % from 2006 to 2010 (Figure 4).



Source: Kenya Port Authority Annual Review and Bulletin of Statistics 2010  
**Figure 4 Mombasa Port Traffic by Cargo Type**

Figure 5 shows potential port demand vs capacity of Kenya Port (Mombasa Port and planned Lamu Port).

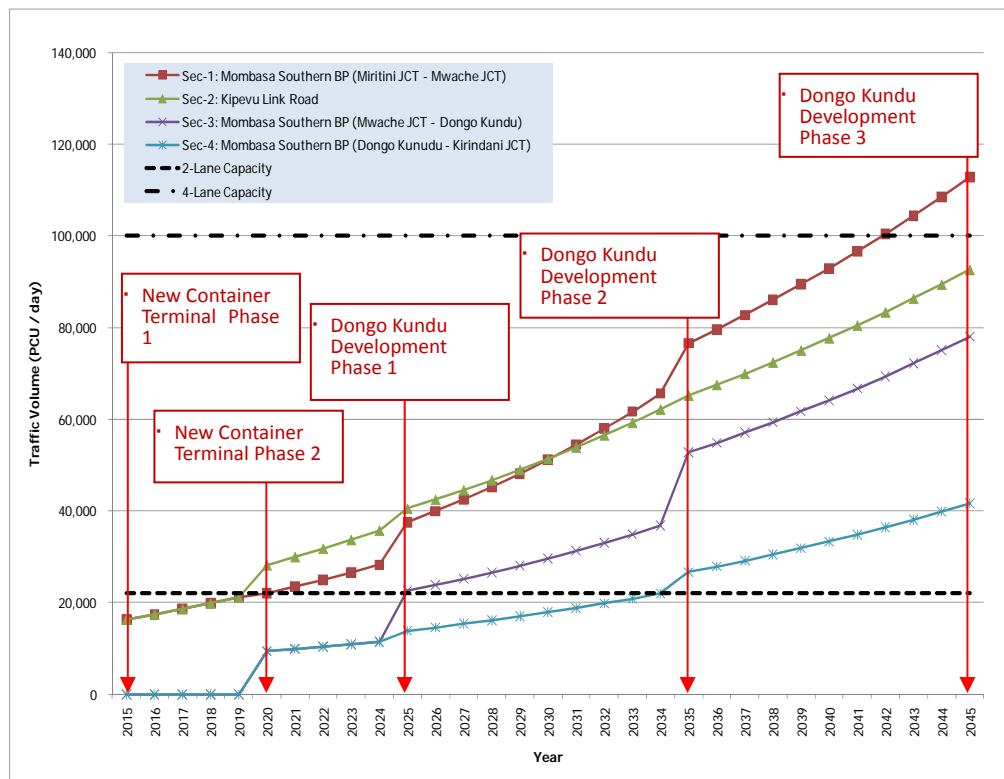


Source: Capacity of Kenya Port; Port of Mombasa Strategic Review

**Figure 5 Potential Port Demand vs Capacity of Kenya Port**

### Traffic Demand of the Project Road

The estimated present and future traffic volume by the Project road section is shown in Figure 6.



Source: JICA Survey Team

**Figure 6 Transition of Future Traffic Volume**



## **Transportation Infrastructure Development Projects Assisted by Other Donors in Mombasa Area and along the Northern Corridor**

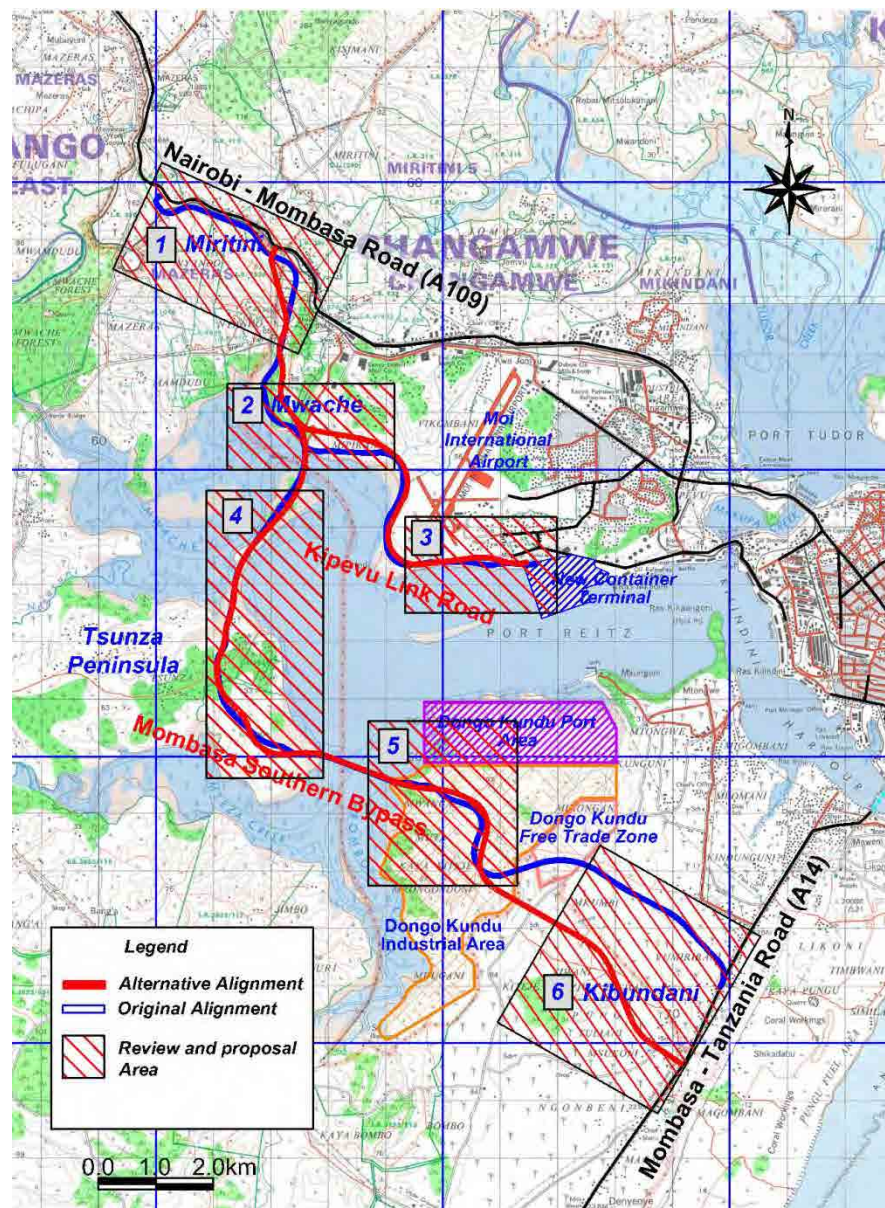
The major projects assisted by foreign donor are as follows:

- Thika Highway Improvement Project (AfDB)
- Northern Corridor Transport Improvement Project (IDA and NDF)
- Feasibility study and detailed engineering design of Malindi-Mombasa-Lunga Lungu-Tanga-Bagamoyo Road (EAC)

### **Basic Design of the Project Facilities**

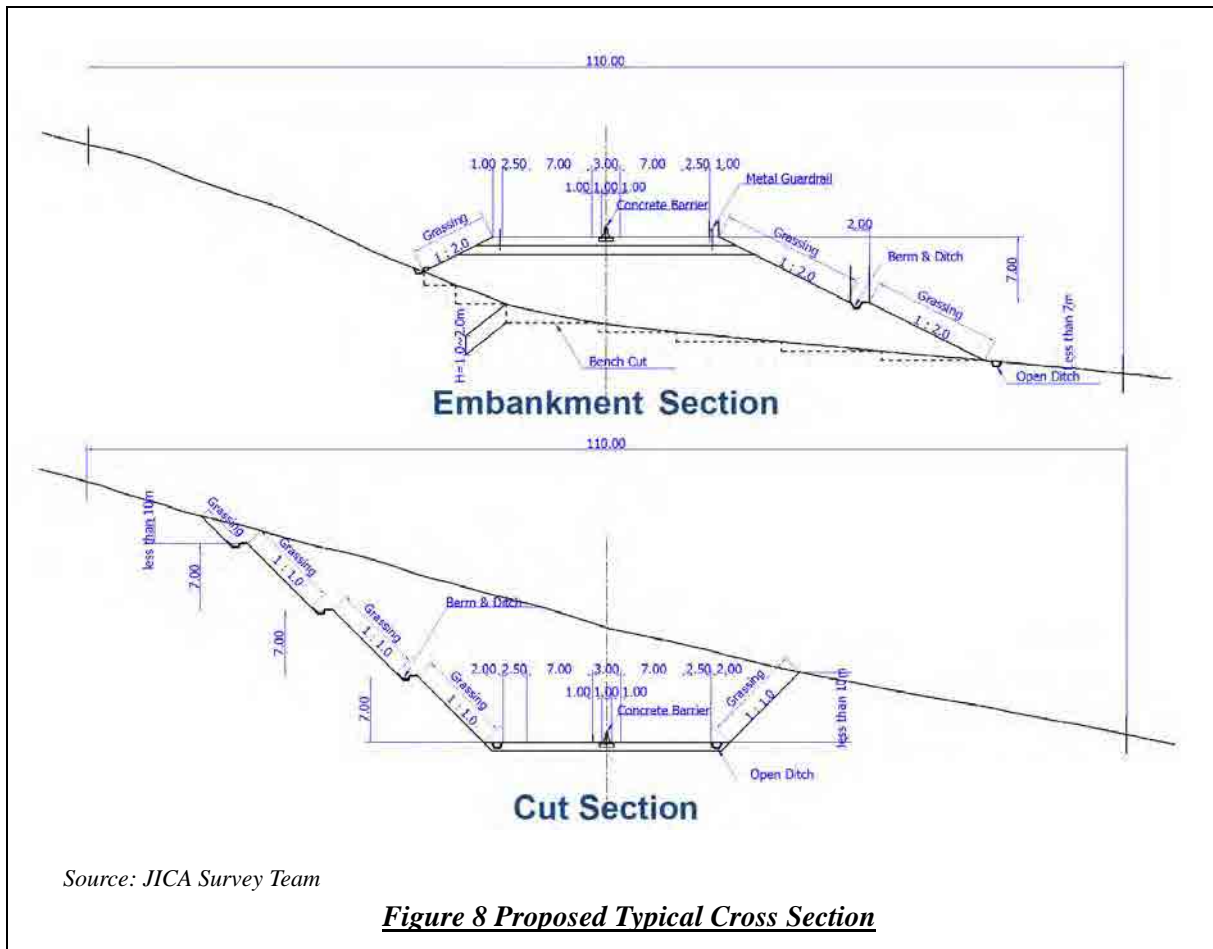
The road alignment proposed in F/S (original alignment) was reviewed and an alternative road alignment was proposed (Figure 7).

The proposed typical cross sections are shown in Figure 8.

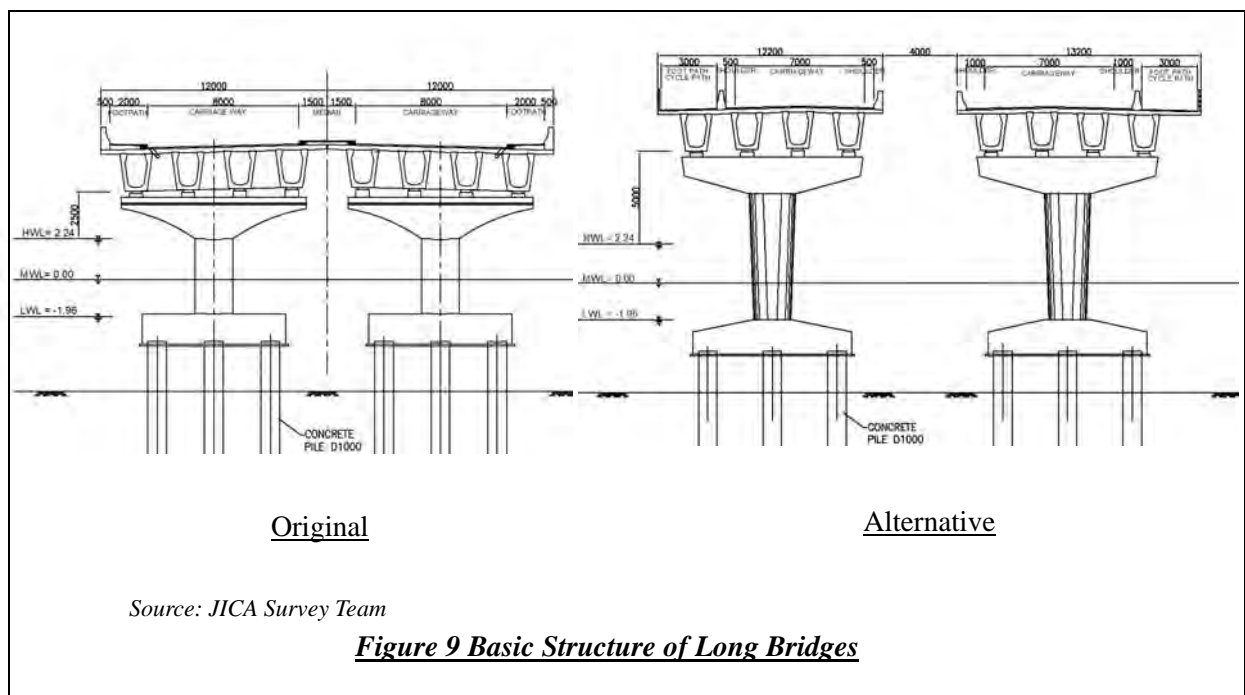


Source: JICA Survey Team

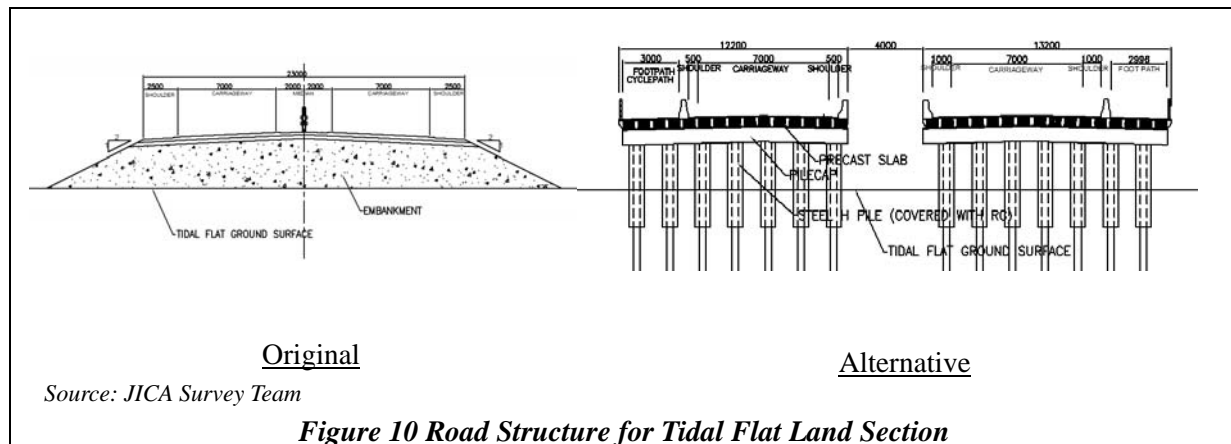
***Figure 7 Review and Revision Project Road Alignment***



Basic structure of the long bridges (Mwache Bridge: 900m and Mteza Bridge: 1,450m) was reviewed and the alternative plan was proposed (Figure 9).



A 1,300m long pile-slab viaduct was proposed for the tidal flat land section instead of the embankment originally proposed (Figure 10).



## Project Cost

**Table 2 Project Cost**

Item	FC & Total: million Yen, LC: million Ksh		
	FC	LC	Total
<b>A. ELIGIBLE PORTION</b>			
<b>I ) Procurement / Construction</b>	8,444	19,251	23,845
Package1 :Miritini-Mwache-Kipevu	257	6,388	5,367
Package2 :Mwache-Tunza-Mteza	6,624	4,544	10,259
Package3 :Mteza-Kibundani	244	1,704	1,607
Utility Relocation	0	0	0
Base cost for JICA financing	7,125	12,636	17,233
Price escalation	551	4,865	4,444
Physical contingency	768	1,750	2,168
<b>II ) Consulting services</b>	1,425	2,461	3,394
Base cost	1,226	1,684	2,573
Price escalation	70	554	512
Physical contingency	130	224	309
<b>Total ( I + II )</b>	9,869	21,712	27,239
<b>B. NON ELIGIBLE PORTION</b>			
<b>a Procurement / Construction</b>	2,111	5,190	6,263
Package1 :Miritini-Mwache-Kipevu	64	1,597	1,342
Package2 :Mwache-Tunza-Mteza	1,656	1,136	2,565
Package3 :Mteza-Kibundani	61	426	402
Utility Relocation	0	285	228
Base cost	1,781	3,444	4,537
Price escalation	138	1,274	1,157
Physical contingency	192	472	569
<b>b Land Acquisition</b>	0	1,553	1,242
Base cost	0	1,211	969
Price Contingency:	0	201	160
Physical contingency	0	141	113
<b>c Administration cost</b>	0	2,172	1,737
<b>d VAT</b>	0	0	0
<b>e Import Tax</b>	0	0	0
<b>Total (a+b+c+d+e)</b>	2,111	8,915	9,243
<b>TOTAL (A+B)</b>	11,980	30,627	36,482

Note: Exchange Rate: 1US\$ = 96.4 Ksh, 1US\$= 76.8 Yen

Source: JICA Survey Team

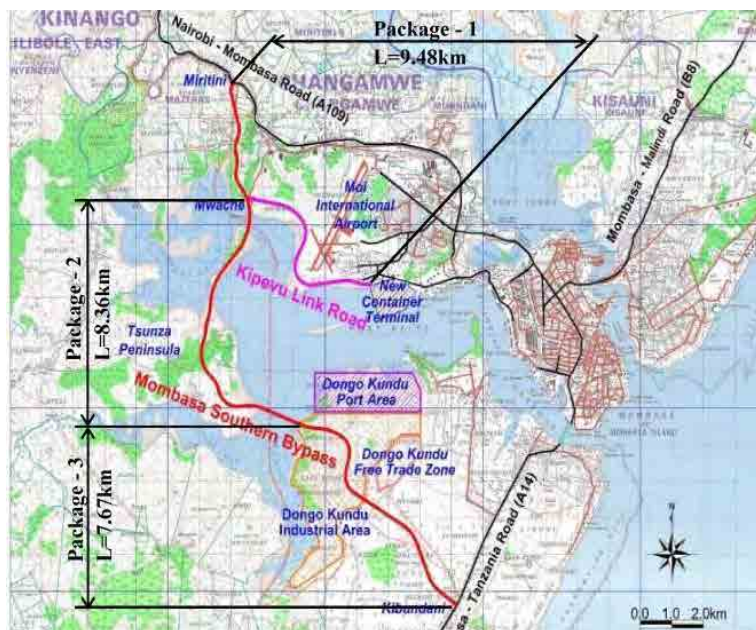


## Project Implementation Schedule

***Table 3 Proposed Project Implementation Schedule***

	2012	2013	2014	2015	2016	2017	2018	2019
Loan Agreement								
Selection of Consultant	■	(10M)						
Land Acquisition		■	■	(26M)				
Utility Relocation		■	■	(18M)				
Detailed Design								
Package-1: Miritini - Mwache - Kipevu		■	(9 M)					
Package-2: Mwache -Tunza - Mteza		■	(12 M)					
Package-3: Mteza - Kibundani		■	(9 M)					
Tendering								
Package-1: Miritini - Mwache - Kipevu		■	(15M)					
Package-2: Mwache -Tunza - Mteza		■	(15M)					
Package-3: Mteza - Kibundani		■	(15M)					
Construction								
Package-1: Miritini - Mwache - Kipevu			■	(24 M)				
Package-2: Mwache -Tunza - Mteza			■	■	(41 M)			
Package-3: Mteza - Kibundani			■	■	(24 M)			

Source: JICA Survey Team



Source: JICA Survey Team

***Figure 11 Project Packaging***

## Procurement and Construction Plan

This project is expected to be implemented with Japanese ODA loan. The employment of consultant and procurement of goods and services under the project financed by ODA loans from JICA will be carried out in accordance with the general principles and procedures stipulated in the Guidelines for the Employment of Consultants under Japanese ODA Loans and Guidelines for Procurement under Japanese ODA Loans, respectively. The way how the guidelines are to be applied specifically to the Project is to be stipulated in the Loan Agreement.

### **Technical and Financial Capacity of the Implementing Agency**

KeNHA has many experiences having implemented national highway development projects such as Nairobi - Thika Road Project and Northern Corridor Transport Improvement Project all of which are very similar to this Project. Therefore, KeNHA is technically capable of implementing the Project.

KeNHA was established by the Kenya Roads Act, 2007. The financial statement of KeNHA was reported for period from April 2009 to June 2010. By assessing available financial record, KeNHA has sound financial capacity.

### **Project Implementing Organization**

KeNHA is the implementing agency of this Project. Special Project Department of KeNHA, currently responsible for Northern Corridor Transport Improvement Project (NCTIP) together with the Feasibility Study on Mombasa Bypass, is designated to assume this Project.

### **Operation and Performance Indicators**

Operation indicators are average traffic volume of goods and passenger vehicles. Effect indicators are established in order to monitor the project performance and effectiveness (Table 4). The targets of the indicators are set for post evaluation of the Project.

***Table 4 Effect Indicators***

Objective of the Project	Indicators
To facilitate transportation of goods and passengers	<ul style="list-style-type: none"><li>• Good vehicle traffic volumes</li><li>• Passenger vehicle traffic volumes (Both are operation indicators)</li></ul>
To dissolve road traffic congestion	<ul style="list-style-type: none"><li>• Traffic congestion degree (VC ratio)</li></ul>
To improve transport efficiency	<ul style="list-style-type: none"><li>• Travel time and / or</li><li>• Travel Speed</li></ul>
To promote regional development	<ul style="list-style-type: none"><li>• Progress of Dongo Kundu development</li><li>• Increase in population in Kilindini District</li><li>• Increase in tourists in Kilindini District</li></ul>

*Source: JICA Survey Team*

### **Qualitative Effect of the Project**

Major qualitative effects of the Project are as follows:

- Promotion of poverty reduction
- Promotion of Dongo Kundu Port and industrial development
- Reduction of freight transport related facilities congestion
- Promotion of tourism development

## **Economic Analysis**

Evaluation of the economic viability is done through three approaches using social discount rate of 12.0%. Compared with such discount rate, it can be said that economic viability is secured to be an appropriate feasibility level (Table 5).

***Table 5 Result of Economic Analysis***

Economic Indicators	
EIRR (%)	20.21%
BCR	2.84
NPV (US\$'000)	419,371

*Notes: 1) Project life is assumed to be 30 years*

*2) Adopted discount rate is 12.0 %*

*Source: JICA Survey Team*

## **Risk Analysis**

The major risk factors of the Project are as follows:

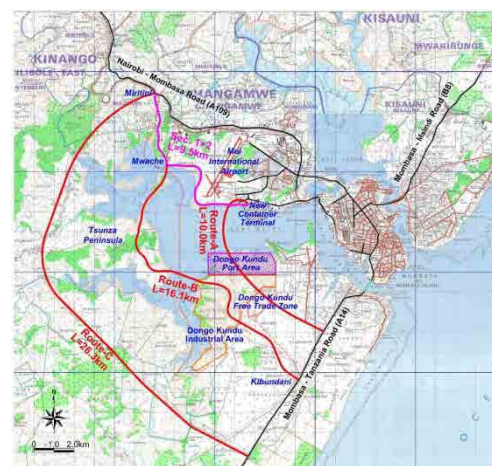
- Cost escalation
- Politics
- Negative impacts on natural environment
- Negative impacts on social environment
- Delay of related development projects
- Internal factors (negative campaign, accident, etc.)
- External factors (natural disaster, socioeconomic condition change, etc.)

## **Comparison of the Bypass Route Alternatives**

There are 3 alternative bypass routes as shown in Figure 12. A comparison was made from the aspect of environmental and social impacts, project cost, economic indices, etc. As a result, the justification of the selection of Route-B was confirmed.

## **Countermeasure against Increase of HIV/AIDS Risk**

During the implementation of the Project, many workers flow into the site where some of them may be affected with HIV. In order to prevent them from being infected with HIV, provision of safety devices as short-term measures and awareness-raising through education/seminar for the workers and residents as long-term measures are recommended to be undertaken in cooperation with National AIDS Control Council (NACC).



*Source: JICA Survey Team*

***Figure 12 Alternative Bypass Routes***



### **Consulting Service**

Consultancy services are required to support the implementing agency in such stages as the detailed design, pre-construction and construction. It is herewith recommended that the consulting services in all phases of the project be carried out by a competent Consultant. A draft TOR of the consulting services is shown in Appendix 7.

### **Environmental Impact Assessment (EIA)**

KeNHA submitted the EIA report to NEMA in October 2010. At the end of May 2011, NEMA asked the public to submit comments on the EIA report within thirty days, if they have any.

The JICA survey Team has examined the EIA report in accordance with the JBIC Guidelines. The JICA Survey Team carried out the following supplemental environmental surveys after reviewing the results and items to be improved in the EIA report.

- Ambient air quality survey
- Noise survey
- Flora and fauna survey
- Sediment quality survey

The EIA report has been reviewed by NEMA and a licence was issued on 17 November 2011.

### **Resettlement Action Plan (RAP)**

The number of PAPs of the original alignment and proposed alignment is shown in Table 6.

***Table 6 Number of PAPs and Project Affected Structures of  
the Original Alignment and Proposed Alignment***

Category	Unit	Original Alignment	Proposed Alignment	Difference
Land Owner	Person	597	459	-138 (23%)
Project Affected Population	Person	3,340	3,067	-273 (-8%)
House, Shed	No.	370	226	-144 (-39%)
School	No.	2	0	-2 (-100%)
Mosque	No.	2	0	-2 (-100%)
Church	No.	1	0	-1 (-100%)
Fisherman	Person	220	250	+30 (+14%)
Fish Farmer	Person	No Data	21	N/A
Famer	Person	No Data	407	N/A
Boat Operator	Person	No Data	6	N/A
Canoe Operator	Person	No Data	11	N/A
Boba-boda Operator	Person	No Data	38	N/A
Conservation Group	No.	No Data	30	N/A
Economic Tree	No.	21,949	14,413	-7,536 (-34%)

Source: Draft RAP Report Mouchelparkman in association with CAS Consultant Ltd and Supplementary RAP

## Assistance for the Stakeholder Consultation Meeting

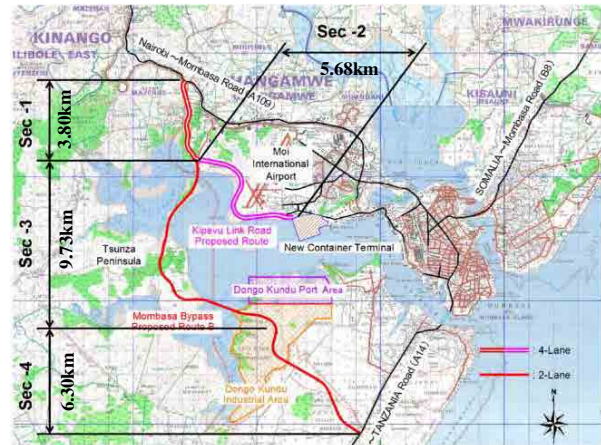
A total of 15 stakeholder consultation meetings were organized and held by KeNHA in order to collect opinions and views from PAPs.

## Recommendation

### Stage Construction

Stage Construction is recommended from the view point of traffic capacity and economic feasibility. The appropriate timing of widening of Section 3 & 4 into 4-lane depends on future development of Dongo Kundu Area which is expected to be promoted around 2025.

- Phase-1: Construction of Section 1 & 2 with 4-lanes and Section 3 & 4 with 2-lanes
- Phase-2: Widening of Section 3 & 4 into 4-lanes



Source: JICA Survey Team

**Figure 13 Stage Construction Section**

### Timely implementation of RAP

A large size of resettlement of affected houses and land acquisition are required for the Project. To implement the project without delay, smooth implementation of resettlement and land acquisition is the key for which the following are recommended:

- Establish RAP committee composed of representatives from the related government organizations and local communities to coordinate and implement the resettlement and land acquisition.
- Establish RAP implementing team at the Project site under KeNHA to conduct the negotiation for compensation for resettlement and land acquisition
- Assign a sociologist within consultant team to assist and monitor the resettlement and land acquisition. Periodic report should be prepared by him or her.

### Preservation of Natural Environment

The Project road runs through mangrove forest and tidal flat lands. Measures should be taken to preserve the natural environment.

- Contractor's registration of ISO14000s (Environmental Management System) should be one of the qualification.
- Contractor's construction plan regarding environmental preservation should be strictly evaluated as one of the tendering evaluation criteria.
- An environmental specialist should be assigned in the consultant team to inspect for the work to be done in accordance with the EIA monitoring plan.

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# PREPARATORY SURVEY ON MOMBASA CITY ROAD DEVELOPMENT PROJECT

## *Final Report*

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- 10 Results of Supplementary EIA Survey
- 11 Supplementary Environmental Impact Assessment (EIA) Report
- 12 JBIC Environmental Checklist
- 13 Supplementary Resettlement Action Plan (RAP)

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## LIST OF ABBREVIATIONS

AAGR	Average Annual Growth Rate
AfDB	African Development Bank
AGOA	African Growth Opportunity Act
BCR	Benefit Cost Ratio
BOT	Build Operation and Transfer
BMMS	Bridge Maintenance Management System
BSIMS	Building Sector Information Management System
CBR	California Bearing Ratio
CDS	Corridor Diagnostic Study
CFSs	Container Freight Stations
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
EARNP	East African Road Network Project
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMCA	Environmental Management and Coordination Act
GDP	Gross Domestic Product
GoK	Government of Kenya
GPS	Global Positioning System
ICB	International Competitive Bidding
IDA	International Development Association
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KAA	Kenya Airports Authority
KCA	Kenya Civil Aviation Authority
KEDAP	Kenya Energy Development and Access Project
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KNASP III	Kenya National AIDS Strategic Plan 2009/10-2012/13
KNBS	Kenya National Bureau Statistics
KPA	Kenya Port Authority
KRB	Kenya Road Board
KURA	Kenya Urban Road Authority
KWS	Kenya Wildlife Service
LATF	Local Authorities Trust Fund
MoR	Ministry of Road
NACC	National AIDS Control Council
NCTIP	Northern Corridor Transport Improvement Project
NDF	Nordic Development Fund
NEMA	National Environment Management Authority
NOx	Nitrogen Oxide
NEPAD	New Partnership for Africa's Development
NPV	Net Present Value
ODA	Official Development Assistance
OP	Operational Policy

---

PAPs	Projected Affected Persons
PCU	Passenger Unit
PMMS	Pavement Maintenance Management System
PMU	Project Management Unit
RAP	Resettlement Action Plan
RIMS	Roads Information Management System
RMLF	Road Maintenance Levy Fund
ROW	Right of Way
RSIP	Road sector Investment Programme
RUC	Road User Cost
SADC	Southern African Development Community
SPM	Suspended Particulate Matter
TTC	Travel Saving in Time Cost
DFID	U.K. Department for International Development
USAID	U.S. Agency for International Development
VOC	Vehicle Operating Cost
WBIMS	Weigh Bridge Information Management System

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# CHAPTER 1 INTRODUCTION

## 1.1 Background

Mombasa Port is the hub port of the freight transportation of Kenya and East African Community (EAC) countries as well as South Sudan and Ethiopia. The freight transportation is crucial for the Northern Corridor which runs from Mombasa to Nairobi and neighboring landlocked EAC and other countries. The freight transportation by containers has increased in recent years. However, inadequacy of port facilities and lack of road network in the area are bottlenecking the transportation. Strengthening the port functions and development of the transportation infrastructures are necessary for the expansion of the freight transportation capacity of Mombasa Port. Particularly, the construction of the new link road which connects Mombasa Port with the Northern Corridor and Mombasa Southern Bypass which connects southern coastal areas with the Northern Corridor is urgently needed.

Kenya Vision 2030 is the national development blueprint covering the period from 2008 to 2030. It aims at making Kenya a globally competitive and prosperous nation with a high quality of life by 2030. The vision is based on three “pillars”: the economic pillar, the social pillar and the political pillar. The development of infrastructures is positioned as a support to the pillars. In transportation sector, construction of efficient transportation networks is targeted.

Facilitation of trade through developing Mombasa Port is one of the top priorities for the Government of Kenya and New Container Terminal at Mombasa Port, which is under construction with Japanese ODA loans, is scheduled to be completed by 2015. To maximize the effect of the project and the port’s transportation function, it is necessary to construct a new link road which connects the new container terminal with the Northern Corridor. Without this new link road, the effect of the construction of the new container terminal would be achieved less.

Substantial portion of goods passing Mombasa Port are transported not only to inland region of Kenya, but also to neighboring landlocked EAC and other countries such as Uganda, Burundi, Rwanda, South Sudan and Ethiopia. As integration of EAC deepens, this road serves as a key road not only to Kenya, but also to the EAC countries.

It is also crucial to build the Bypass that connects the new container terminal with the southern coast of Mombasa to support development in the southern coastal area and to mitigate congestion in the Mombasa Island which is caused by traffic waiting for the ferries to cross the channel. The Bypass would eventually lead to Tanzania.

Feasibility study with environmental and social impact assessment and preliminary engineering design of Mombasa Southern Bypass including the Kipevu Link Road

(hereinafter referred to as “the F/S”) has been conducted with assistance of the World Bank.

This Survey reviewed the F/S and updated the basic designs to facilitate formation of the project to be implemented with a Japanese ODA loan.

## **1.2 Objectives of the Survey**

### **1.2.1 The objectives of the Project**

To facilitate transportation of goods and passengers to Kenya and neighboring countries by construction of the following two roads to achieve economic and social development in Kenya and neighboring countries

- Mombasa Southern Bypass (Miritini Jct. at the Northern Corridor - Tsunza Peninsula – Kibundani Jct. at Tanzania Road, the Road length is approximately 20.0 km)
- Kipevu Link Road (Mwache Jct. at Mombasa Southern Bypass - Mombasa Port New Container Terminal, the Road length is approximately 5.7 km)

### **1.2.2 The objectives of the Survey**

To review the project data currently available from the viewpoints of environmental and social consideration, engineering appropriateness and financial and economic feasibility; and to conduct supplemental survey to facilitate formation of the project

## **1.3 Survey Area**

The Survey area is Mombasa City, particularly along Mombasa Southern Bypass and Kipevu Link Road including their vicinity roads. The Survey area is shown in Location Map.

## **1.4 Survey Schedule**

The Survey schedule is shown in Figure 1.4-1.

## **1.5 Member of the Survey Team**

The member of the Survey team is shown in Table 1.5-1.

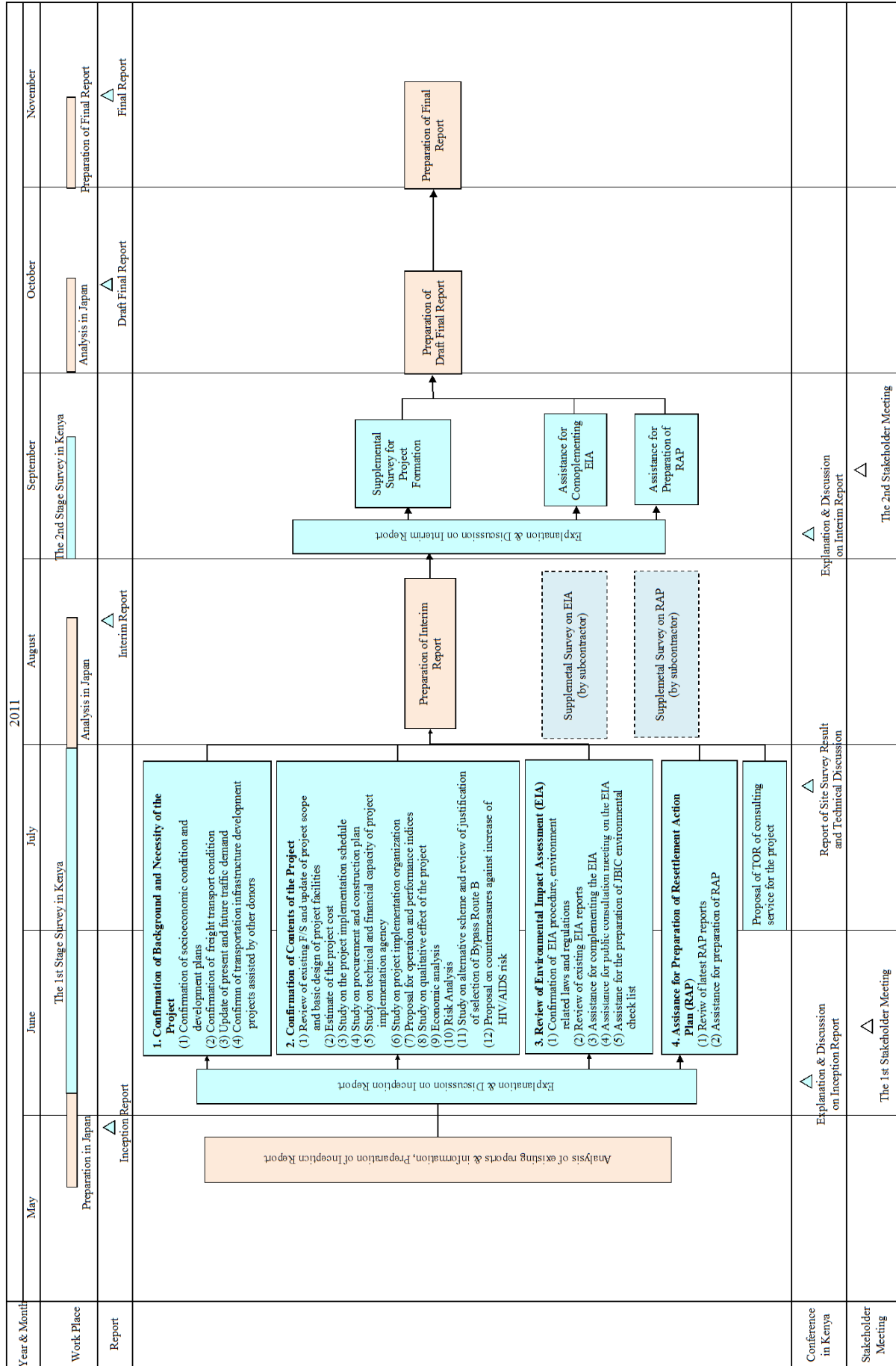


Figure 1.4-1 Survey Schedule

**Table 1.5-1 Member of the Survey Team**

<b>No.</b>	<b>Name</b>	<b>Job Title</b>	<b>Firm</b>
1	OSHITA Soemu	Team Leader/Bridge & Road Planner	Katahira & Engineers International
2	ISOMOTO Kenji	Deputy Team Leader/Road Planner	Katahira & Engineers International
3	WATANABE Masato	Traffic Demand Analyst	Katahira & Engineers International
4	KIMURA Toshio	Finance & Economic Analyst	Katahira & Engineers International
5	WATANABE Hiroshi	Procurement Planner & Cost Estimator	Katahira & Engineers International
6	OGASAWARA Koyo	Environmental Specialist	Katahira & Engineers International
7	MUKAI Kiyoshi	Social Consideration Specialist	Katahira & Engineers International
8	FUJIWARA Hidekatsu	Project Coordinator/Road & Bridge Planning Assistant	Katahira & Engineers International

## CHAPTER 2 SOCIO-ECONOMIC CONDITION AND DEVELOPMENT PLAN IN KENYA AND NEIGHBORING COUNTRIES

### 2.1 Socio-Economic Condition in Kenya and Neighboring Countries

#### 2.1.1 General

This section is to describe the socio-economic condition in Kenya and neighboring countries. The neighboring countries in the report are defined as the East African Community (EAC) which includes Uganda, Rwanda, Burundi, Tanzania and other surrounding countries such as Somalia, Ethiopia, South Sudan and DR. Congo. However, due to the scarcity of data available on Somalia, the description of its condition has to be very limited.

#### 2.1.2 Current Economic Condition

##### (1) Current Economic Condition in Kenya

Figure 2.1-1 shows GDP growth rate between 2000 and 2010 and Figure 2.1-2 shows GDP per capita in the same period based on data from Kenya National Bureau Statistics (KNBS).

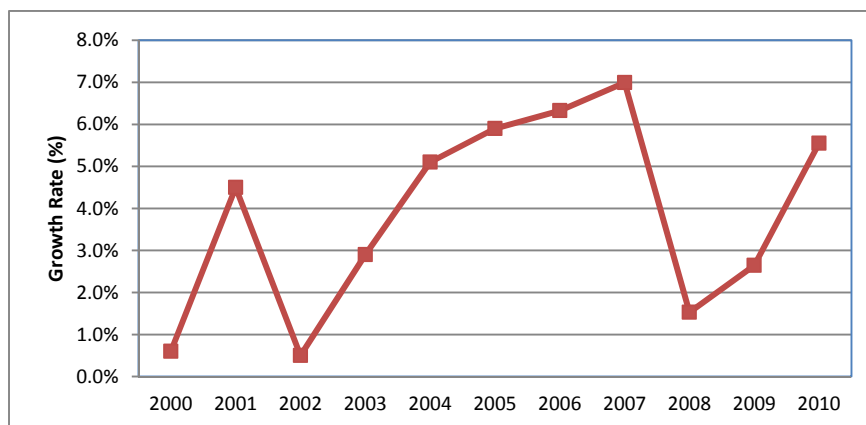
Since 2003, macro economy in Kenya has been steadily increasing and the growth of GDP recorded at 5.6 % in 2010 compared with 1.6 % in 2008 and 2.6 % in 2009. GDP per capita in 2010 is US\$ 760.

**Table 2.1-1 GDP Growth Rate and GDP Per Capita in Kenya from 2000 to 2010**

Item	2005	2006	2007	2008	2009	2010
GDP at Market Price	1,175,133	1,249,479	1,336,848	1,357,277	1,393,174	1,470,517
Growth Rate	5.9%	6.3%	7.0%	1.5%	2.6%	5.6%
GDP per Capita (US\$)	523	611	719	774	738	760

Note: 2001 constant prices in Ksh million

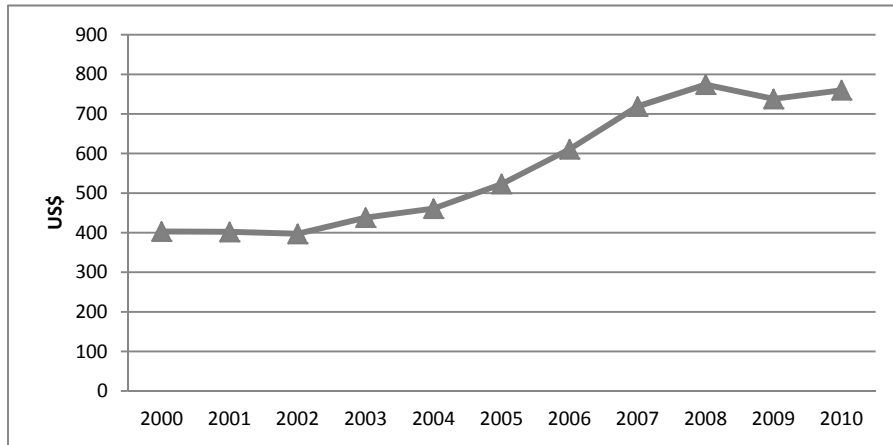
Source: KNBS



Source: KNBS

**Figure 2.1-1 GDP Growth Rate in Kenya**



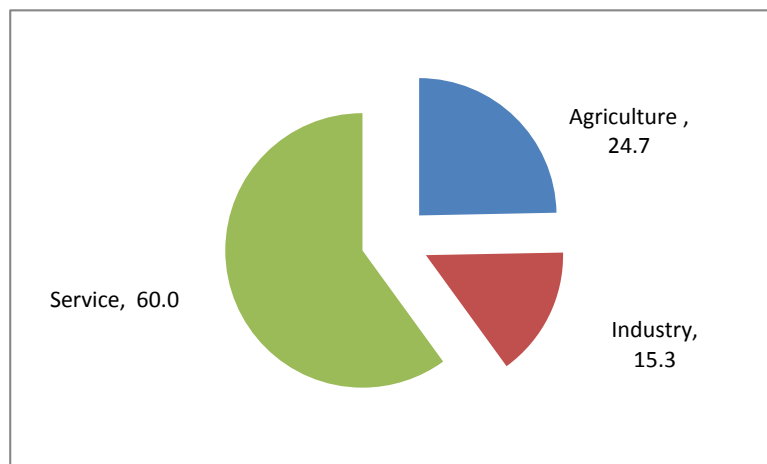


Source: KNBS

**Figure 2.1-2 GDP per Capita in Kenya**

It is noted that inflation in 2011 surpassed the high end of target range of the Government of Kenya due to food and oil price hikes and Kenya Shilling depreciated.

Figure 2.1-3 shows the GDP share by industry in 2010 and Table 2.1-2 shows the GDP growth rate since 2007. Of the total GDP in 2010, service sector accounts for 60%, agriculture 25% and industry 15 %.



Source KNRS

**Figure 2.1-3 Share of GDP by Industry in 2010**

**Table 2.1-2 Growth Rate of GDP by Industry from 2007 to 2010**

Category	2007	2008	2009	2010
Agriculture (%)	2.1	-5.0	-1.4	6.3
Industry (%)	7.1	4.8	3.4	5.3
Service (%)	8.1	2.6	4.3	5.4
All GDP (%)	7.0	1.6	2.6	5.6

Source: KNRS

(2) Import and Export Condition in Kenya

Table 2.1-3 shows the growth rate of export and import and Table 2.1-4 shows the values of major exports and imports from 2006 to 2010, respectively. During this period, annual average growth rate (AAGR) of export was 14 % while that of import was 16 %. Taking consideration of growth rate of GDP in the same period, the AAGR of export and import was about 4 times higher than that of GDP.

As for the major export commodities, tea, horticulture, coffee and apparel and clothing were the leading export earners accounting for 51 % in total of all the export earnings. As for the major import commodities, industrial machinery, petroleum products and iron and steel were main ones accounting for 44 % in total of all the import value. Table 2.1-5 shows statistics of African trade from Kenya from 2006 and 2010.

**Table 2.1-3 Export and Import Growth Rate from 2007 to 2010**

	2006/07	2007/08	2008/09	2009/10
GDP Growth Rate (%)	7.0	1.6	2.6	5.6
Export (%)	14.7	23.3	0.3	19.2
Import (%)	16.0	27.4	2.3	20.2
Export and Import Total (%)	15.6	26.1	1.7	19.9

Source: KNRS

**Table 2.1-4 Export and Import Amount by Major Commodities from 2006 to 2010**

(Unit: Ksh Million)

Items	2006	2007	2008	2009	2010	Growth Rate (%) (2010/06)
<b>Export</b>						
Tea	47,349	46,754	63,812	68,766	91,617	1.93
Horticulture	48,813	56,808	71,182	65,220	72,093	1.48
Coffee	9,138	10,425	10,126	15,309	16,244	1.78
Tabasco	7,869	8,532	9,053	10,411	10,562	1.34
Apparel and Clothing	16,561	16,165	17,452	13,948	15,561	0.94
Others	98,451	123,001	151,035	149,917	179,589	1.82
Total	228,181	261,685	322,660	323,571	385,666	1.69
<b>Import</b>						
Industrial Machinery	62,079	78,014	100,900	130,929	168,564	2.72
Petroleum Products	64,540	73,088	116,792	99,550	122,004	1.89
Crude Petroleum	55,016	49,214	81,453	54,495	72,598	1.32
Road Motor Vehicle	36,936	42,678	45,323	50,115	55,812	1.51
Iron and Steel	21,340	26,335	34,829	33,776	43,558	2.04
Others	281,572	335,783	391,354	419,232	484,846	1.72
Total	521,483	605,112	770,651	788,097	947,382	1.82
Export and Import Total	749,664	866,797	1,093,311	1,111,668	1,333,048	1.78

Source: KNRS

**Table 2.1-5 African Trade from Kenya from 2006 to 2010**

(Unit: Ksh Million)

	Export						Import					
	2006	2007	2008	2009	2010	AAGR 2006-10	2006	2007	2008	2009	2010	AAGR 2006-10
<b>EAC Countries</b>												
Tanzania	18,288	22,326	29,224	30,087	33,211	16.1	4,514	6,678	7,265	7,809	10,549	23.6
Uganda	27,812	33,571	42,285	46,240	52,108	17.0	1,001	5,979	5,221	4,426	9,227	74.2
Rwanda	4,765	5,801	8,953	9,536	10,535	21.9	210	88	25	240	430	19.6
Burundi	2,184	2,424	3,479	4,597	5,458	25.7	339	153	78	92	145	-19.2
S-Total	53,049	64,122	83,941	90,460	101,312	17.6	6,064	12,898	12,589	12,567	20,351	35.3
<b>Other Neighboring Countries</b>												
Ethiopia	3,671	3,434	4,363	4,319	4,385	4.5	119	141	201	237	247	86.0
Sudan	10,099	11,589	14,073	12,763	18,824	16.8	86	11	162	12	167	18.0
DR Congo	7,627	8,307	9,852	11,323	12,792	13.8	923	1,527	985	879	1,330	9.6
Somalia	7,597	8,330	12,848	11,214	13,056	14.5	13	12	30	2	19	9.9
S-Total	28,994	31,660	41,136	39,619	49,057	14.1	1,141	1,691	1,378	1,130	1,763	11.5
<b>Rest of African Countries</b>												
Rest of African Countries	25,954	28,247	37,464	32,653	38,606	10.4	56,408	57,449	72,024	90,975	92,805	13.2
<b>Total Africa</b>	<b>107,997</b>	<b>124,029</b>	<b>162,541</b>	<b>162,732</b>	<b>188,975</b>	<b>15.0</b>	<b>63,613</b>	<b>72,038</b>	<b>85,991</b>	<b>104,672</b>	<b>114,919</b>	<b>15.9</b>

Source: KNBS

Note: AAGR means average annual growth rate.

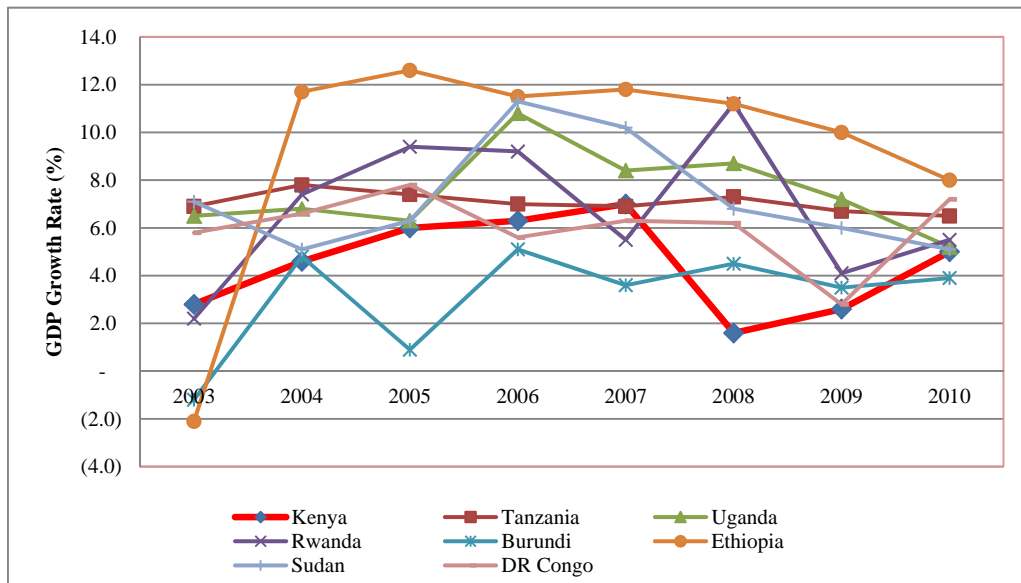
**(3) Current Economic Condition in Neighboring Countries**

Table 2.1-6 shows the past trend of GDP and GDP per capita and Figure 2.1-4 shows the past trend of GDP growth rate in the neighboring countries. According to this table and figure, GDP and GDP per capita in the neighboring countries have steadily grown since 2004.

**Table 2.1-6 GDP and GDP Per Capita in Neighboring Countries**

Country	GDP (US\$ Million)			GDP Per Capita (US\$)		
	2000	2005	2010	2000	2005	2010
<b>EAC Countries</b>						
Kenya	12,316	18,739	32,163	399	547	809
Uganda	6,196	9,223	17,011	253	321	501
Tanzania	9,550	13,724	22,671	284	366	548
Burundi	709	801	1,489	110	106	180
Rwanda	1,718	2,590	5,602	214	286	562
<b>Other Neighboring Countries</b>						
Ethiopia	8,176	12,307	39,717	124	165	350
Sudan	12,365	27,386	68,441	397	776	1,705
DR. Congo	4,303	7,183	13,125	79	118	186

Source: World Economic Outlook Database, Oct. 2010, IMF



Source: IMF Database 2011

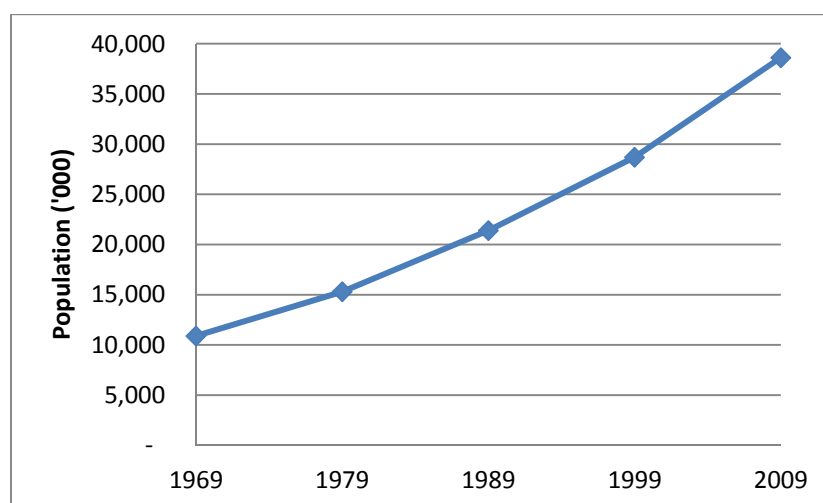
**Figure 2.1-4 Past Trend of GDP Growth Rate in the Neighboring Countries, 2003 – 2010**

### 2.1.3 Current Social Condition

#### (1) Social Condition in Kenya

##### Population

Figure 2.1-5 shows the past trend of population in Kenya from 1969 to 2009. Table 2.1-7 shows the past trend of population of Kenya by province from 1999 to 2009 and Table 2.1-8 shows the population density by province in 2009. According to the trend seen in the Table above, population has been gradually increasing with an average annual growth rate (AAGR) of 3.0% and total population in 2009 based on the population census was 38.6 million.



Source: KNBC

**Figure 2.1-5 Population Trend in Kenya, 1969 – 2009**

**Table 2.1-7 The Number of Population by Province**

Province	1999	2009	AAGR (%) 1999-2009
Nairobi	2,143	3,138	3.9
Central	3,724	4,384	1.6
Coastal	2,487	3,325	2.9
Eastern	4,632	5,688	2.1
North Eastern	962	2,311	9.1
Nyanza	4,392	5,442	2.2
Rift Valley	6,987	10,007	3.6
Western	3,359	4,334	2.5
Kenya Total	28,686	38,629	3.0

Source: KNBS

Note: AAGR means average annual growth rate

**Table 2.1-8 Population and Population Density by Province in 2009**

Province	Land Area (km <sup>2</sup> )	Population in 2009 (000)	Population Density (Per / km <sup>2</sup> )
Nairobi	695	3,138	4,515
Central	13,164	4,384	333
Coastal	82,893	3,325	40
Eastern	153,404	5,688	37
North Eastern	126,852	2,311	18
Nyanza	12,613	5,442	431
Rift Valley	183,383	10,007	55
Western	8,309	4,334	522
Total	581,313	38,629	66

Source: KNBS

### Urbanization

Table 2.1-9 shows the urbanization in Kenya. Although Kenyan's urbanization level was 18 % twenty years ago, over 30 % of Kenyan people live in urban areas in 2009 with rapid urbanization of the country as shown in Figure 2.1-6.

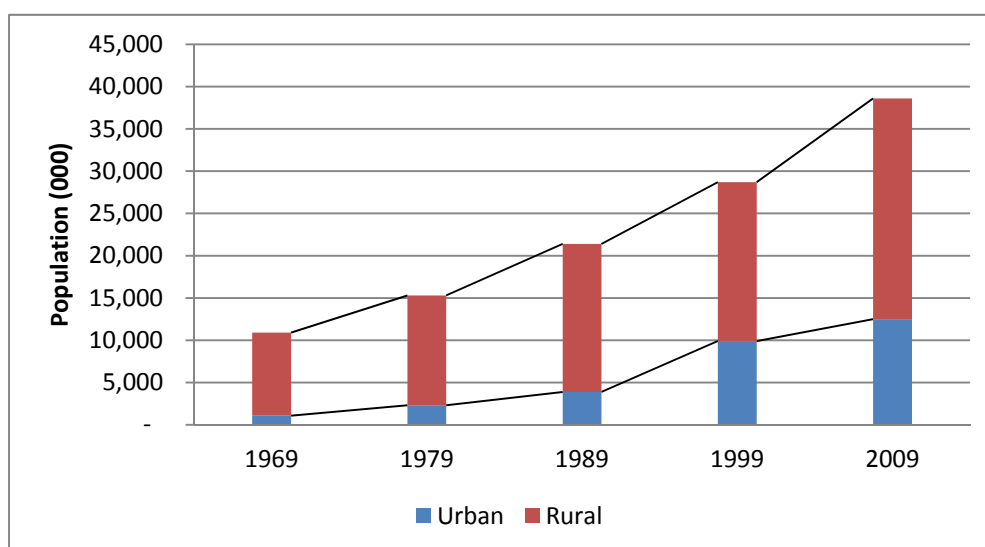
According to the Kenya Economic Update<sup>1</sup>, rural to urban migrations will be continued and by 2030, about 48 % are expected to reside in the urban areas.

<sup>1</sup> Kenya Economic Update, World Bank, June 2011

**Table 2.1-9 Urban and Rural Population Trend, 1969-2009**

	Urban	Rural	Population	Urbanization Rate (%)
1969	1,080	9,820	10,900	10%
1979	2,310	12,990	15,300	15%
1989	3,880	17,520	21,400	18%
1999	9,900	18,800	28,700	34%
2009	12,487	26,123	38,610	32%

Source: KNBS



Source: KNBS

**Figure 2.1-6 Urban and Rural Population Trend, 1969-2009**

### Poverty Condition

As indicated in Table 2.1-10, the absolute poverty level in Kenya improved from 45.8 % in 1999 to 38.3 % in 2005/06 in household and from 52.6 % to 46.6 % in individual, respectively.<sup>2</sup> The poverty level in urban area is much lower than that in rural area.

<sup>2</sup> Absolute poverty level is defined that the amount of income a person or family needs to purchase an absolute amount of the basic necessities of life. These basic necessities are identified in terms of calories of food, energy, square feet of living space, etc.



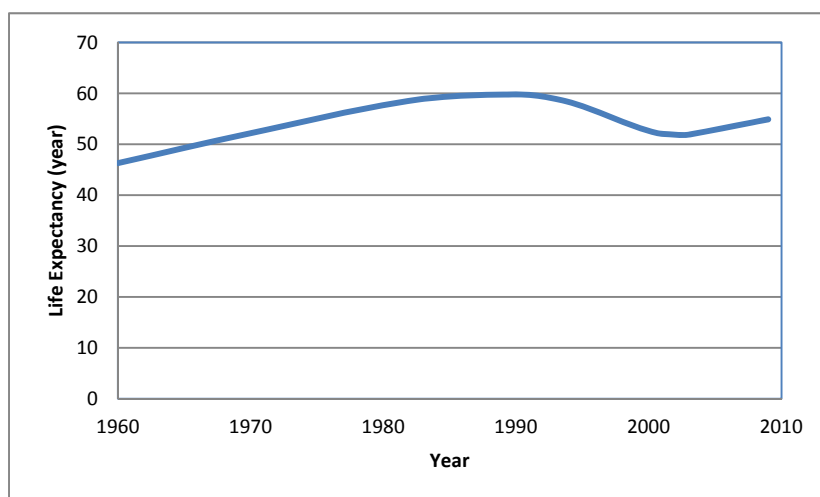
**Table 2.1-10 Absolute Poverty Level in Kenya in 1997 and 2005/06**

Area	1997		2005/06	
	Household	Individual	Household	Individual
Kenya	45.8%	52.6%	38.3%	46.6%
Urban	43.5%	50.1%	27.4%	34.4%
Rural	46.4%	53.1%	42.0%	49.7%
Nairobi	NA	NA	19.6%	22.0%
Mombasa	NA	NA	28.2%	37.6%

Source: Basic report on Well-being in Kenya, KNBS April 2007

### Life Expectancy

Figure 2.1-7 shows the life expectancy in Kenya since 1960.



Source: World Bank Data Bank

**Figure 2.1-7 Life Expectancy in Kenya since 1960**

### Literacy Rate in Kenya

It can be said that the literacy level in Kenya is generally high compared with other African countries. Moreover, due to the efforts by the Government, the literacy rate increased from 74 % in 2000 to 87 % in 2009.

**Table 2.1-11 Literacy Level in Kenya**

Year	Literacy Rate (%)
2000	74 %
2009	87 %

Source: World Bank Data Bank

(2) Social Condition in the Neighboring Countries

Population

Table 2.1-12 shows population, population density and urbanization rate in the neighboring countries in 2009 based on the World Bank data base.

**Table 2.1-12 Population, Population Density and Urbanization Rate in 2009  
in Neighboring Countries**

Country	Population ('000)	Population Density (Per/km2)	Urbanization Rate (%)
<b>EAC Countries</b>			
Kenya	39,802	66.4	32.0%
Uganda	32,710	165.9	18.6%
Tanzania	43,739	45.9	25.9%
Burundi	8,303	323.0	11.0%
Rwanda	9,998	405.3	18.6%
<b>The Other Neighboring Countries</b>			
Ethiopia	82,825	82.8	17.3%
DR Congo	66,020	29.1	34.6%
Sudan	42,272	17.8	44.3%
Somalia	9,133	14.6	36.0%

Sources: Kenya: KNBS

Other Countries: World Bank Data Base, 2010

Major Social Indicators

Table 2.1-13 shows poverty, life expectancy and literacy rate in neighboring countries in 2009.

**Table 2.1-13 Poverty, Life Expectancy, and Literacy Rate in 2009  
in Neighboring Countries**

Country	Poverty Headcount (%)	Life Expectancy (year)	Literacy Rate (%)
<b>EAC Countries</b>			
Kenya	45.9 %	55	87 %
Uganda	24.5 %	53	73 %
Tanzania	33.4 %	53	73 %
Burundi	66.9 %	51	67 %
Rwanda	58.5 %	51	71 %
<b>The Other Neighboring Countries</b>			
Ethiopia	38.9 %	56	30 %
DR Congo	71.3 %	48	67 %
Sudan	N/A	58	70 %
Somalia	N/A	50	N/A

Source: World Bank Data Base, 2010

#### 2.1.4 Major Findings and Issues

Based on the discussion in the previous sections, the major findings and issues are as follows:

- Socioeconomic conditions in EAC countries and the other neighboring countries have rapidly and steadily improved since 2004. This trend generates more person and freight traffic. In order to cope with these increasing traffic movements, it is essential to develop transport infrastructure as much as possible.
- The urbanization in Kenya is expected to continue in future. Population in Mombasa as the second largest city in Kenya is also expected to increase. In order to prepare land for settlement and respond to the increasing traffic, it is essential to provide transport network in Mombasa.

## 2.2 National and Regional Development Plan

### 2.2.1 National Development Plan

The basic policies of national economic development, poverty reduction, and infrastructure development are principally given by “Vision 2030.” The policy on economic development, urbanization and industrial development and infrastructure development direction announced by the Government give the basic planning framework to this Survey.

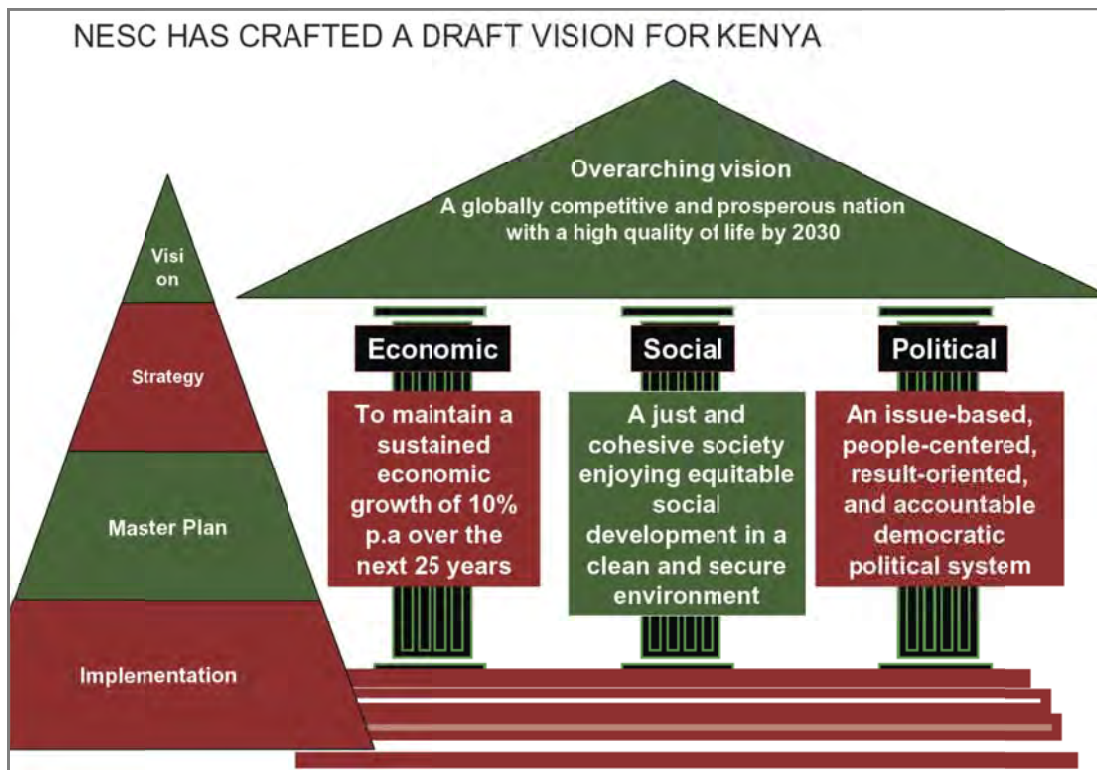
#### (1) Vision 2030

Kenya Vision 2030 is the country’s development blue print covering the period from 2008 to 2030. It aims at making Kenya a newly industrialized, “middle income country providing high quality of life for all its citizens by the year 2030”. The Vision is based on three “Pillars” as shown in Figure 2.2-1, namely the economic, social and political pillar.

The economic pillar aims at providing prosperity of all Kenyans through economic development program aimed at achieving an average GDP growth rate at 10 % per annum over the next 25 years. The social pillar seeks to build just and comprehensive social equity definitely realizing democratic rights and freedoms of every individual in Kenya society. The political pillar aims at realizing a democratic political system founded on issue-based policies.<sup>3</sup>

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<sup>3</sup> Kenya Vision 2030 , December 2008



Source: Vision 2030

**Figure 2.2-1 Thematic Overview of “Kenya Vision 2030”**

(2) First Medium Term Plan (2008-2012)

The Government published the First Medium Term Plan (2008-2012) in 2008 in line with “Vision 2030”. In this plan, the followings are described:

MTP identifies the key policy and actions and reforms as well as programs and projects that the Government intends to implement during the period 2008-2012. The overall objective is to realize higher and sustainable growth of economy in a more equitable environment, accomplished by increased employment opportunities.

The major targets of economic sector are as follows:

The economic growth target of the MTP is that the real GDP growth rate is estimated to be from 7 % in 2007 to 7.9 -8.7 % by the year 2009 -10 and to 10.0% in 2012. Over the next five years, saving and investment levels are targeted to increase at a high rate in order to support the high economic growth and employment creation envisaged under the plan.

Manufacturing, wholesale and trade; growth rate of the sector is targeted to increase from current 5 % to 10-12 % by 2012. To meet this target, Special Economic Clusters<sup>4</sup> will be set up in Mombasa and in Kisumu for manufacturing establishment.

<sup>4</sup> Special Economic Cluster is geographic concentration of interconnected industries, suppliers, and associated institution in the industrial field.

Physical infrastructure; the development of highly qualified national physical infrastructure is a critical foundation for the MTP. The strategies and measures to be pursued in the medium term period include the strengthening of the institutional framework for infrastructure development and raising the efficiency and quality of infrastructure as well as increasing the pace of implementation of infrastructure projects.

- The five-year target is to have 64,599 km of well-maintained and motor-able roads with a total of Ksh. 186 billion spent on road construction and upgrade during 2008-2012 period.
- Over the same period, the Government will grant concession to many toll roads to be built by the private sector.
- A new transport corridor linking Lamu, Ethiopia, South Sudan and Somalia through constructing the second port at Lamu will be developed and implemented through Build Own, Operation and Transfer (BOT) arrangement at a cost of US\$ 15-20 billion while a free port at Dongo Kundu in Mombasa will also be developed.
- Other major transport infrastructure projects will be Rapid Bus Project and Light Rail System in Nairobi Metropolitan area.

### (3) Future Economic Framework Plan

There are many study reports in economic and transport sectors lately. Among these, the Survey Team employs GDP growth rate forecasted until 2014 by IMF and employs GDP forecasted by Corridor Diagnostic Study (CDS) as shown in Table 2.2-1. Because these forecasted growth rates are more reliable and realistic.

**Table 2.2-1 GDP Growth Rate Forecasted by Various Economic and Transport Study Reports**

	2009	2010	2011	2012	2013	2014	2015-2020	2021-2030
IMF Report	3.8%	5.4 %	6.1%	6.7 %	6.8%	6.8%	NA	NA
Corridor Diagnostic Study	5.4%						5.7 %	5.5 %

Source: 1) Kenya; Request for a Three Year Arrangement under the Extended Credit Facility, IMF, January 2011  
 2) Corridor Diagnostic Study of the Northern and Central Corridors of East Africa, Jan. 2011

As for GDP growth rate in the neighboring countries, the Survey Team employs the one forecasted by the CDS report as shown in Table 2.2-2.

**Table2.2-2 Average Annual GDP Growth in Neighboring Countries**

Country	2011-2014	2015-2020	2020-2029	2030-2045
<b>EAC Countries</b>				
Kenya	6.1-6.8 %	5.7 %	5.5 %	5.5 %
Uganda	6.9 %	6.2 %	5.8 %	5.8 %
Tanzania	6.8 %	6.2 %	5.8 %	5.8 %
Burundi	4.5 %	5.0 %	5.2 %	5.2 %
Rwanda	6.0 %	5.9 %	5.6 %	5.6 %
<b>The Other Neighboring Countries</b>				
Ethiopia	7.2 %	6.5 %	5.9 %	5.9 %
DR Congo	6.2 %	6.1 %	5.8 %	5.8 %
Sudan	4.7-5.8%	5.8 %	5.8 %	5.8 %
Somalia	N/A	N/A	N/A	N/A

Source: JICA Survey Team based on CDS report.

## 2.2.2 Transport Development Plans in Kenya

### (1) Integrated National Transportation Policy

#### Background

The Integrated National Transport Policy (INTP) was formulated in 2009 by Ministry of Transport (MOT). At the commencement of Vision 2030, the Government (GOK) is prospecting future with the aim of consolidating, enhancing and sustaining the gains of Economic Recovery Strategy 2003-2007. The transport sector is recognized not only improving the competitiveness of the products from Kenya and the region, but also serving strategic development of the country. Furthermore the sector is expected to hold a key component in tackling such challenges as reduction of poverty by half by the year 2015 and overall improvement in the general welfare of the population.

Challenges facing the transport sector are as follows:

- Poor quality of transport services
- Inappropriate modal split
- Unexploited regional role of the transport system
- Not fully integrated transport system
- Urban environmental pollution
- Lack of an urban/rural transport policy
  - 1) Institutional deficiencies
  - 2) Inadequate human resource capacity
  - 3) Lack of vision for transport sector

### Vision, Mission and Policy Principles

In order to achieve the above-mentioned challenges, the following transport sector vision, mission and policy principles are set up:

1) Vision

A world class integrated transport system responsive to the needs of people and industry

2) Mission

To develop, operate and maintain an efficient, cost- effective, safe, secure and integrated transport system

3) Policy Principles

- Clarification of the roles among the central and local governments, statutory bodies, non-governmental bodies and the private sector
- User pays and polluter pays principal
- Stakeholder consultation deciding tariffs and other prices
- Financing of economic infrastructure through user charging or cost recovering from direct users
- Financing social and strategic infrastructure through eliminating subsidy

(2) Road Sector investment Program 2010-2014

The purpose of this program is

- To provide good roads for a globally competitive and prosperous Kenya
- To provide an investment program for the entire road network in the next 15 years



**Table 2.2-3 Sector Investment Program, 2010-2014**

(Ksh. Thousand)

		2010	2011	2012	2013	2014	Total
<b>A</b>	<b>Road Networks</b>						
1	Routine Maintenance	11,897	12,457	12,495	12,571	12,245	61,665
2	Periodic Maintenance	3,630	4,600	6,846	9,283	10,660	35,019
3	Rehabilitation/Reconstruction	12,933	14,134	18,043	21,903	25,772	92,785
4	Upgrade of Bitumen Standard	23,191	24,705	25,359	26,201	27,300	126,756
5	Capacity Improvement	7,247	6,389	4,497	2,130	685	20,948
6	New Road Construction	4,026	4,026	2,562	1,342	244	12,200
7	Proposed Development Projects	4,500	4,500	4,500	4,500	4,500	22,500
8	Public Transport Facilities	200	200	200	200	200	1,000
9	Trunk Storm Water Drainage	150	150	150	150	150	750
10	Separate NMT Facilities	150	150	150	150	150	750
	<b>Sub-Total</b>	67,924	71,311	74,802	78,430	81,906	374,373
<b>B</b>	<b>Road Maintenance Issues</b>						-
1	Capacity Building including Training, Information Management System	300	300	300	300	300	1,500
2	Road Safety	250	250	250	250	250	1,250
3	Axle Load Compliance	400	400	400	400	400	2,000
4	Environmental Sustainability	50	50	50	50	50	250
5	Research and Development	150	150	150	150	150	750
6	Traffic Management and Enforcement	200	200	200	200	200	1,000
7	Cross Cutting Issues	50	50	50	50	50	250
8	Data Collection, Monitoring and Evaluation	200	200	200	200	200	1,000
9	Feasibility Study	1,000	1,000	1,000	1,000	1,000	5,000
	<b>Sub-Total</b>	2,600	2,600	2,600	2,600	2,600	13,000
	<b>Total</b>	70,524	73,911	77,402	81,030	84,506	387,373
	<b>Total Funds Availability</b>	70,524	73,911	77,402	81,030	84,506	387,373
<b>C</b>	<b>Committed Works/On-Going</b>						-
1	Routine Maintenance	-	-	-	-	-	-
2	Periodic Maintenance	1,410	1,410	897	470	85	4,272
3	Rehabilitation / Reconstruction	8,625	6,961	4,258	2,304	4,212	26,360
4	Upgrade of Bitumen Standard	19,586	19,586	12,464	6,520	1,187	59,343
5	Capacity Improvement	6,389	6,389	4,066	2,130	387	19,361
6	New Road Construction	4,026	4,026	2,562	1,342	244	12,200
	<b>Total</b>	40,036	38,372	24,247	12,766	6,115	121,536

Source: Road Sector investment Program 2010-2014

### (3) Corridor Diagnostic Study of the Northern and Central Corridor of East Africa

#### Background

The Corridor Diagnostic Study of the Northern and Central Corridor of East Africa (CDS) was conducted by the International Aid Agencies such as World Bank, USAID and JICA.

The Northern Corridor anchored at Mombasa Port in Kenya and the Central Corridor anchored at Dar-es-Salaam Port in Tanzania are principal and crucial transport routes for national, regional and international trade of the EAC countries. Due to physical inadequacy and inefficiency of infrastructure, these corridors are characterized by long transit times and high service cost. Freight costs per km for landlocked countries are about 50 percent higher than that of the USA and Europe and transport costs are as high as about 75 percent of the value of exports. Modernization of transport infrastructure and removal of non-tariff barriers in these corridors are critical for trade expansion and economic growth, which are the key to success of regional integration as well as creation of wealth and poverty alleviation in the individual countries.

Having experienced successful development of an action plan for tackling effectively on transport bottlenecks on the North-South Corridor, the Tripartite - COMESA<sup>5</sup>, EAC and SADC<sup>6</sup> - has ordered the preparation of a similar action plan in the key trade routes of Eastern Africa.

#### Goals of the Study

To overcome the challenges facing the Governments in the region, the Corridor Diagnostic Study's goals focus on:

- Collecting and synthesizing existing information on time and cost of transporting goods
- Compiling and assessing national and regional policies
- Analyzing costs and benefits of interventions
- Setting a baseline to measure future corridor improvement
- Highlighting solutions including PPPs
- Creating an Action Plan

The Action Plan aims to development an efficient transport system in the East Africa region. It will galvanize the member countries into action and get support from international partners and private sector. The Action Plan will be presented by the Tripartite at an international investment conference to showcase the approach and mobilize necessary investment finance.

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<sup>5</sup> COMESA means Common Market for Eastern and Southern Africa

<sup>6</sup> SADEC means South Africa Development Community

Major financing institutions, the private sector, investment funds and consortiums, and bilateral and multilateral donors will be invited to participate. It is expected that the CDS will make a difference in securing implementation of projects while removing the long afflicted transport bottlenecks in East Africa.

Cognizant of the long-term development strategies for the region, the Action Plan focuses on identifying interventions and measures that can have an immediate and fast impact on the Corridors' performance. As such, the proposed projects are those that can be implemented within the next five years.

#### Draft Action Plan Projects

The 30 transport infrastructure projects by mode are proposed in the Draft Action Plan. These projects to be implemented within the next five years have a total cost of US\$ 4.3 billion. It is anticipated that 33 of the 40 projects could be implemented under a PPP arrangement at varying degrees of private sector participation. Of the 30 infrastructure projects, 13 projects are in the Northern Corridor with a total cost of US\$ 2.5 billion while 17 projects are in the Central Corridor with a total cost of US\$ 1.8 billion.

There are 11 proposed infrastructure projects for the rail sector with a total capital cost of US\$ 1.5 billion. Eight of the proposed rail infrastructure projects are deemed suitable for PPP financing.

The six proposed road infrastructure projects have a total capital cost of US\$ 1.7 billion in which US\$ 0.8 billion are for the Northern Corridor and US\$ 0.9 billion are for the Central Corridor. Except for a few specific road segments in urban areas or trunk roads on the Corridor with the busiest traffic, these projects are not considered as the likely candidates for PPP financing.

**Table 2.2-4 Proposed Infrastructure Project**

Name of Projects	Cost (US\$ mil.)	Corridor	PPP Potential
<b>Port Projects</b>			
Mombasa Container Terminal- Kievu West	342.5	Northern	Yes
Dar-es-Salaam Container Port	500.0	Central	Yes
Lamu Corridor New Port and Associated Infrastructure	7.0	Northern	Yes
Other Projects in Northern Corridor	36.7	Northern	Yes
Other Projects in Central Corridor	188.3	Central	Yes
Sub-Total	1,074.5		
<b>Road Projects</b>			
Northern Corridor Capacity Upgrades	234.5	Northern	No
Northern Corridor Road Rehabilitation	362.9	Northern	No
Northern Corridor Upgrade to Paved	143.7	Northern	No
Central Corridor Capacity Upgrades, Others	936.5	Central	No
Sub-Total	1,677.6		
Rail Projects	1,493.0	Northern & Central	Yes or No
Lake Transport Projects	36.4	Central	Yes
<b>Total</b>	<b>4,281.5</b>		

Source: CDS Report

### 2.2.3 Regional Development Plan in Mombasa

#### (1) Population Distribution

The Survey area for the project can be divided into 2 districts in the Coastal Province:

- Mombasa District
- Kilindini District

Mombasa District covers Island, Kisaumi and Banburi areas while Kilindini covers Likoni and Lomgo areas in the south mainland and Changamwe and Jomvu areas in the west mainland. The population distribution in the Survey area is shown in Table 2.2-5.

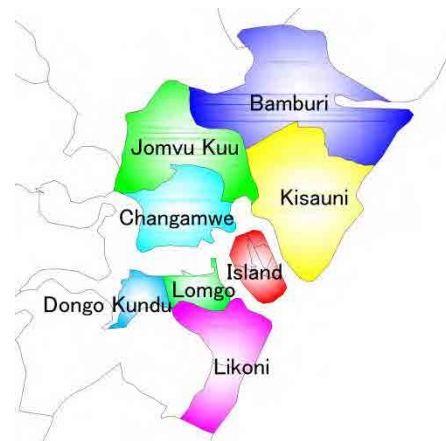


Figure 2.2-2

Map of Mombasa and Kilindini Districts

**Table 2.2-5 Population Distribution**

	1999	2009	AAGR (%)
Island	142,808	143,128	0.0
Kisauni	199,625	308,141	4.4
Banburi	44,199	71,914	5.0
<b>Mombasa District Total</b>	<b>386,632</b>	<b>523,183</b>	<b>3.1</b>
Likoni	59,372	111,804	6.5
Lomgo	35,311	54,204	4.4
Changamwe	110,150	132,692	1.9
Jomvu Kuu	63,780	117,487	6.3
<b>Kilindini District Total</b>	<b>268,613</b>	<b>416,187</b>	<b>4.5</b>
<b>MMA -Total</b>	<b>655,245</b>	<b>939,370</b>	<b>3.7</b>

Note: AAGR means Average annual growth rate

Source: KNBS

## (2) Future Population Plan in Mombasa Area

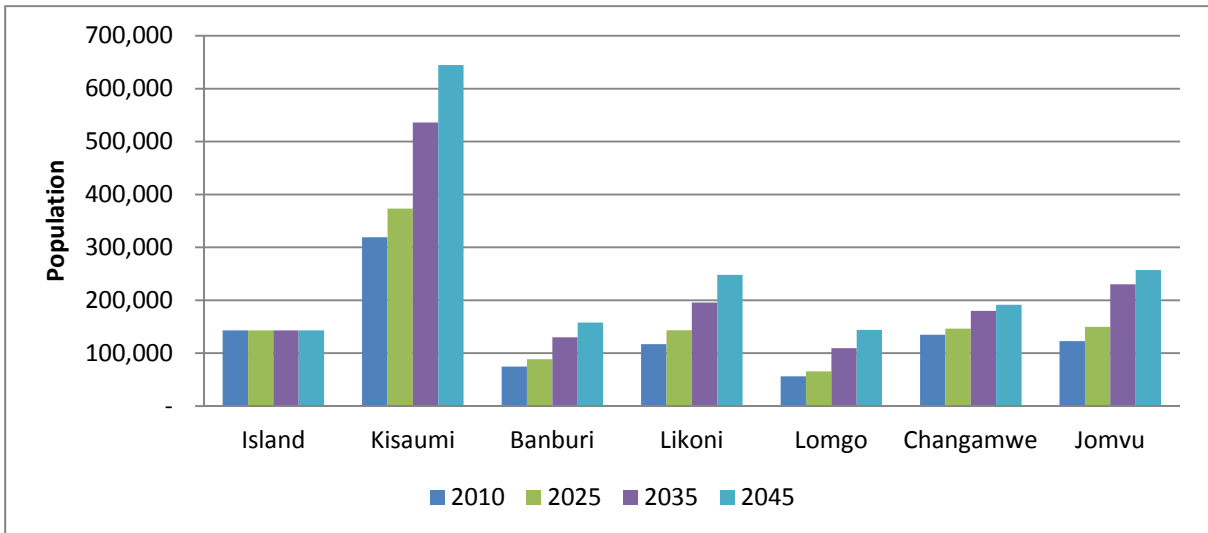
Future population, forecasted based on the past trend of each land division, is shown in Table 2.2-6 and Figure 2.2-3.

**Table 2.2-6 Future Population Distribution Plan**

Division	2010	2015	2025	2035	2045	AAGR (%) 2010-45
Island	143,000	143,000	143,000	143,000	143,000	1.000
Kisauni	318,997	373,257	536,037	644,557	698,817	1.026
Banburi	74,680	88,535	130,100	157,810	171,665	1.028
<b>Mombasa District Total</b>	<b>536,677</b>	<b>604,792</b>	<b>809,137</b>	<b>945,367</b>	<b>1,013,482</b>	<b>1.021</b>
Likoni	117,045	143,260	195,690	248,120	300,550	1.032
Lomgo	56,090	65,535	109,425	143,870	178,315	1.039
Dongo Kundo			25,000	50,000	75,000	-
Changamwe	134,944	146,214	180,024	191,294	213,834	1.015
Jomvu Kuu	122,850	149,700	230,250	257,100	310,800	1.031
<b>Kilindini District Total</b>	<b>430,929</b>	<b>504,709</b>	<b>726,049</b>	<b>799,829</b>	<b>947,389</b>	<b>1.027</b>
<b>MMA -Total</b>	<b>967,606</b>	<b>1,109,501</b>	<b>1,535,186</b>	<b>1,745,196</b>	<b>1,960,871</b>	<b>1.024</b>

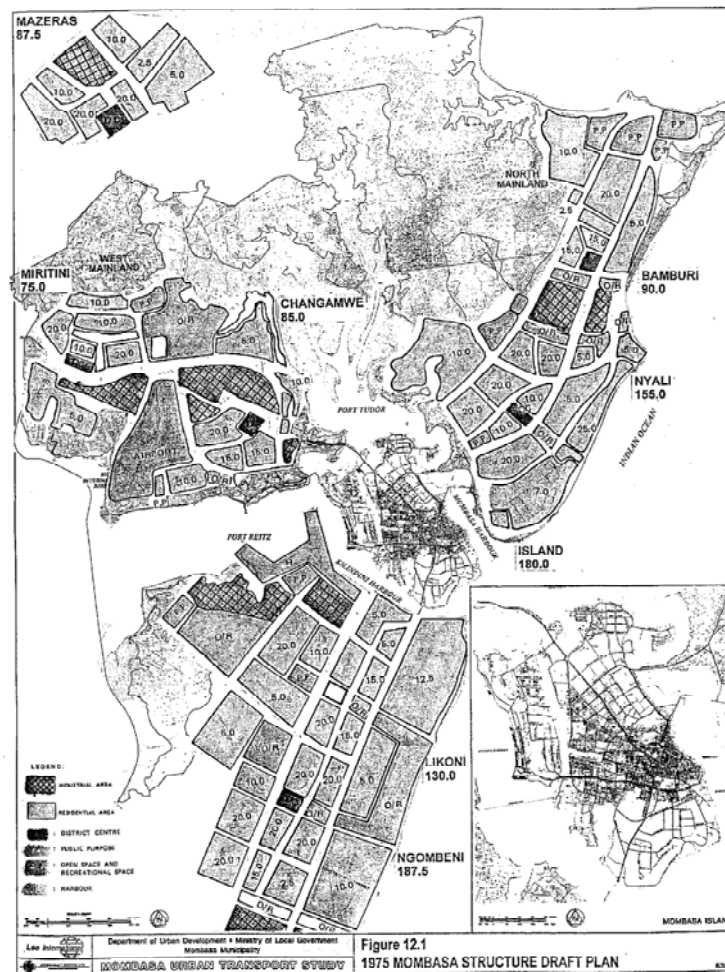
Source: JICA Survey Team

Note: Lomgo division includes Dongo Kundo



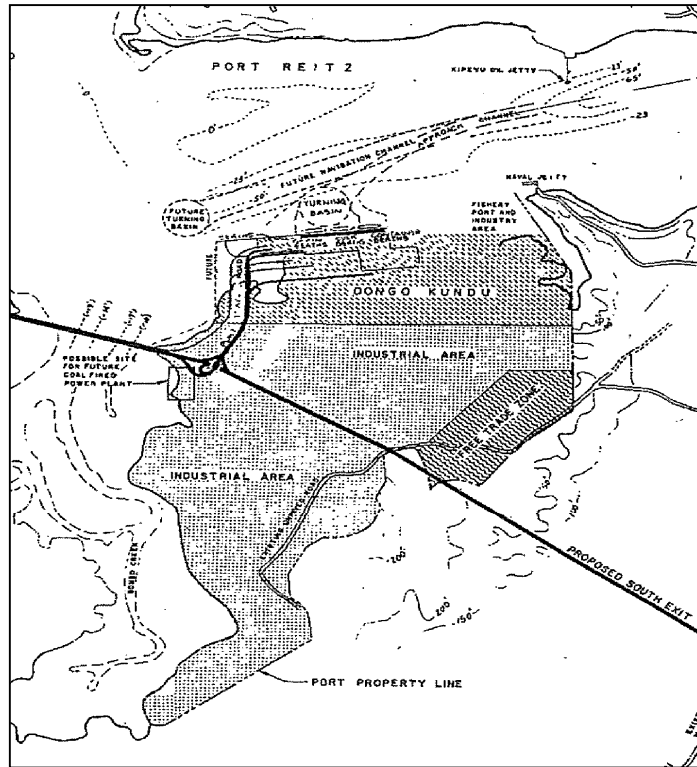
Source: JICA Survey Team

Figure 2.2-3 Future Population Distribution Plan



Source: Mombasa Municipality Urban Transportation Study 2001

Figure 2.2-4 Dongo Kundu Area Development Plan in 1970's



Source: Dongo Kundu Port Industrial Development by Van Houten in 1989

**Figure 2.2-5 Dongo Kundu Port Industrial Development by Van Houten in 1989**

(3) Dongo Kundu Development Plan

The Likoni area including Dongo Kundu area was originally drawn as residential area with port development when the structure plan was formulated in 1975 as shown in Figure 2.2-4. Mombasa Municipality Urban Transport Plan is based on this plan. However, plans formulated by Van Houten consulting firm in 1989 proposed not only port development but also industrial development and a free trade zone as shown in Figure 2.2-5.

According to the Medium Term Plan (2008-2012), it is proposed that a free port at Dongo Kundu in Mombasa will also be developed.

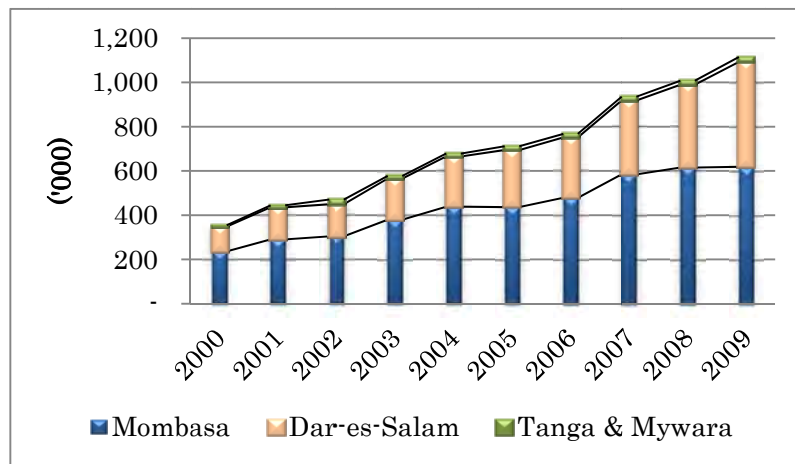


## CHAPTER 3 FREIGHT TRANSPORT CONDITION IN KENYA AND NEIGHBORING COUNTRIES

### 3.1 General

Prior to referring to Mombasa Port freight traffic condition, the position of Mombasa Port will be discussed. Freight handled at the Mombasa Port comprises of domestic demand and transit flows of cargoes into landlocked countries of EAC and neighboring countries. The Mombasa Port is located in a key strategic location serving for the interests of the entire region while competing with Dar-es-Salam Port for some hinterland cargoes. Its dynamic growth and earning potential in the container sector are noted prominently and therefore it represents as the regional container port.

Figure 3.1-1 and Table 3.1-1 show the regional container port demand. Among these ports, the Mombasa Port can be identified as regional hub port. However, taking account of growth of Dar-es-Salam, it is necessary to strengthen Mombasa Port with its related infrastructure.



Source: Port of Mombasa Strategic Review, Dec. 2010

**Figure 3.1-1 Regional Container Port Demand, 2000-2009**

**Table 3.1-1 Regional Container Port Demand, 2000-2009**

(Unit: '000)

Country	City	2004	2005	2006	2007	2008	2009	AAGR 2004-09
Kenya	Mombasa	439	437	479	585	616	619	7.1%
Tanzania	Dar-es-Salam	227	258	273	334	374	474	15.9%
	Tanga & Mywara	13	17	16	17	18	22	11.1%
Total		679	712	768	936	1,008	1,115	10.4%

Source: Port of Mombasa Strategic Review, Dec. 2010

## 3.2 Mombasa Port

### 3.2.1 Characteristics of Mombasa Port

The characteristics of Mombasa Port are presented in Table 3.2-1

**Table 3.2-1 Characteristics of Mombasa Port**

Item	Description
Natural Catchment Area	Kenya, Uganda, South Sudan, Rwanda, Burundi, DR. Congo, Ethiopia
Volume of Freight in 2009	Total 19 million ton, Import; 16.5 million ton, Export; 2.4 million ton, of which Transit Cargo 5.38 million ton
No. of Berths, Depths	16 berths, Depth 10.0m
Container Berths	5, total length 964 m
Container Equipment	4 x 40 ton gantry cranes
Container Volumes in 2009	619,000 TEU's
Bulk Berths and Equipment	17 cranes, 5 ton to 20 ton
Marine Access	Channel 15 km long, Depth 13.7 m, Tide 2.5 to 4.0m
Road Access	Poor, congested
Rail Access	Via Rift valley railway
Current Operational Status	Fully operational, congested
Specific Problems/Issues	Container dwell time, port congestion
Planned Developments	85 % of cargo containerized(Planned) Expansion of container terminal Improvement of road access, Kipeve Port Link Road
Intervention/Assistance Required	No plans yet for container privatization

Source: CDS

### 3.2.2 Current Mombasa Port Demand

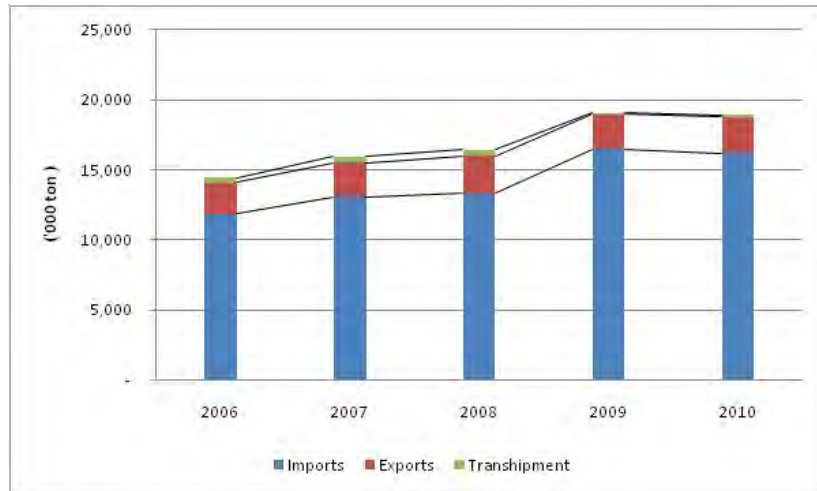
#### (1) Current Mombasa Port Demand

Mombasa Port handles containerized cargoes, general cargoes, dry bulk and liquid bulk. In 2010, total throughput of the port was 18.8 million ton, which has been growing at average annual growth rate of 9.6 % from 2006 to 2010.

**Table 3.2-2 Mombasa Port Traffic, 2006 -2010**

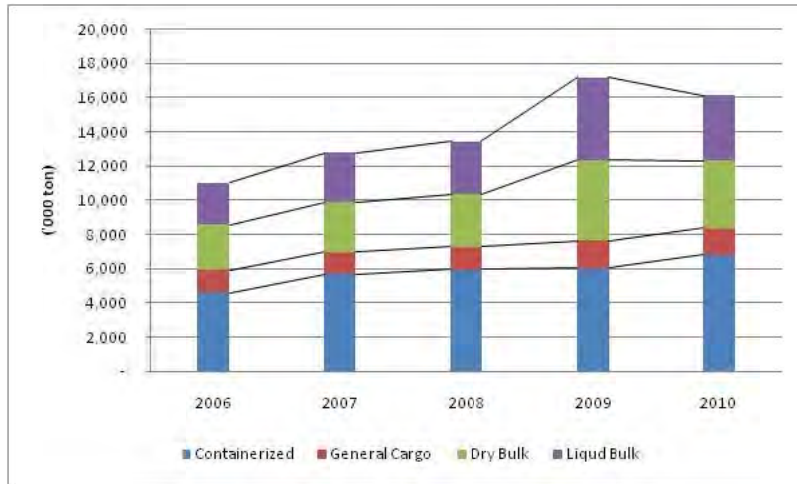
Import / Export	2006	2007	2008	2009	2010	AAGR 2006-10
Imports ('000 DWT)						
Containerized	2,970	3,761	3,959	4,086	4,591	11.5
General Cargo	1,129	1,105	1,020	1,349	1,397	5.5
Dry Bulk	2,344	2,722	2,891	4,641	3,827	13.0
Liquid Bulk	5,403	5,474	5,441	6,431	6,386	4.3
Total	11,846	13,062	13,311	16,507	16,201	8.1
of which, Transit	3,473	4,042	4,471	4,612	5,004	9.6
Exports ('000 ton)						
Containerized	1,625	1,934	1,996	1,952	2,218	8.1
General Cargo	185	168	299	269	192	0.9
Dry Bulk	313	205	200	62	70	- 31.2
Liquid Bulk	132	167	190	167	95	- 7.9
Total	2,255	2,474	2,685	2,450	2,575	3.4
of which, Transit	335	381	404	368	377	3.0
Total Imports & Exports	14,101	15,536	15,996	18,957	18,776	7.4
Transshipment ('000 DWT)	318	426	419	105	158	- 16.0
Total Throughput ('000 DWT)	14,419	15,962	16,415	19,062	18,934	7.0
Container Traffic (TEU's)	479,355	58,367	615,733	618,816	695,600	9.8

Source: Kenya Port Authority Annual Review and Bulletin of Statistics 2010



Source: Kenya Port Authority Review and Bulletin of Statistics 2010

**Figure 3.2-1 Mombasa Port Traffic by Imports, Exports and Transshipment, 2006-2010**

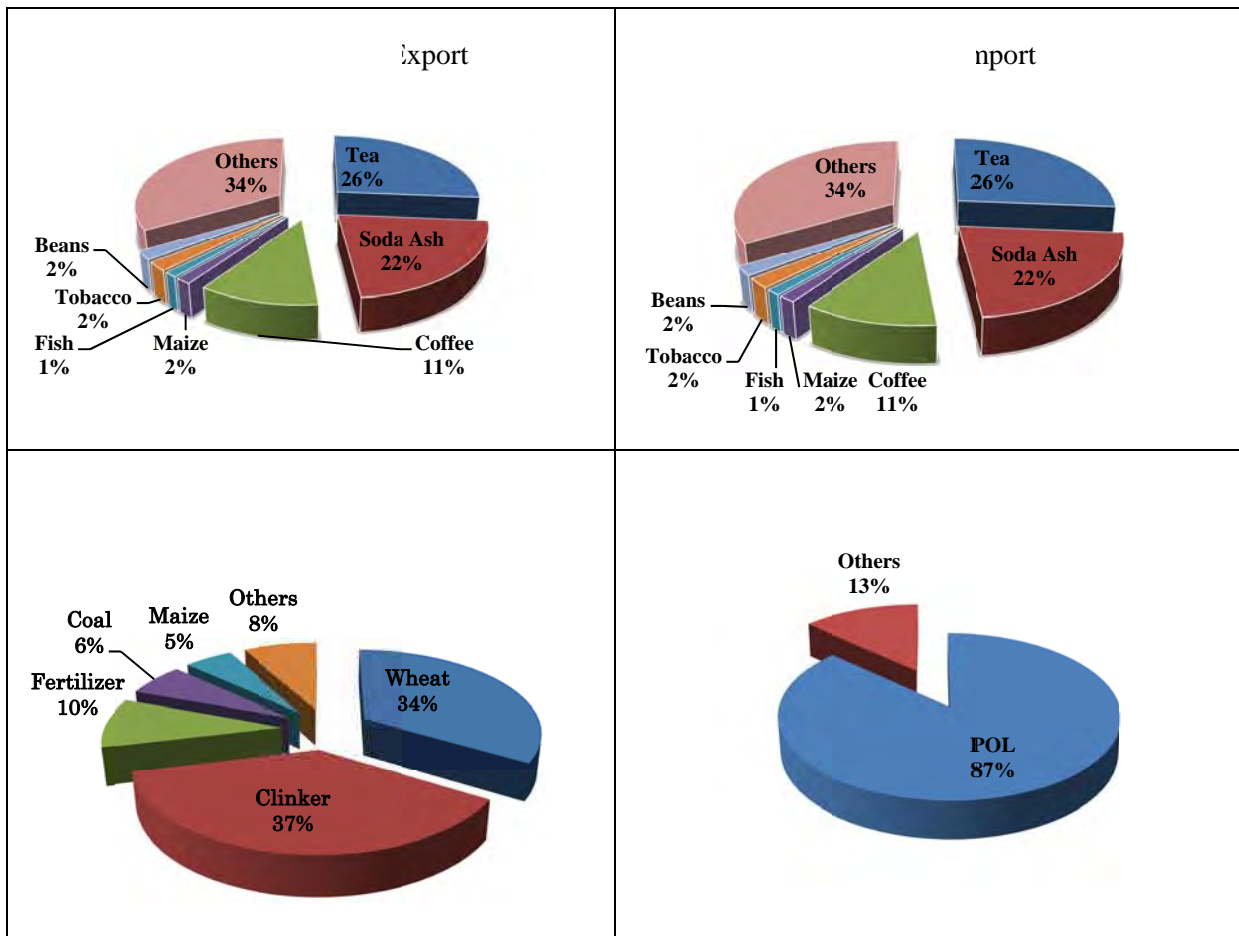


Source: Kenya Port Authority Annual Review and Bulletin of Statistics 2010

**Figure 3.2-2 Mombasa Port Traffic by Cargo Type, 2006-10**

(2) Type of Commodity

Figure 3.2.3 shows Mombasa Port Traffic Composition by commodity in 2010.

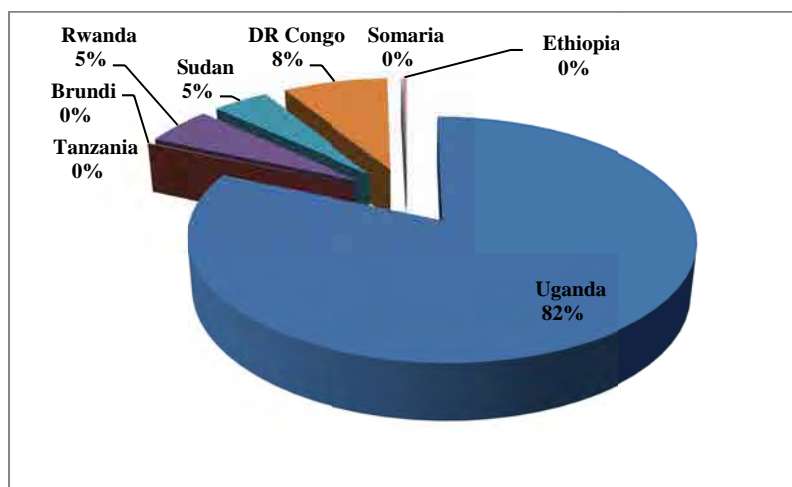


Source: Kenya Ports Authority (KPA) Annual Review and Bulletin Statistics, 2010

**Figure 3.2-3 Mombasa Port Traffic Composition by Commodity in 2010**

### (3) Transit Traffic Destination

Figure 3.2.4 shows Mombasa Port transit traffic destination in 2010.



Source: Kenya Ports Authority (KPA) Annual Review and Bulletin Statistics, 2010

**Figure 3.2-4 Mombasa Port Transit Traffic by Destination in 2010**

**Table 3.2-3 Mombasa Port Transit Traffic by Destination, 2006 –2010**

(Unit: '000 ton)

Country	2006	2007	2008	2009	2010	AAGR (%). 2006-2010
Uganda	2,822.1	3,398.6	3,701.3	3,980.4	4,232.7	10.7%
Tanzania	0.3	0.2	0.3	0.3	0.2	-9.7%
Burundi	66.4	50.1	55.8	19.4	6.1	-45.0%
Rwanda	253.1	286.7	293.5	250.6	288.1	3.3%
Sudan	137.8	145.5	223.3	167.4	223.5	12.8%
DR. Congo	226.5	257.1	304.4	288.7	430.4	17.4%
Somalia	30.0	32.9	43.2	16.8	5.2	-35.4%
Ethiopia & Others	0.7	1.2	1.1	4.0	15.5	116.9%

Source: Kenya Ports Authority (KPA) Annual Review and Bulletin Statistics, 2010

### 3.3 Future Demand Forecast of Mombasa Port

#### 3.3.1 General

Future Mombasa Port demand is forecasted in the following methodology using various studies conducted in this region like Port of Mombasa Strategic Review and F/S for Mombasa Bypass. These studies employed principally historical trend of Mombasa Port demand and economic indicators using elasticity method.

In the Survey the following presumptions are made:

1. Average annual growth rate of GDP in IMF forecast and CDS report are used for that of Kenya and the neighboring counties as shown in Table 2.2-2.
2. Elasticity is set up using the ones in “Port of Mombasa Strategic Review” and “Preliminary Design Report for Mombasa Bypass” report.
3. Mombasa Port demand is forecasted by making an assumption based on actual figures.

### 3.3.2 Future Traffic Demand of Mombasa Port

Table 3.3-1 shows traffic demand of Mombasa Port from 2011 to 2045. Table 3.4-2 shows future transit traffic demand of Mombasa Port from 2011 to 2045.

**Table 3.3-1 Future Traffic Demand of Mombasa Port, 2011 to 2045**

(Unit: '000 ton)

Type of Cargo	2010	2015	2020	2025	2030	2035	2040	2045	AAGR
Containerized Cargo	6,809	11,237	15,643	20,639	26,975	32,819	39,929	48,580	6.1
Conventional Cargo	1,589	2,223	2,778	3,378	3,974	4,607	5,340	6,191	4.1
Dry Bulk	3,897	6,283	8,289	10,645	13,202	15,305	17,743	20,569	5.2
Liquid Bulk	6,481	8,846	11,671	14,988	18,835	22,915	27,880	33,921	5.0
Total	18,776	28,588	38,381	49,651	62,986	75,646	90,893	109,260	5.4
Container Traffic ('000 TEU)	695.6	1,148.0	1,598.1	2,108.5	2,755.7	3,352.7	4,079.1	4,962.9	6.1

Source: GDP Growth rate in Kenya by 2014 is adopted by IMF forecast and that after 2015 by CDS Study. GDP Growth rate in other countries is adopted by CDS Study.

**Table 3.3-2 Future Transit Traffic Demand of Mombasa Port by Destination, 2010-2045**

(Unit: '000 ton)

Country	2010	2015	2020	2030	2040	2045
Uganda	4,232.7	6,117.5	8,517.6	16,514.5	32,069.0	32,069.0
Tanzania	0.2	0.3	0.4	0.9	1.7	1.7
Burundi	6.1	8.8	12.3	23.8	46.4	46.4
Rwanda	288.1	399.7	559.5	1,096.2	2,147.5	2,147.5
Sudan	223.5	322.0	445.5	853.0	1,638.6	1,638.6
DR Congo	430.4	622.1	866.3	1,680.2	3,263.6	3,263.6
Somalia	5.2	8.2	12.5	29.6	70.0	70.0
Ethiopia	15.5	24.0	36.4	85.3	201.0	201.0
Total	5,201.7	7,502.6	10,450.5	20,283.4	39,437.7	39,437.7

Source: JICA Survey Team

### 3.3.3 Demand vs Capacity of Kenya Port

Table 3.3-2 shows port demand vs capacity of Kenyan Ports (Mombasa Port and planned Lamu Port. The other ports are negligible).

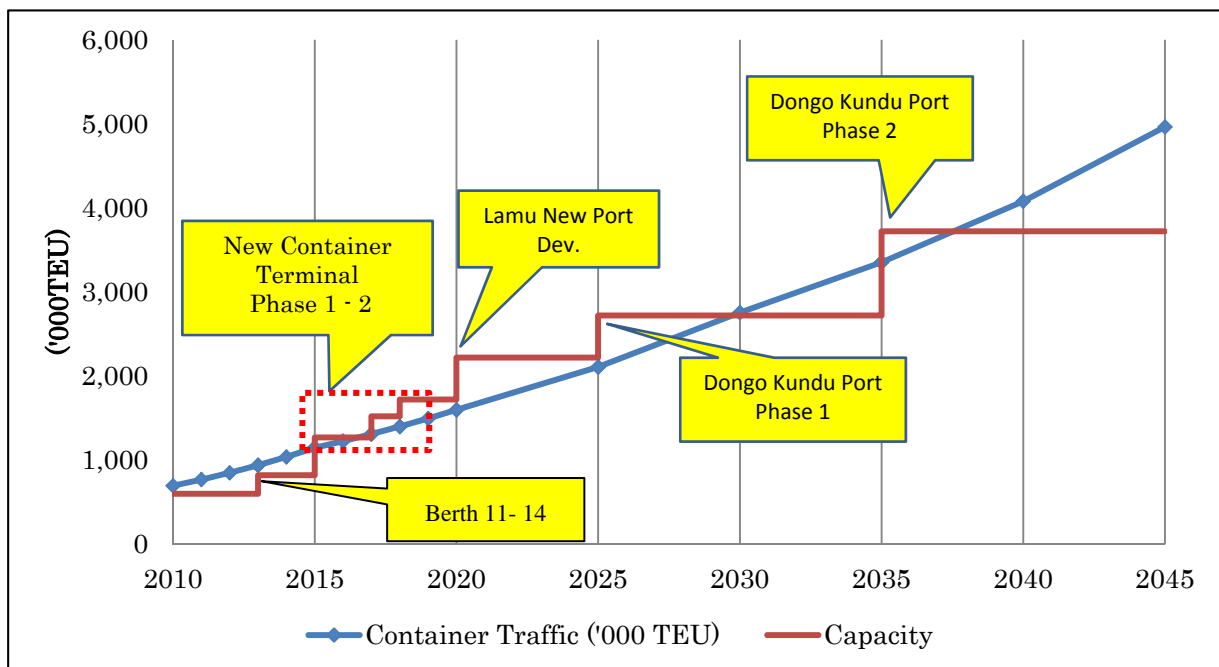
**Table 3.3-3 Port Demand vs Capacity of Kenya Port, 2011-2045**

(Unit: '000 tons)

	2011	2012	2013	2014	2015	2020	2025	2030	2040	2045
<b>Container Traffic Demand</b>	769	850	940	1,057	1,148	1,598	2,108	2,756	4,079	4,963
<b>Capacity</b>										
Container Terminal	600	600	450	450	450	450	450	450	450	450
Berths 11-14			370	370	370	370	370	370	370	370
Kipevu Container Terminal					450	900	900	900	900	900
Dongo Kundu Container Terminal							500	500	1,000	1,500
<b>Mombasa Port</b>	600	600	820	820	1,270	1,720	2,220	2,220	2,720	3,220
Lamu Port						500	500	500	500	500
<b>Total</b>	600	600	820	820	1,270	2,220	2,720	2,720	3,220	3,720
<b>Balance</b>	- 169	-250	- 120	237	122	622	612	36	- 859	-1,243

Sources: 1. Capacity of Kenya Port of Mombasa Strategic Review

2. Dongo Kundu Port development is assumed by the Survey Team



Source: Capacity of Kenya Port; Port of Mombasa Strategic Review

**Figure 3.3-1 Port Demand vs Capacity of Kenya Port, 2011-2045**



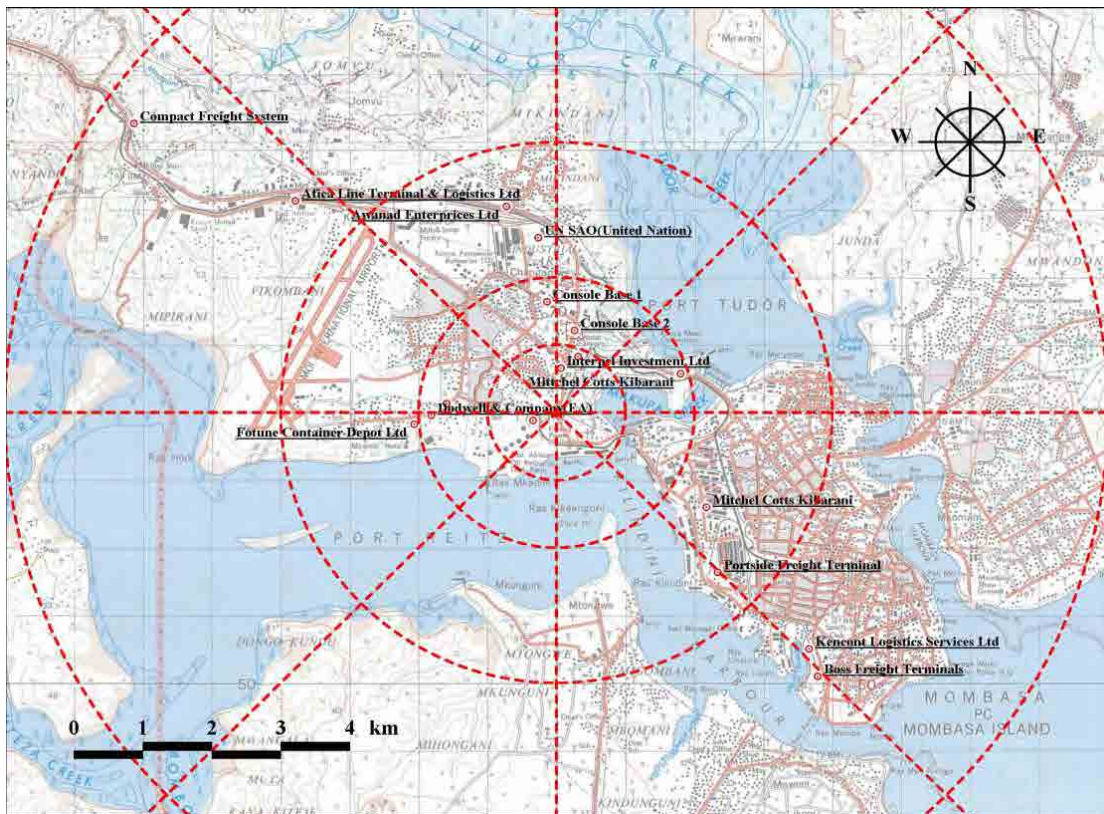
### 3.4 Container Freight Stations (CFSs) in Mombasa

To ease congestion at the marine terminals, Kenya Port Authority (KPA) allows transfer of domestic import boxes to be bonded at CFSs in Mombasa. CFSs' activities previously performed at the marine terminals; therefore KPA controls the operations of these CFSs and impose ports' tariffs onto them. Currently those CFSs are located outside of the container terminal of Mombasa.

JICA Survey Team surveyed the present conditions of CFSs through the questionnaire to them. The outline of the CFSs conditions are described below and the summary of the feedbacks from the CFSs are shown in Appendix 1.

#### 3.4.1 Location of CFSs

Based on the JICA Survey Team's field investigations, 17 CFSs locate in Mombasa as shown in Figures 3.4-1.



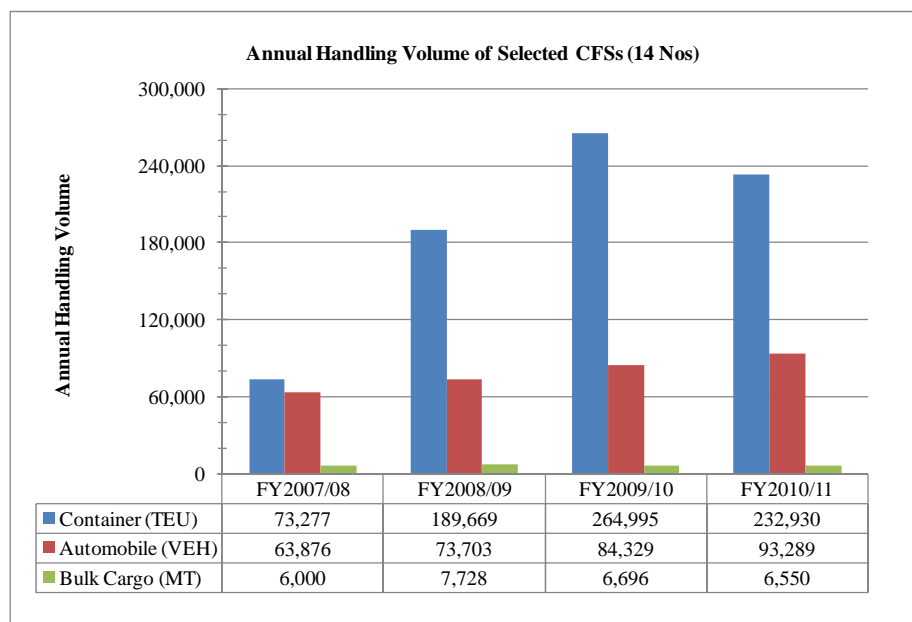
Source: JICA Survey Team

Figure 3.4-1 Location of CFSs in Mombasa



### 3.4.2 Annual Handling Volume of CFSs

Annual handling volume of selected 14 CFSs (Only 14 CFSs out of 17 total CFSs answered to JICA Survey Team's inquiry.) are shown in Figure 3.4-2.



Source: JICA Survey Team

**Figure 3.4-2 Annual Handling Volume of Selected 14 CFSs**

### 3.4.3 Size of CFSs

According to feedbacks from 14 CFSs, their facilities spaces including track waiting space (TWS) are as shown in Table 3.4-1.

**Table 3.4-1 Size of CFSs**

Descriptions	Depot (ha)	Office (sq. m)	TWS Width (m)	TWS Length (m)	TWS Area (sq. m)
Average	3.21	3,811	4.3	103.7	502
Maximum	6.90	20,480	10.0	285.0	1,500
Minimum	0.20	160	3.5	15.2	53

Source: JICA Survey Team

### 3.4.4 Number of Equipment Possessed by CFSs

According to the feedbacks from 12 CFSs, their possessed equipment is as shown in Table 3.4-2.

**Table 3.4-2 Number of Equipment Possessed by CFSs**

Descriptions	Reach Stacker	Container Lifter	Others
Average	2.9	2.3	3.1
Maximum	5.0	4.0	5.0
Minimum	1.0	1.0	1.0

Source: JICA Survey Team

#### 3.4.5 Number of Personnel of CFSs

According to the feedbacks from 13 CFSs, their numbers of personnel are as shown in Table 3.4-3.

**Table 3.4-3 Number of Personnel of CFSs**

Descriptions	Admin.	Operators	Others
Average	13	13	53
Maximum	28	30	130
Minimum	3	2	5

Source: JICA Survey Team

#### 3.4.6 Issues raised by CFSs

According to the feedbacks from 12 CFSs, most of them has encountered either traffic congestion due to poor road conditions or poor road network between port and their compound or port system (including tariff, delay of discharge, etc.), and some of them also raised issues regarding environment (night time noise level) and security (along access road and/or around perimeter). The numbers by issue are shown in Table 3.4-4.

**Table 3.4-4 Issues Raised by CFSs**

Issues	Traffic Congestion	Road Condition	Port System	Environment	Security	No Problem
Numbers	5	4	6	1	1	1

Source: JICA Survey Team

#### 3.4.7 Intentions of CFSs

According to the feedbacks from 13 CFSs, their intentions of port are as shown in Table 3.4-5.

**Table 3.4-5 Intentions of CFSs**

Descriptions	Yes	No	No Answer
Improvements	9	4	4
Expansions	11	2	4
Relocations	2	11	4
Merging	0	13	4
Others	1	8	8

Source: JICA Survey Team

#### 3.4.8 Recommendations based on the Feedbacks from CFSs

Based on the above described feedbacks from CFSs, and field observations as well as a series of discussions with relevant authorities and/or stakeholders, following recommendations are proposed:

- Improvements of existing road networks including widening of Port Reitz Road, Barak Obama Road, and Mombasa-Nairobi Highway (A109), especially in the sections where single carriageway has remained, to decongest the access between port gate and CFSs
- Cost sharing of road improvement and maintenance works between KeNHA / KURA / KeRRA / MCM and KPA for both existing and proposed roads
- Information sharing with various stakeholders in transport sector (private), such as CFS Association, KTA (Kenya Transport Association), RVR (Rift Valley Railways), Freight Forwarders, Shipping Agents, etc.
- Proper guidance of relocation and/or expansion of CFSs toward the lands along Kipevu Link Road and/or nearby Miritini Junction along Mombasa-Nairobi Highway (A109) by authority

## **CHAPTER 4 PRESENT AND FUTURE TRAFFIC DEMAND OF THE PROJECT RELATED ROADS**

### **4.1 Present Traffic Volume**

#### **4.1.1 Traffic Count Survey**

##### **(1) Methodology**

Traffic count survey on 10 locations is shown in Figure 4.1-1. Its survey was conducted over two weekdays at each location in order to identify the present traffic conditions and produce present Origin-Destination (OD) tables.

The number of vehicles passing the given points on the roads was counted manually and classified according to following vehicle types:

- Motorcycles, mopeds, scooters and tuk-tuks
- Cars
- Pick-ups, 4 wheel drive SUVs, vans
- Matatus
- Minibuses (15-40 seats)
- Large buses (more than 40 seats)
- Light trucks 2 axles (<3.5 ton capacity)
- Medium trucks 2 axles (>3.5 ton capacity)
- Heavy trucks 3 axles
- Heavy trucks 4 or more axles
- Handcarts (in case of Likoni Ferry only)
- Cyclists (in case of Likoni Ferry only)
- Pedestrians (in case of Likoni Ferry only)

Note: Vehicle classification is based on the F/S report



**Figure 4.1-1 Traffic Count Survey Locations**

**Table 4.1-1 Traffic Count Survey Locations**

Station No.	Location	24 / 12 hr	No. of Survey Direction	Description
Sta.1	Mazeras	12hr	2	Roadside
Sta.2	Miritini	12hr	2	Roadside
Sta.3	Nairobi Rd. / Magongo Rd. JCT	12hr	6	Junction
Sta.4	Barack Obama Rd. / Port Reitz Rd. JCT	12hr	6	Junction
Sta.5	Magongo Rd. / Barack Obama Rd. JCT	12hr	6	Junction
Sta.6	Changamwe Roundabout	12hr	8	Roundabout
Sta.7	Makupa Causeway	24hr	2	Roadside
Sta.8	Nyali Bridge	12hr	2	Roadside
Sta.9	Likoni Ferry	12hr	2	Roadside
Sta.10	Vumirirani (District Boundary)	12hr	2	Roadside

Source: JICA Survey Team

(2) Survey Results

Traffic volume

The vehicle type categories have been integrated for the analysis as shown in Table 4.1-2. Table 4.1-3 presents the traffic volume by Survey location. The survey result is shown in Appendix 2.

**Table 4.1-2 Vehicle Type Categories in Analysis**

Vehicle Type Categories in Traffic Count Survey		Vehicle Type Categories in Analysis		Passenger Car Equivalent
2	Cars	1	Cars	1.0
4	Matatus	2	Matatus	1.0
3	Pick-ups, 4 wheel drive SUVs, vans	3	LGVs (Light Goods Vehicle)	1.0
7	Light trucks 2 axles (<3.5 ton capacity)	4	MGVs (Medium Goods Vehicle)	2.5
8	Medium trucks 2 axles (>3.5 ton capacity)			
9	Heavy trucks 3 axles	5	HGVs (Heavy Goods Vehicle)	3.5
10	Heavy trucks 4 or more axles			
5	Minibuses (15-40 seats)	6	Buses	2.0
6	Large buses (more than 40 seats)			

Source: JICA Survey Team

Note: categories and passenger car equivalent are based on the F/S report

Traffic Composition

The traffic composition at each station is presented in Figure 4.1-2. There shows heavy traffic of cargo vehicles at station 1, 2, and 3 which are located on A109 between Nairobi and the industrial area in Mombasa.

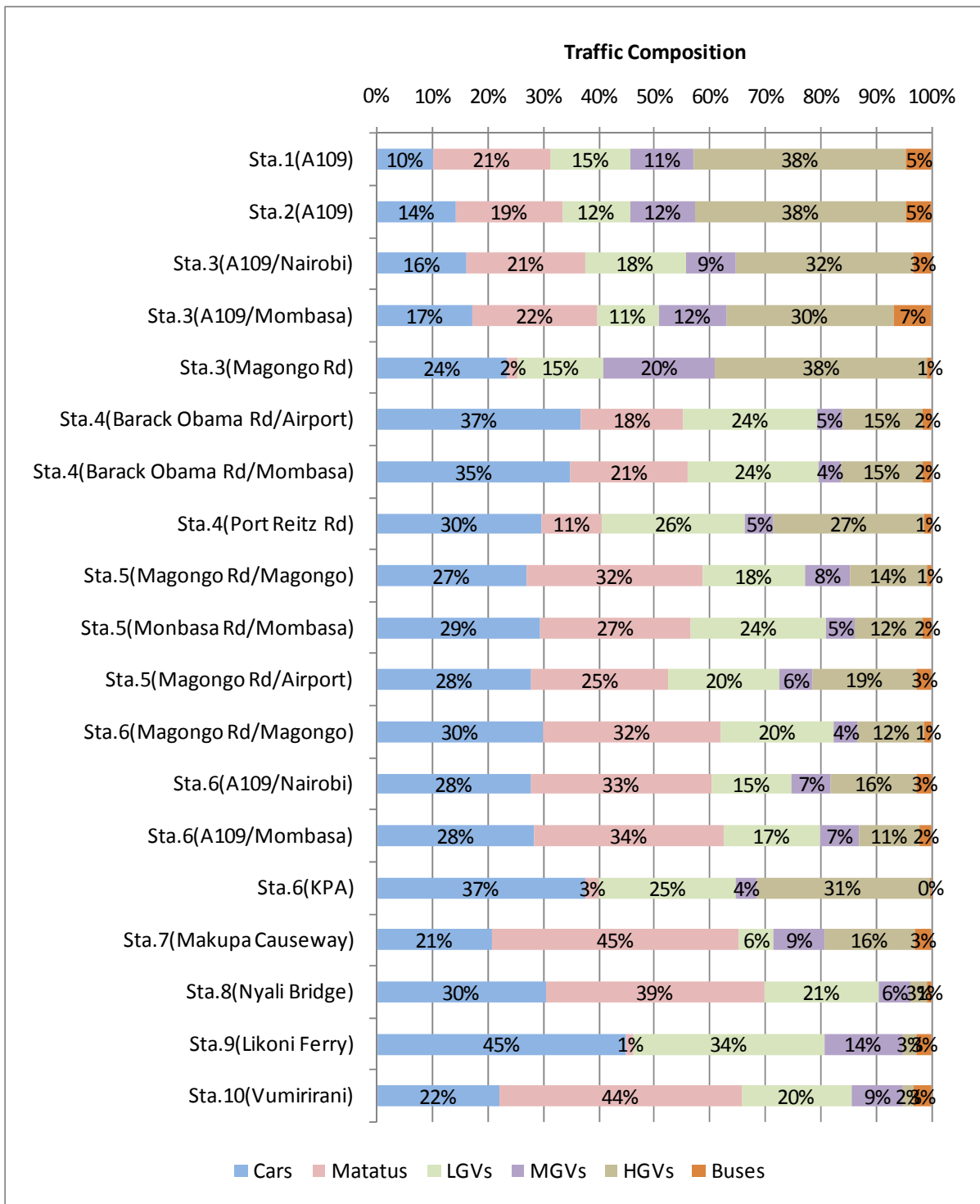
Hourly Distribution of Traffic Volume

Figure 4.1-3 presents the hourly distribution of traffic volume at the station 2, 7, 9, and 10, where a certain degree of traffic is expected to divert to the Bypass and Kipevu Link Road. The figure shows that there are no distinct peak hours during the daytime hours.

**Table 4.1-3 Traffic Volume at the Survey Stations**

Station No.	Location	Road Name /Approach	Date	12hr Traffic Volume							
				Vehicle							PCU
				Cars	Matatus	LGVs	MGVs	HGVs	Buses	Total	Total
Sta. 1	Mazeras (District Boundary)	A109	1st	631	1,383	981	788	2,818	382	6,983	15,592
			2nd	783	1,541	1,043	791	2,494	264	6,916	14,602
			Avg	707	1,462	1,012	790	2,656	323	6,950	15,097
Sta. 2	Miritini	A109	1st	883	1,187	712	756	2,267	306	6,111	13,219
			2nd	931	1,237	848	739	2,541	300	6,596	14,357
			Avg	907	1,212	780	748	2,404	303	6,354	13,788
Sta. 3	Nairobi Rd. / Magongo Rd. JCT	A109 / Nairobi	1st	1,398	1,886	1,569	829	2,891	339	8,912	17,722
			2nd	1,703	2,170	1,902	895	3,221	308	10,199	19,902
			Avg	1,551	2,028	1,736	862	3,056	324	9,556	18,812
		A109 / Mombasa	1st	1,199	1,558	803	901	2,123	439	7,023	14,121
			2nd	1,658	2,130	1,042	1,114	2,849	716	9,509	19,019
			Avg	1,429	1,844	923	1,008	2,486	578	8,266	16,570
		Magongo Rd	1st	1,117	124	800	1,401	2,306	37	5,785	13,689
			2nd	1,296	64	784	665	1,607	47	4,463	9,525
			Avg	1,207	94	792	1,033	1,957	42	5,124	11,607
Sta. 4	Barack Obama Rd. / Port Reitz Rd. JCT	Barack Obama Rd / Airport	1st	2,314	1,282	1,322	235	515	74	5,742	7,456
			2nd	1,677	721	1,273	269	1,060	105	5,105	8,264
			Avg	1,996	1,002	1,298	252	788	90	5,424	7,860
		Barack Obama Rd / Mombasa	1st	2,452	1,424	1,497	261	862	90	6,586	9,223
			2nd	2,703	1,680	1,982	322	1,323	148	8,158	12,097
			Avg	2,578	1,552	1,740	292	1,093	119	7,372	10,660
		Port Reitz Rd	1st	1,145	242	1,172	231	1,510	50	4,350	8,522
			2nd	1,707	804	1,303	257	1,093	87	5,251	8,456
			Avg	1,426	523	1,238	244	1,302	69	4,801	8,489
Sta. 5	Magongo Rd. / Barack Obama Rd. JCT	Magongo Rd / Magongo	1st	2,089	2,586	1,320	537	844	57	7,433	10,406
			2nd	2,073	2,361	1,508	741	1,304	80	8,067	12,519
			Avg	2,081	2,474	1,414	639	1,074	69	7,750	11,462
		Magongo Rd / Mombasa	1st	3,063	3,686	2,360	504	1,151	191	10,955	14,780
			2nd	4,227	3,007	3,699	752	1,866	231	13,782	19,806
			Avg	3,645	3,347	3,030	628	1,509	211	12,369	17,293
		Magongo Rd / Airport	1st	2,468	1,871	1,644	388	1,247	116	7,734	11,550
			2nd	1,841	1,938	1,464	504	1,664	306	7,717	12,939
			Avg	2,155	1,905	1,554	446	1,456	211	7,726	12,244
Sta. 6	Changamwe Roundabout	Magongo Rd / Magongo	1st	5,662	5,342	3,100	763	1,888	204	16,959	23,028
			2nd	4,336	5,332	3,681	723	2,062	264	16,398	22,902
			Avg	4,999	5,337	3,391	743	1,975	234	16,679	22,965
		A109 / Nairobi	1st	4,959	5,713	2,685	1,171	2,699	470	17,697	26,671
			2nd	4,698	5,600	2,366	1,271	2,701	468	17,104	26,231
			Avg	4,829	5,657	2,526	1,221	2,700	469	17,401	26,451
		A109 / Mombasa	1st	9,006	9,311	6,363	1,950	2,943	500	30,073	40,856
			2nd	7,185	10,064	3,591	2,020	3,327	749	26,936	39,033
			Avg	8,096	9,688	4,977	1,985	3,135	625	28,505	39,944
		KPA	1st	1,787	105	1,167	201	1,384	22	4,666	8,450
			2nd	1,732	145	1,145	140	1,548	20	4,730	8,830
			Avg	1,760	125	1,156	171	1,466	21	4,698	8,640
Sta. 7	Makupa Causeway	A109	1st	2,300	5,691	939	1,378	2,587	578	13,473	22,586
			2nd	4,717	9,423	1,134	1,757	2,864	508	20,403	30,707
			Avg	3,509	7,557	1,037	1,568	2,726	543	16,938	26,646
Sta. 8	Nyal Bridge	B8	1st	9,658	13,475	7,206	1,945	829	336	33,449	38,775
			2nd	11,248	13,680	6,982	2,003	1,201	280	35,394	41,681
			Avg	10,453	13,578	7,094	1,974	1,015	308	34,422	40,228
Sta. 9	Likoni Ferry	Likoni Ferry	1st	1,323	30	1,024	427	76	88	2,968	3,887
			2nd	1,244	43	930	378	76	66	2,737	3,560
			Avg	1,284	37	977	403	76	77	2,853	3,723
Sta. 10	Vumirani (District Boundary)	A14	1st	967	1,885	930	401	66	167	4,416	5,350
			2nd	951	1,884	788	414	81	129	4,247	5,200
			Avg	959	1,885	859	408	74	148	4,332	5,275

Source: JICA Survey Team

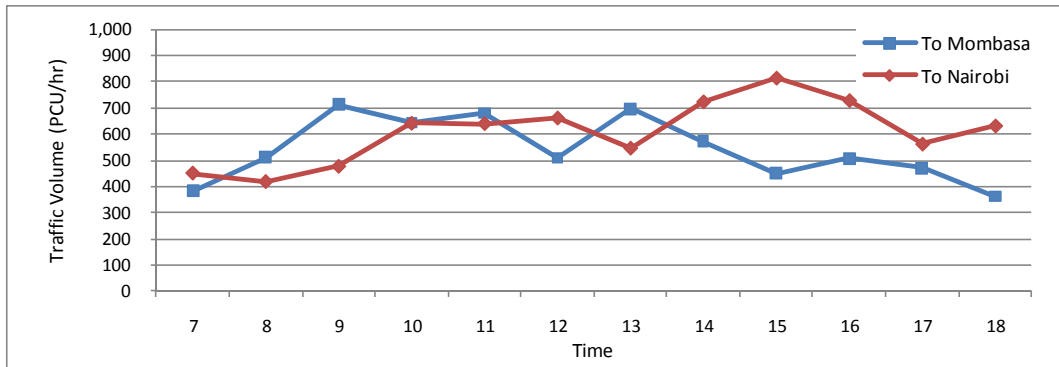


Source: JICA Survey Team

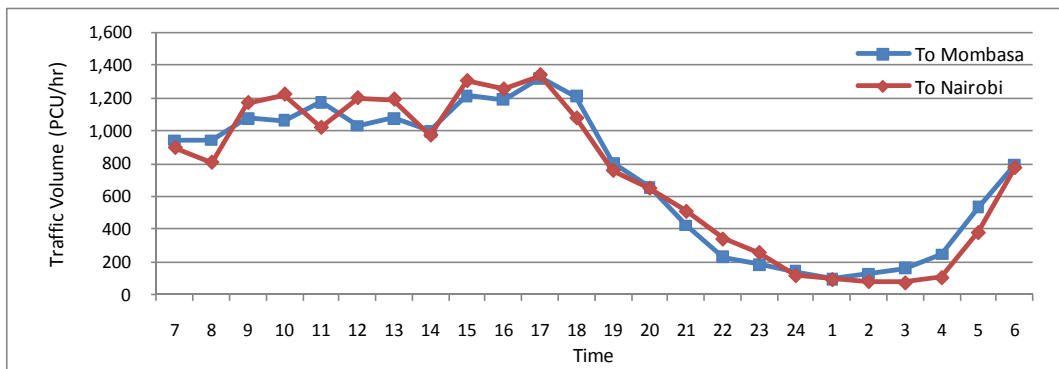
**Figure 4.1-2 Traffic Composition at the Survey Stations**



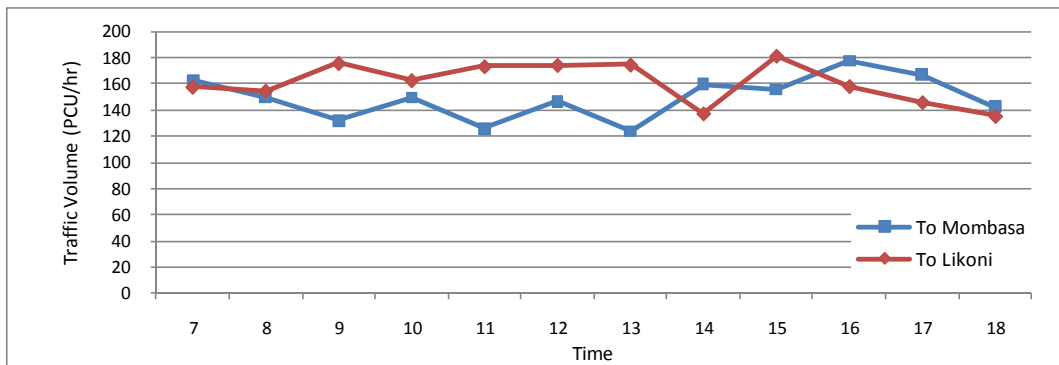
Station 2: Miritini (24-hour count)



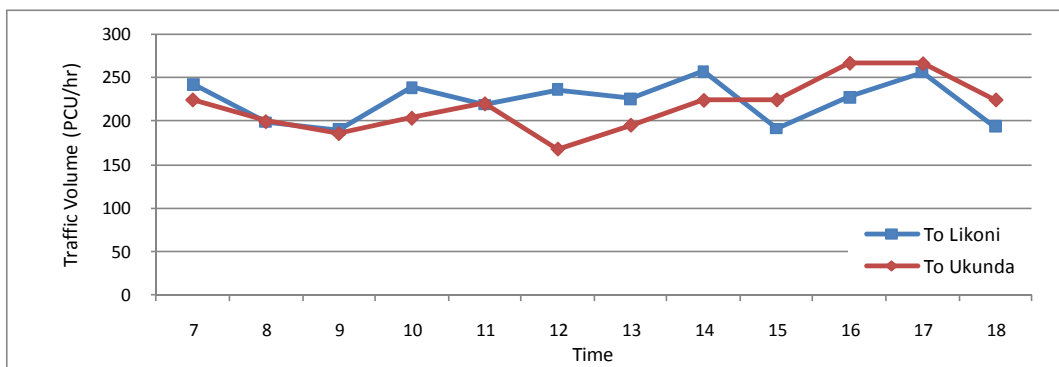
Station 7: Mapuka Causeway (24-hour count)



Station 9: Likoni Ferry



Station 10: Vumiriani



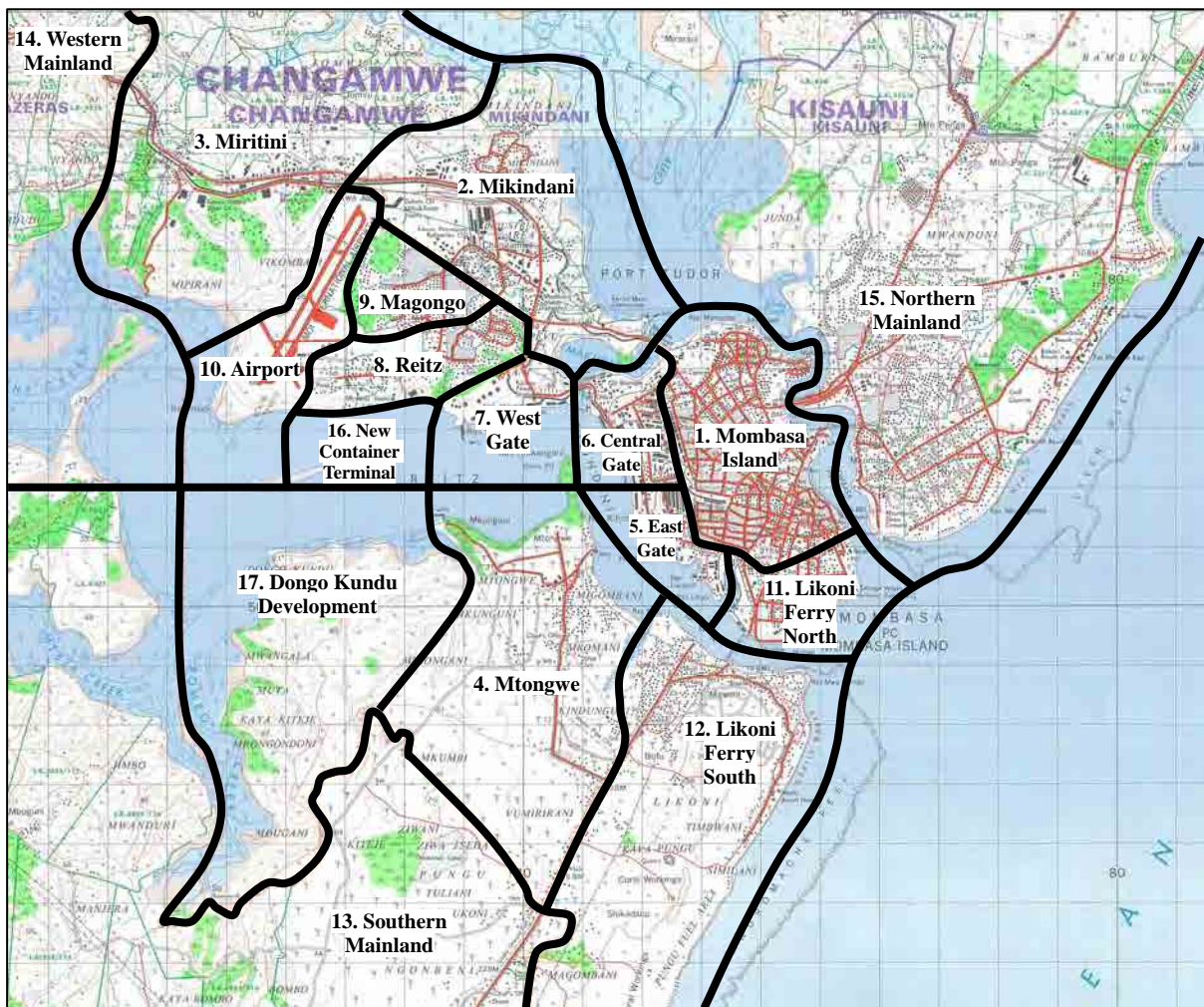
Source: JICA Survey Team

**Figure 4.1-3 Hourly Distribution of Traffic Volume**

#### 4.1.2 Present OD Table

##### (1) Traffic Analysis Zone

The traffic analysis zones in the Survey area are divided into 17 zones including two future development zones: New Container Terminal and Dongo Kundu as shown in Figure 4.1-4 and Table 4.1-4



Source: JICA Survey Team

Figure 4.1-4 Traffic Analysis Zone

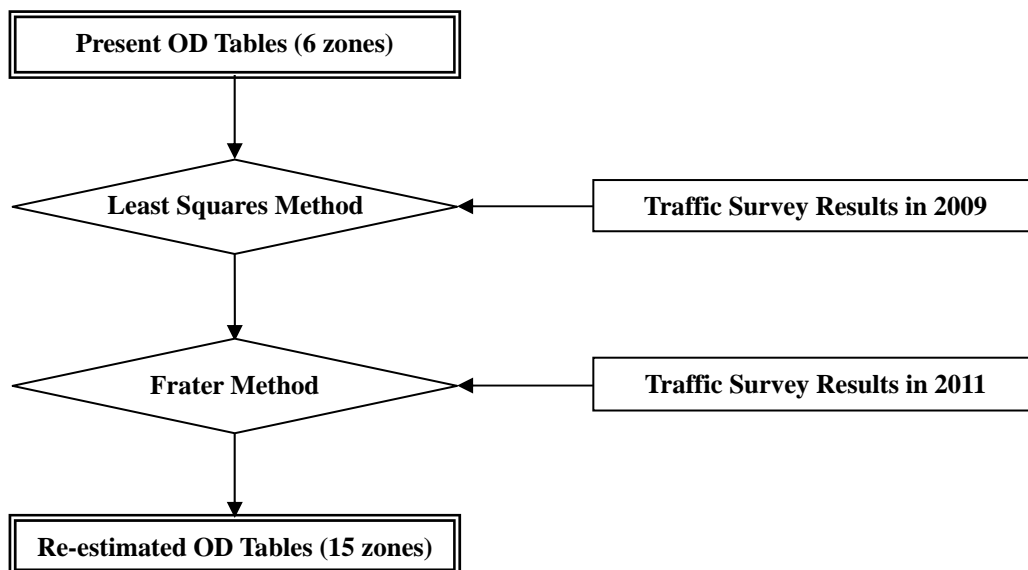
**Table 4.1-4 Traffic Analysis Zone**

Zone No.	Type	Zone Name	Note
1	Town (Residential, commercial, industrial area)	Mombasa Island	
2		Mikindani	
3		Miritini	
4		Mtongwe	
5	Present Container Terminal	East Gate	
6		Central Gate	
7		West Gate	
8	CFS	Reitz	
9		Magongo	
10	Airport	Airport	
11	Ferry Terminal & surrounding	Likoni Ferry North	
12		Likoni Ferry South	
13	External	Southern Mainland	Cordon line on district border
14		Western Mainland	Cordon line on district border
15		Northern Mainland	Cordon line on Nyali bridge
16	Proposed Development	New Container Terminal	In case of future OD
17		Dongo Kundu Development	In case of future OD

Source: JICA Survey Team

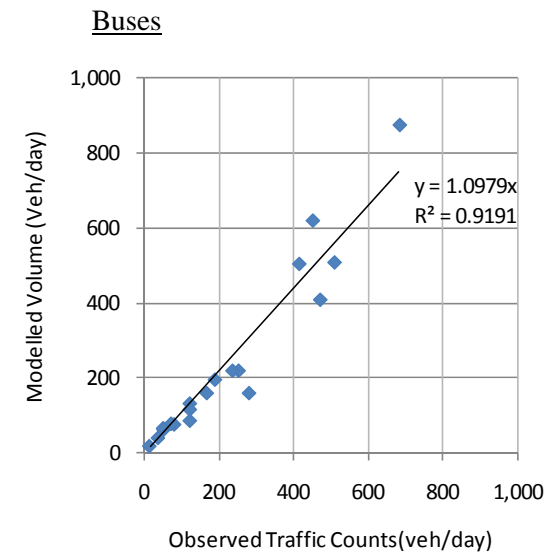
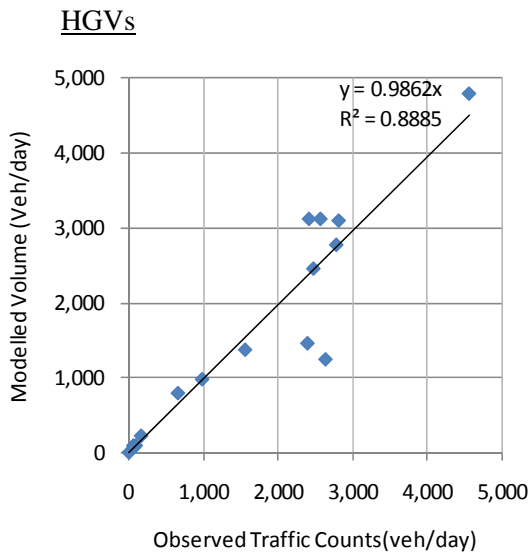
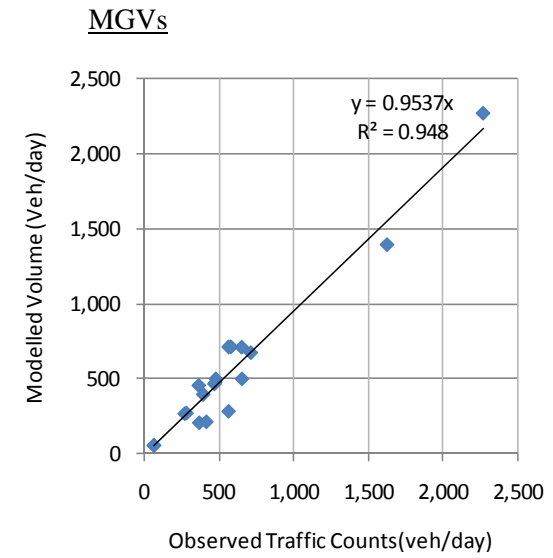
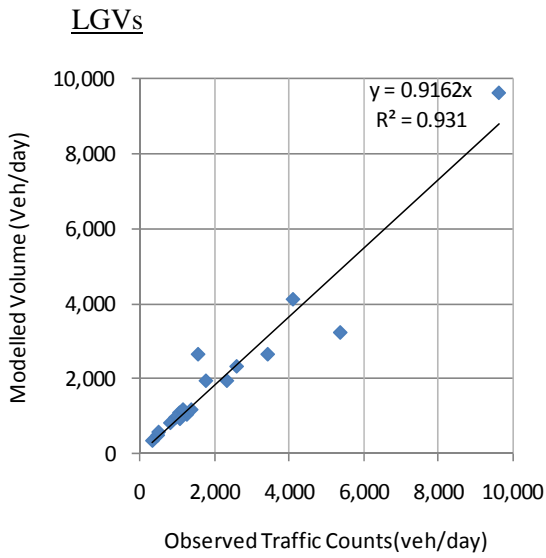
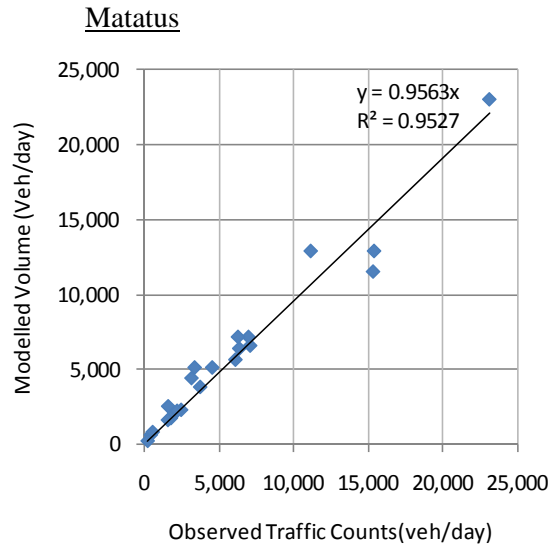
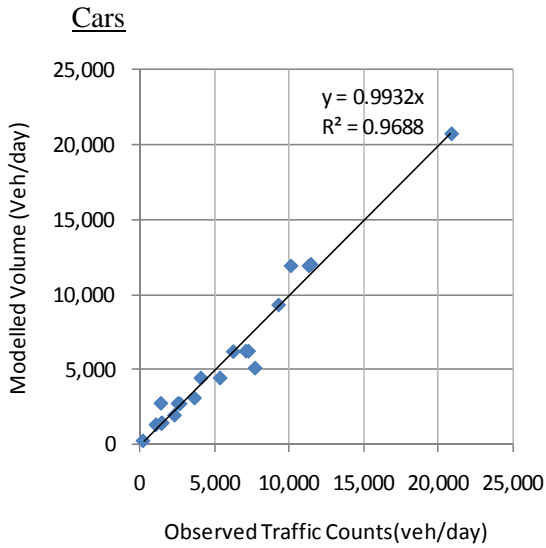
(2) OD Tables by Vehicle Type

OD tables by vehicle type were re-estimated by least squares method and Frater method using the results of the traffic count survey and the present OD tables as shown in Figure 4.1-5. The results of validation check of the model are shown in Figure 4.1-6.



Source: JICA Survey Team

**Figure 4.1-5 Procedure of Re-estimate of OD Tables**



Source: JICA Survey Team

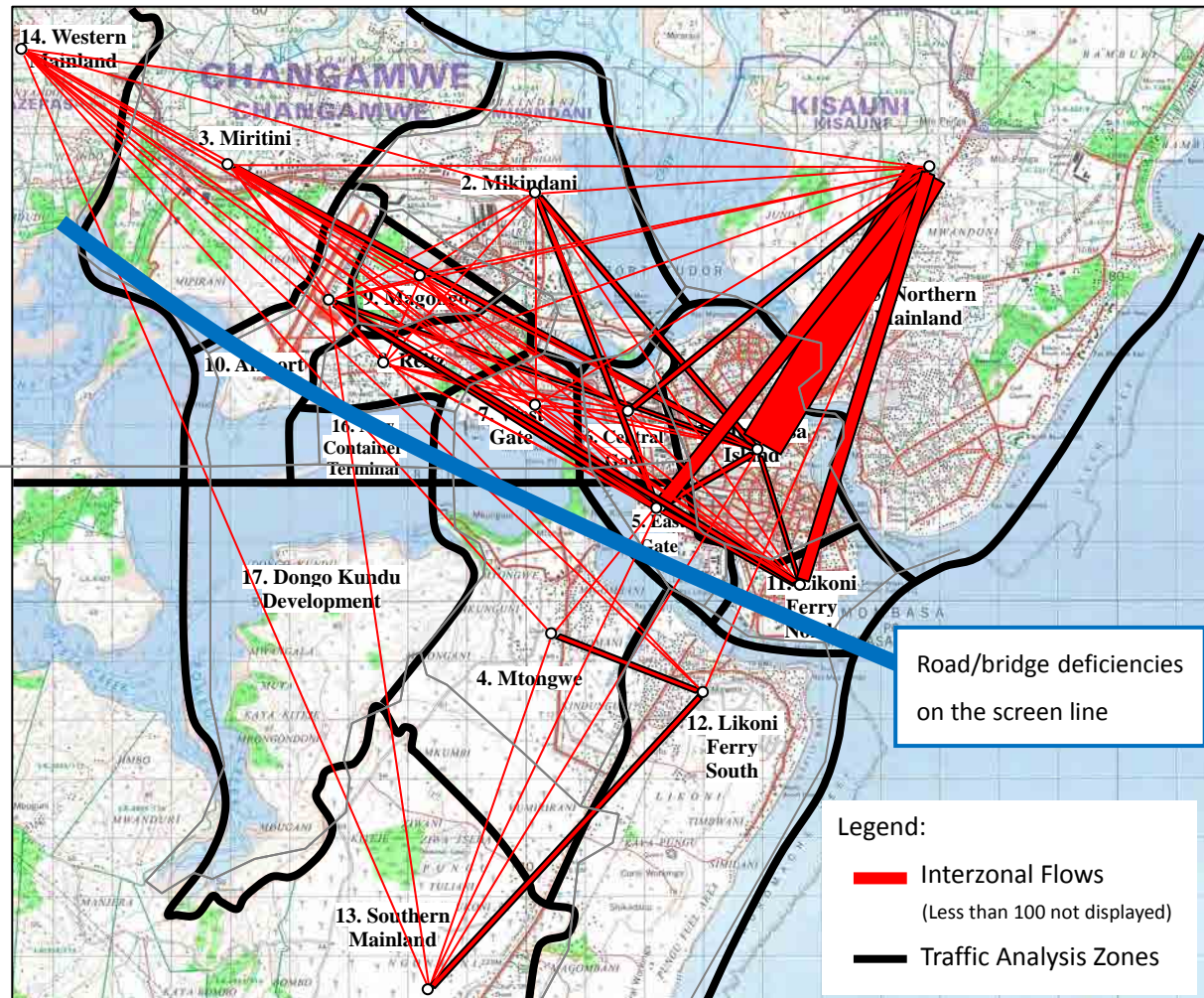
**Figure 4.1-6 Scatter Plots of Modeled Traffic Volumes versus Observed Traffic Counts**



### 4.1.3 Existing Road Condition

#### (1) Traffic Flow

Figure 4.1-7 illustrates desire line diagram of vehicles obtained from OD tables. Red lines show the vehicular flows among traffic analysis zones irrespective of individual roadway links. It is apparent that the red lines are not seamless on the screen line (blue line on the map) because of the deficiencies of roads or bridges. And the deficiencies may disable the south area for being developed.

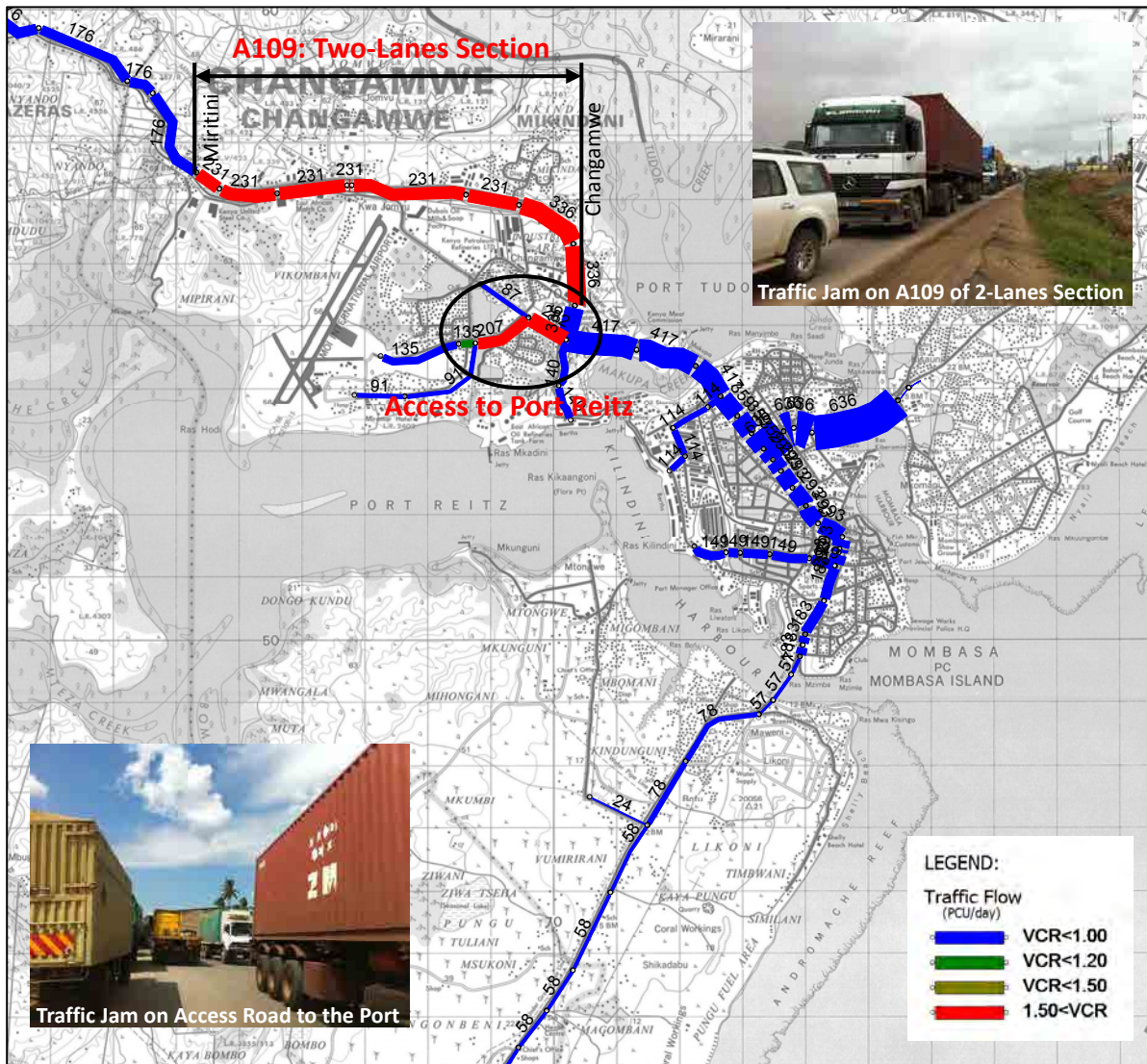


Source: JICA Survey Team

Figure 4.1-7 Desire-Line Diagram of Vehicle

(2) Road Demand and Capacity Balance

Figure 4.1-8 illustrates the traffic flows assigned to the network. It shows that the traffic demand has exceeded the road capacity of A109 at the section between Miritini and Changamwe which has only two lanes. It is also said that the capacity of access roads to Port Reitz is not enough against the demand.



Source: JICA Survey Team

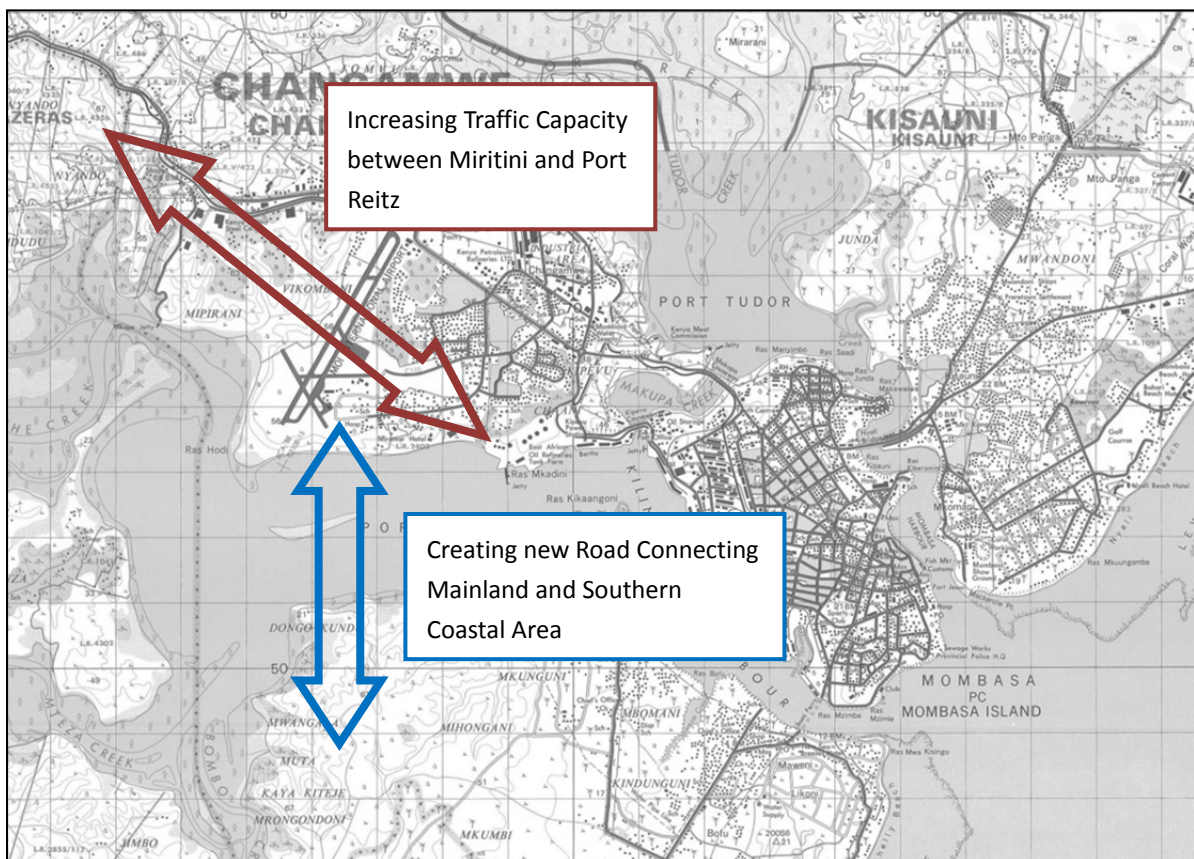
Figure 4.1-8 Traffic Flow Map in 2011



### (3) Major Findings and Issues

As discussed in the previous sections, the following findings and issues are pointed out:

- The traffic demand has exceeded the road capacity of A109 at the section between Miritini and Port Reitz. In order to alleviate the road congestion and to promote the economic growth in Kenya and neighboring countries, it is essential to increase traffic capacity between Miritini and Port Reitz.
- Deficiencies of roads or bridges across Port Reitz disable the southern coastal area from being developed. In order to open the southern coastal area, it is essential to provide new road connecting the southern coastal area with the mainland.



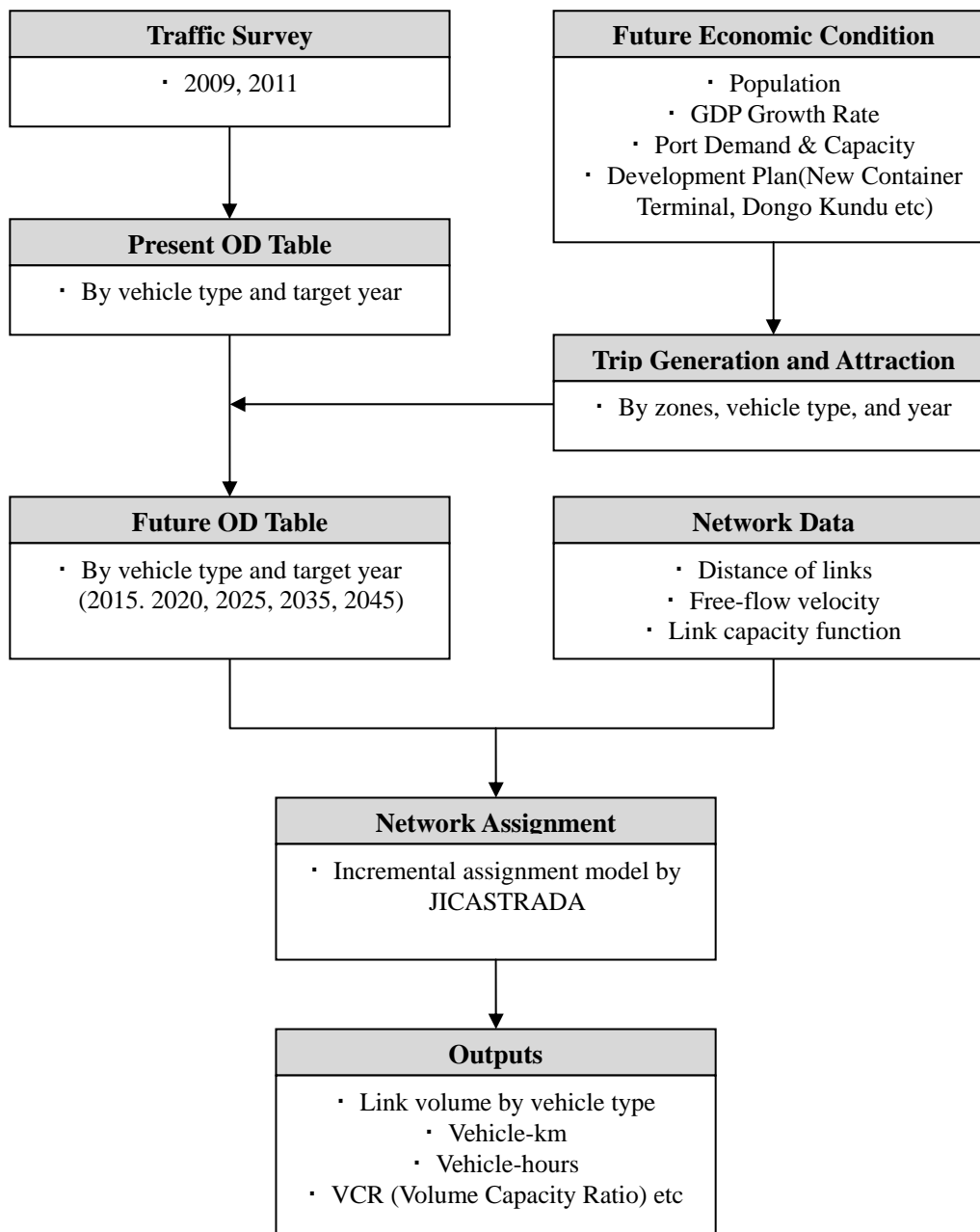
Source: JICA Survey Team

**Figure 4.1-9 Present Traffic Issue**

## 4.2 Future Traffic Demand Forecast

### 4.2.1 Approach

Figure 4.2-1 shows the procedure of future traffic demand forecast.



Source: JICA Survey Team

**Figure 4.2-1 Procedure of Traffic Demand Forecast**



## 4.2.2 Modelling of the OD Table and the Network Data

### (1) Future OD Table

#### Projection Year and Development Plan

The future OD tables are estimated by considering the future economic factors: population, GDP growth rate, demand-capacity balance of the port, and development plans as mentioned in chapter 2 and 3. The OD tables are produced by projection years which are set according to the development schedule of the New Container Terminal and Dongo Kundu Development as shown in Table 4.2-1.

**Table 4.2-1 Projection Year and Development Plan**

Stage	Projection Year	New Container Terminal	Dongo Kundu Development			
			Port Area	Free Trade Zone	Industrial Area	Total
1	2015-	Phase 1 (450,000 TEU)	-	-	-	-
2	2020-	Phase 2 (900,000 TEU)	-	-	-	-
3	2025-	Phase 3 (1,100,000 TEU)	Phase 1 (100 ha)	Phase 1 (60 ha)	Phase 1 (240 ha)	Phase 1 (400 ha)
4	2035-		Phase 2 (200 ha)	Phase 2 (120 ha)	Phase 2 (480 ha)	Phase 2 (800 ha)
5	2045-		Phase 3 (300 ha)	Phase 3 (180 ha)	Phase 3 (720 ha)	Phase 3 (1,200 ha)

Source: JICA Survey Team

Note: For more information, refer to chapter 2 and 3

#### Trip Generation and Attraction

Trip generation and attraction from/to the development area are estimated as follows:

- As for New Container Terminal and Dongo Kundu Port Area, trip generation and attraction are estimated by the trip-rate obtained from the traffic count and the statistic data of current container terminal in Mombasa.
- As for Dongo Kundu Free Trade Zone and Industrial Area, trip generation and attraction are estimated by trip type: goods vehicles (Table 4.2-2) and commuters (Table 4.2-3).

**Table 4.2-2 Generation and Attraction for Goods Vehicles**

Area	Trip-Rate (vehicle/day·ha)	Generation & Attraction (vehicle/day)		
		2025	2035	2045
Free Trade Zone	25	1,500	3,000	4,500
Industrial Area	8	1,920	3,840	5,760
Total		3,420	6,840	10,260

Source: JICA Survey Team

Note: Trip-rates are assumed as one-half of the rates in Tokyo Metropolitan Area

**Table 4.2-3 Generation and Attraction for Commuters**

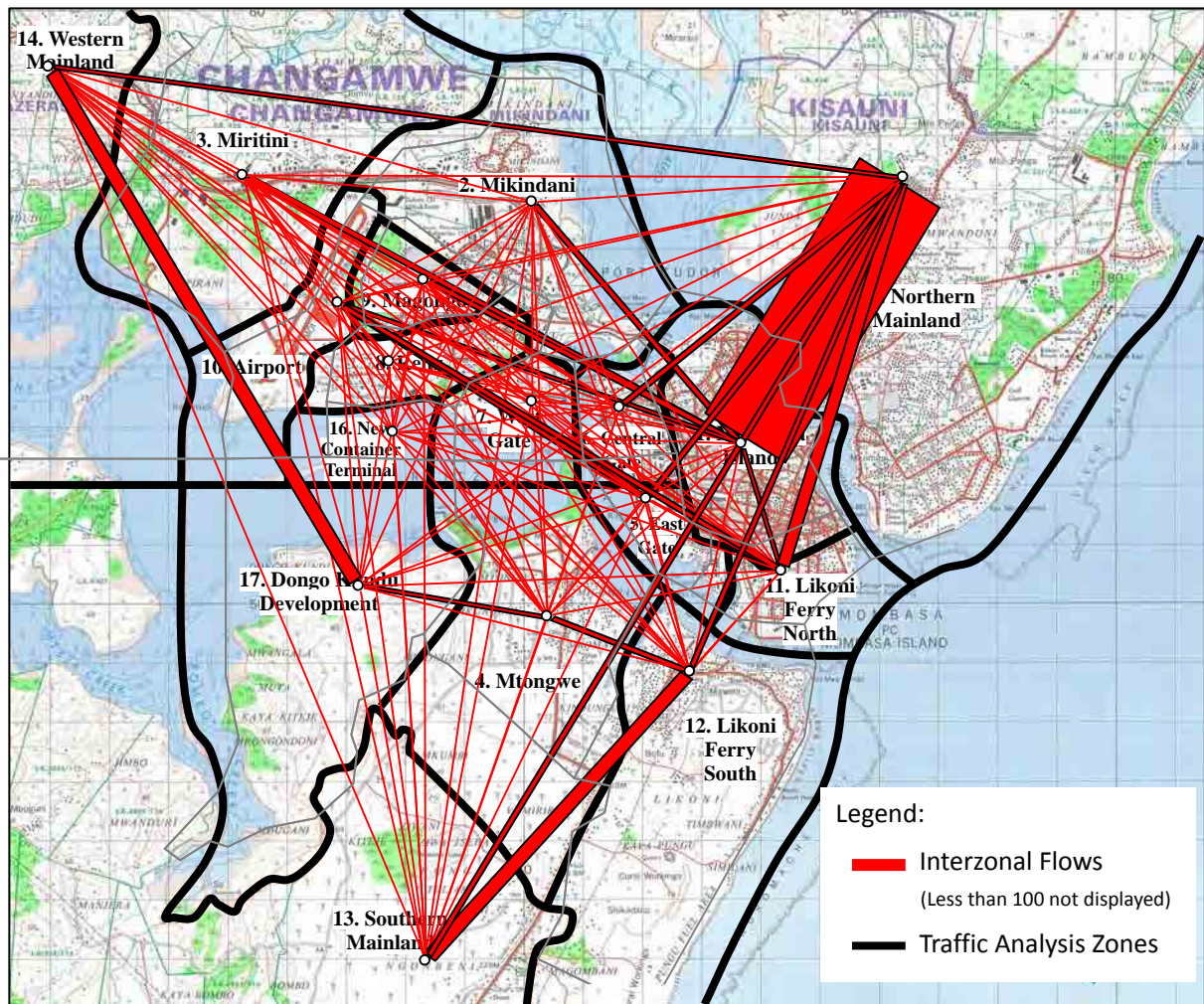
Area	Trip-Rate (person/day·ha)	Generation & Attraction (person/day)		
		2025	2035	2045
Free Trade Zone	25	1,500	3,000	4,500
Industrial Area	40	9,600	19,200	28,800
Total		14,520	29,040	43,560

Source: JICA Survey Team

Note: Trip-rates are assumed as one-half of the rates in Tokyo Metropolitan Area

Future Traffic Flow

Figure 4.2-2 illustrates desire line diagram of vehicles obtained from the future OD tables. It indicates that the traffic flows between mainland zone and Dongo Kundu Development zone generated as the result of Dongo Kundu Development. Therefore, it is obvious that a trunk road which connects the mainland with Dongo Kundu should be added to the network.



Source: JICA Survey Team

Figure 4.2-2 Desire Line Diagram in 2045

(2) Network Data

Projection Case of Network

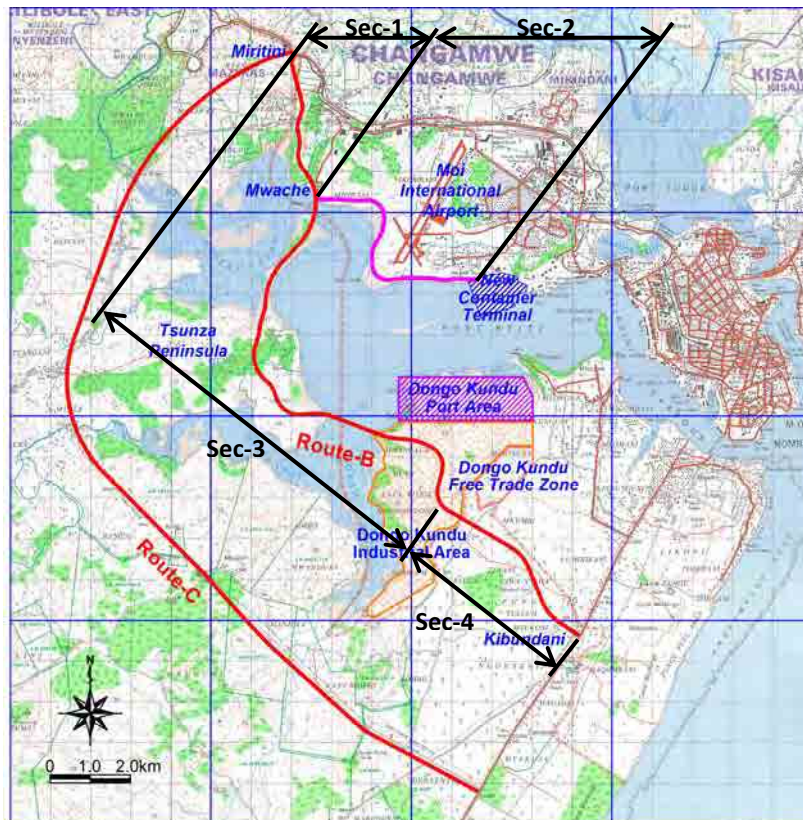
Six cases of assignment network shown in Table 4.2-4 are provided for the Survey. The future OD tables which were mentioned above are assigned to each network.

**Table 4.2-4 Traffic Demand Forecasting Case**

Case		Number of Lane				
		Bypass Route-B and Kipevu Link Road				Bypass Route-C
		Section 1	Section 2	Section 3	Section 4	
0	Do Nothing	-	-	-	-	-
1	Kipevu Link Road Only	4	4	-	-	-
2	Kipevu Link Road with the Bypass Route-B (2-lane)	4	4	2	2	-
3	Kipevu Link Road with the Bypass Route-B (4&2-lane)	4	4	4	2	-
4	Kipevu Link Road with the Bypass Route-B (4-lane)	4	4	4	4	-
5	Kipevu Link Road with the Bypass Route-C	4	4	-	2	4

Note: Figures in the table indicate the number of lanes.

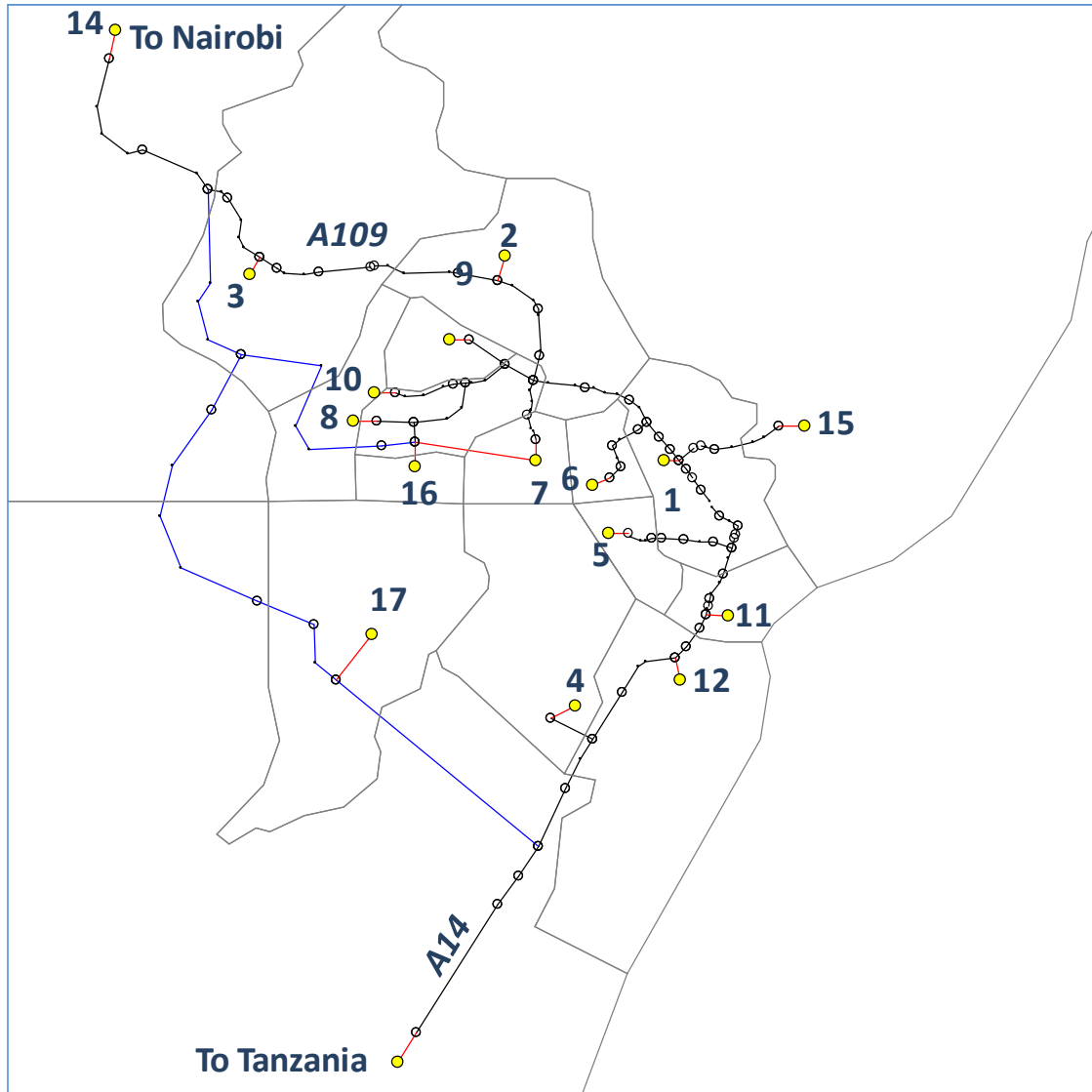
Section numbers are shown in Figure 4.2-3



**Figure 4.2-3 Section Number of Proposed Road**

Traffic Network Assignment Map

Traffic network assignment map for Mombasa Southern Bypass Route-B case in 2045 is shown in Figure 4.2-4.



Source: JICA Survey Team

**Figure 4.2-4 Traffic Network Assignment Map for  
Mombasa Southern Bypass Route-B in 2045**

## Free Flow Speed and Capacity

Free flow speeds and road capacities are set as shown in Table 4.2-5. Basically based on Highway Capacity Manual, some adjustment factors are calibrated for the Survey in order to match the estimated speed for the reality.

**Table 4.2-5 Free Flow Speed and Capacity by Road Type**

Road Class	Number of Lane	Carrigeway	Lateral Clearance	Location	Lane Capacity (PCU/hr/ oneway)	Road Capacity (PCU/day/ bothway)	Free Flow Speed (km/h)	
A or B	6	Divided	with soft	Rural	2,500	150,000	80	
	6	Divided	shoulder	Urban	2,500	105,000	60	
	6	Divided	without soft	Rural	2,500	129,000	80	
	6	Divided	shoulder	Urban	2,500	90,000	60	
	4	Divided	with soft	Rural	2,500	100,000	80	
	4	Divided	shoulder	Urban	2,500	70,000	60	
	4	Divided	without soft	Rural	2,500	86,000	80	
	4	Divided	shoulder	Urban	2,500	60,000	60	
	2	Divided	with soft	Rural	1,100	22,000	80	
	2	Divided	shoulder	Urban	1,100	15,000	60	
	2	Divided	without soft	Rural	1,100	19,000	80	
	2	Divided	shoulder	Urban	1,100	13,000	60	
	2	Undivided	with soft	Rural	1,100	21,000	80	
	2	Undivided	shoulder	Urban	1,100	14,000	60	
	C or Others	6	Divided	with soft	Rural	2,500	135,000	60
		6	Divided	shoulder	Urban	2,500	105,000	40
6		Divided	without soft	Rural	2,500	116,000	60	
6		Divided	shoulder	Urban	2,500	90,000	40	
4		Divided	with soft	Rural	2,500	90,000	60	
4		Divided	shoulder	Urban	2,500	70,000	40	
4		Divided	without soft	Rural	2,500	77,000	60	
4		Divided	shoulder	Urban	2,500	60,000	40	
2		Divided	with soft	Rural	1,100	20,000	40	
2		Divided	shoulder	Urban	1,100	15,000	30	
2		Divided	without soft	Rural	1,100	17,000	40	
2		Divided	shoulder	Urban	1,100	13,000	30	
2		Undivided	with soft	Rural	1,100	16,000	40	
2		Undivided	shoulder	Urban	1,100	13,000	30	
2		Undivided	without soft	Rural	1,100	14,000	40	
2		Undivided	shoulder	Urban	1,100	11,000	30	

Source: JICA Survey Team

Note: Road Classification in Kenya is defined as follows:

Class A as International Trunk Roads, Class B as National Trunk Roads, and Class C as Primary Roads

### 4.2.3 Result of the Traffic Demand Forecast

#### (1) Traffic Assignment

The result of the traffic assignment of case 1, “Kipevu Link Road Only” and case 3, “Kipevu Link Road with Mombasa Southern Bypass Route-B (4&2-Lane)” is shown in Figure 4.2-5 and Figure 4.2-6 respectively. They indicate the number of vehicles ('00 pcu) and volume capacity ratio (VCR) on each link.

#### (2) Traffic Indicators

Table 4.2-6 shows traffic indicators by analysis case. VCR and travel speed express the traffic congestion level. The Vehicle-Km and Vehicle-hours are used for the economic analysis of the cases.

**Table 4.2-6 Traffic Indicators of Forecasting Case**

Vehicle-Km Total

(Unit: PCU\*km/day)

Case	2011	2015	2020	2025	2035	2045
0 Do Nothing	1,385,405	2,036,320	2,484,458	3,785,179	6,487,291	9,472,269
1 Kipevu Link Road Only	1,385,405	1,854,840	2,250,867	3,467,817	6,031,378	8,825,587
2 Kipevu Link Road with the Bypass Route-B (2-lane)	1,385,405	1,875,266	2,275,333	3,220,032	5,244,572	7,693,271
3 Kipevu Link Road with the Bypass Route-B (4&2-lane)	1,385,405	1,875,354	2,276,107	3,224,130	5,294,173	7,724,273
4 Kipevu Link Road with the Bypass Route-B (4-lane)	1,385,405	1,875,417	2,276,574	3,225,127	5,307,795	7,739,392
5 Kipevu Link Road with the Bypass Route-C	1,385,405	1,956,198	2,582,994	3,659,219	6,279,215	9,284,451

Ave. Volume Capacity Ratio (VCR)

Case	2011	2015	2020	2025	2035	2045
0 Do Nothing	0.66	0.66	0.81	1.14	1.79	2.37
1 Kipevu Link Road Only	0.66	0.46	0.55	0.80	1.30	1.76
2 Kipevu Link Road with the Bypass Route-B (2-lane)	0.66	0.42	0.52	0.71	1.09	1.48
3 Kipevu Link Road with the Bypass Route-B (4&2-lane)	0.66	0.37	0.44	0.62	0.96	1.31
4 Kipevu Link Road with the Bypass Route-B (4-lane)	0.66	0.33	0.40	0.56	0.88	1.21
5 Kipevu Link Road with the Bypass Route-C	0.66	0.29	0.38	0.53	0.87	1.22



## Vehicle-hours Total

(Unit: PCU\*hrs/day)

Case		2011	2015	2020	2025	2035	2045
0	Do Nothing	32,408	34,462	44,912	81,701	178,159	321,644
1	Kipevu Link Road Only	32,408	31,684	40,491	72,861	155,954	281,177
2	Kipevu Link Road with the Bypass Route-B (2-lane)	32,408	29,644	37,925	57,890	118,465	214,119
3	Kipevu Link Road with the Bypass Route-B (4&2-lane)	32,408	29,476	37,691	55,713	107,339	193,201
4	Kipevu Link Road with the Bypass Route-B (4-lane)	32,408	29,355	37,509	55,234	105,910	189,378
5	Kipevu Link Road with the Bypass Route-C	32,408	30,345	42,137	62,047	131,227	222,874

## Ave. Travel Speed

(Unit: km/h)

Case		2011	2015	2020	2025	2035	2045
1	Kipevu Link Road Only	42.7	59.1	55.3	46.3	36.4	29.4
2	Kipevu Link Road with Bypass Route-B (2-lane)	42.7	58.5	55.6	47.6	38.7	31.4
3	Kipevu Link Road with Bypass Route-B (4&2-lane)	42.7	63.3	60.0	55.6	44.3	35.9
4	Kipevu Link Road with the Bypass Route-B (4-lane)	42.7	63.6	60.4	57.9	49.3	40.0
5	Kipevu Link Road with the Bypass Route-C	42.7	63.9	60.7	58.4	50.1	40.9
1	Kipevu Link Road Only	42.7	64.5	61.3	59.0	47.9	41.7

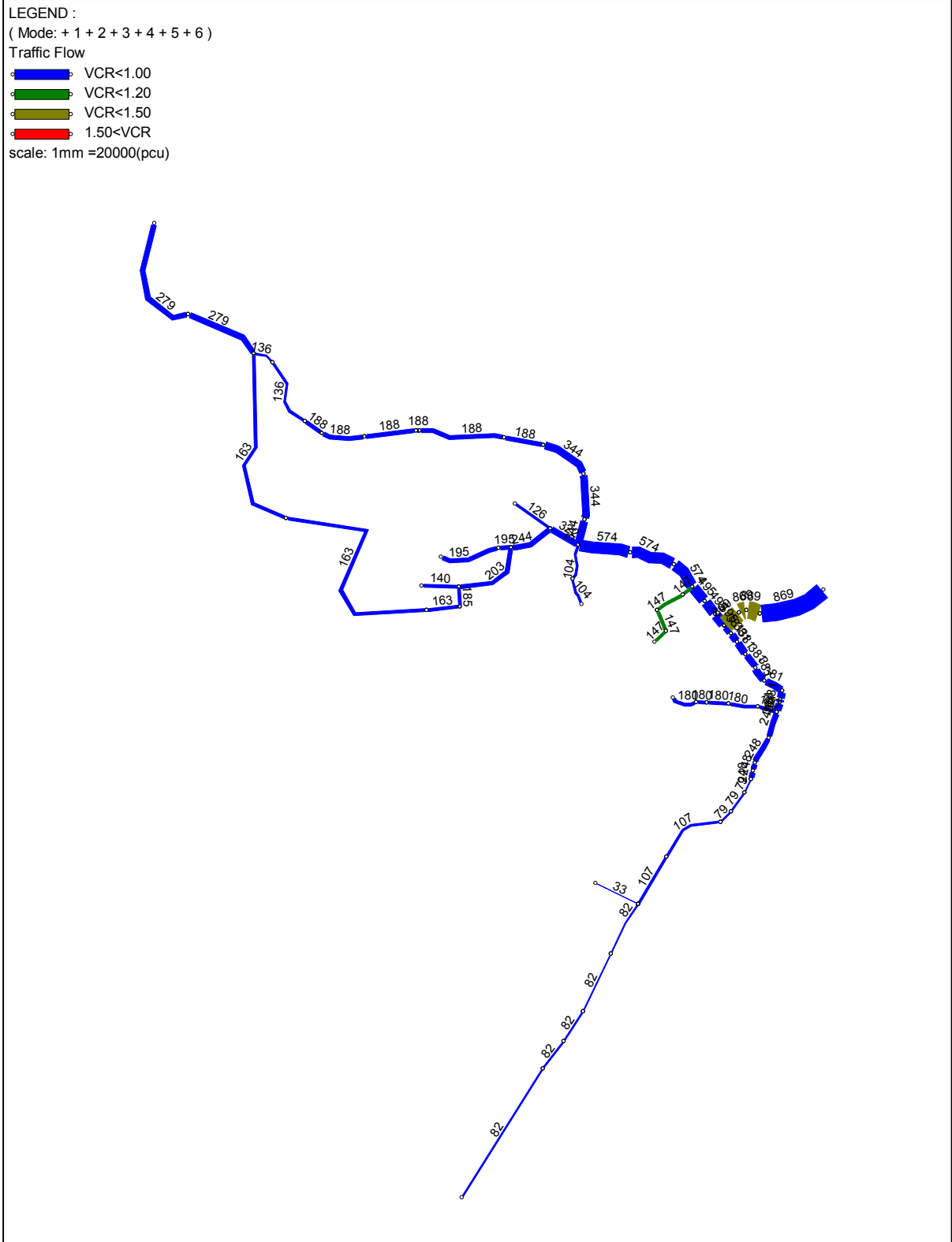
## Peak. Travel Speed

(Unit: km/h)

Case		2011	2015	2020	2025	2035	2045
1	Kipevu Link Road Only	17.9	32.9	26.3	16.8	12.1	10.4
2	Kipevu Link Road with the Bypass Route-B (2-lane)	17.9	34.0	29.4	21.3	13.8	10.7
3	Kipevu Link Road with the Bypass Route-B (4&2-Lane)	17.9	35.8	31.6	22.8	15.1	11.3
4	Kipevu Link Road with the Bypass Route-B (4-lane)	17.9	36.1	31.8	27.1	17.0	12.4
5	Kipevu Link Road with the Bypass Route-C	17.9	36.3	32.0	27.5	17.9	13.0
1	Kipevu Link Road Only	17.9	37.4	31.4	26.9	18.1	14.0

Source: JICA Survey Team

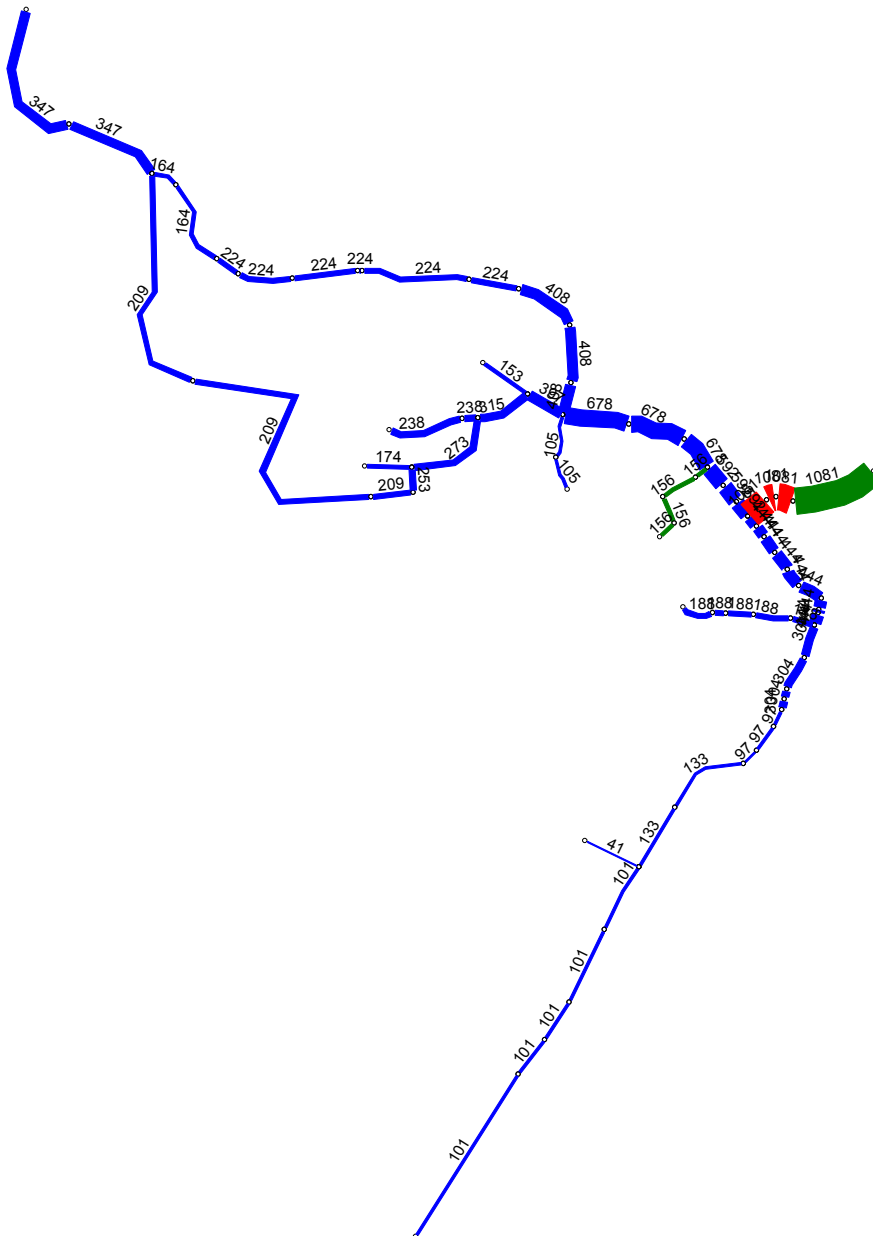




Source: JICA Survey Team

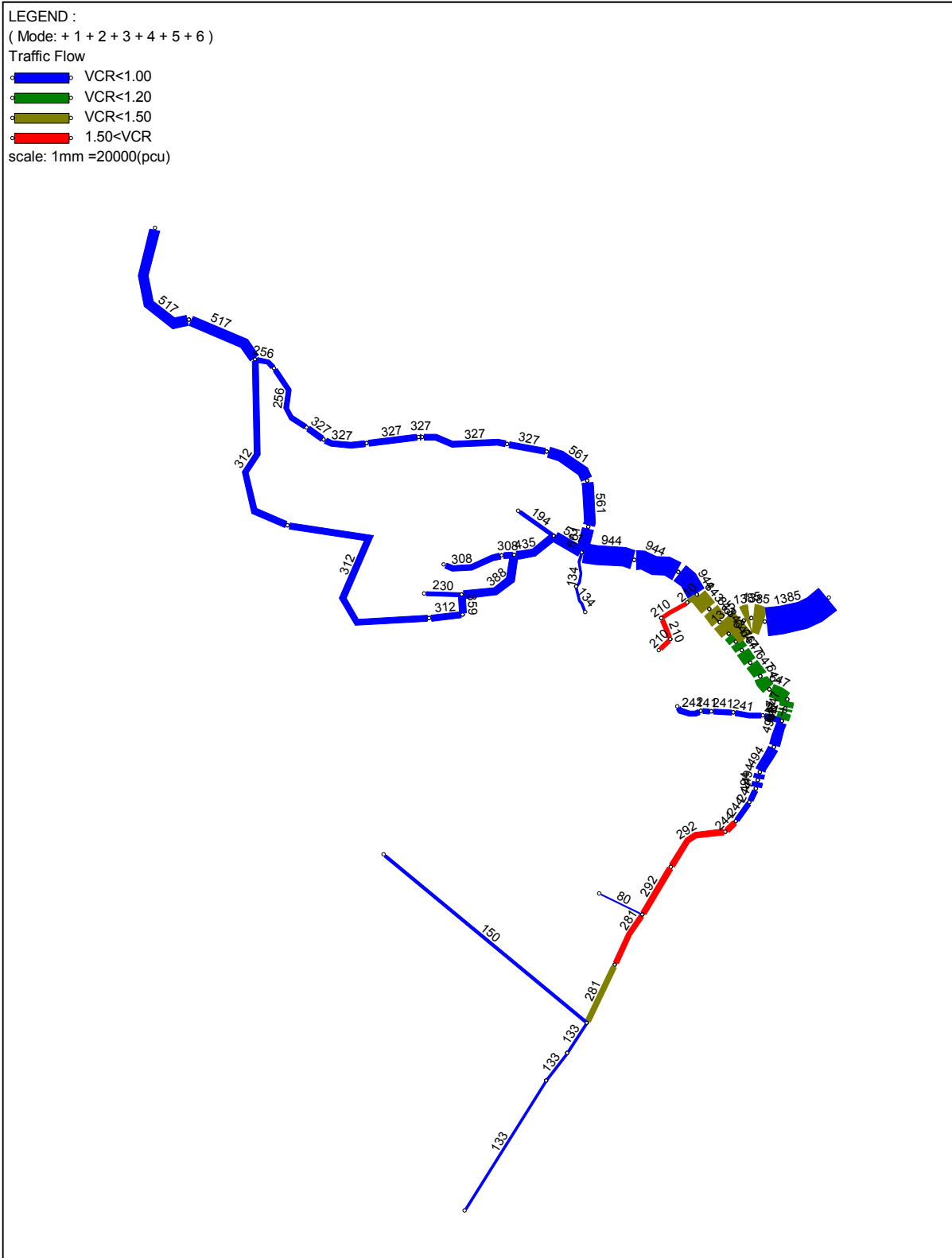
**Figure 4.2-5(1) Traffic Assignment of Case 1:  
 “Kipevu Link Road Only” in 2015**

LEGEND :  
 ( Mode: + 1 + 2 + 3 + 4 + 5 + 6 )  
 Traffic Flow  
 VCR<1.00  
 VCR<1.20  
 VCR<1.50  
 1.50<VCR  
 scale: 1mm =20000(pcu)



Source: JICA Survey Team

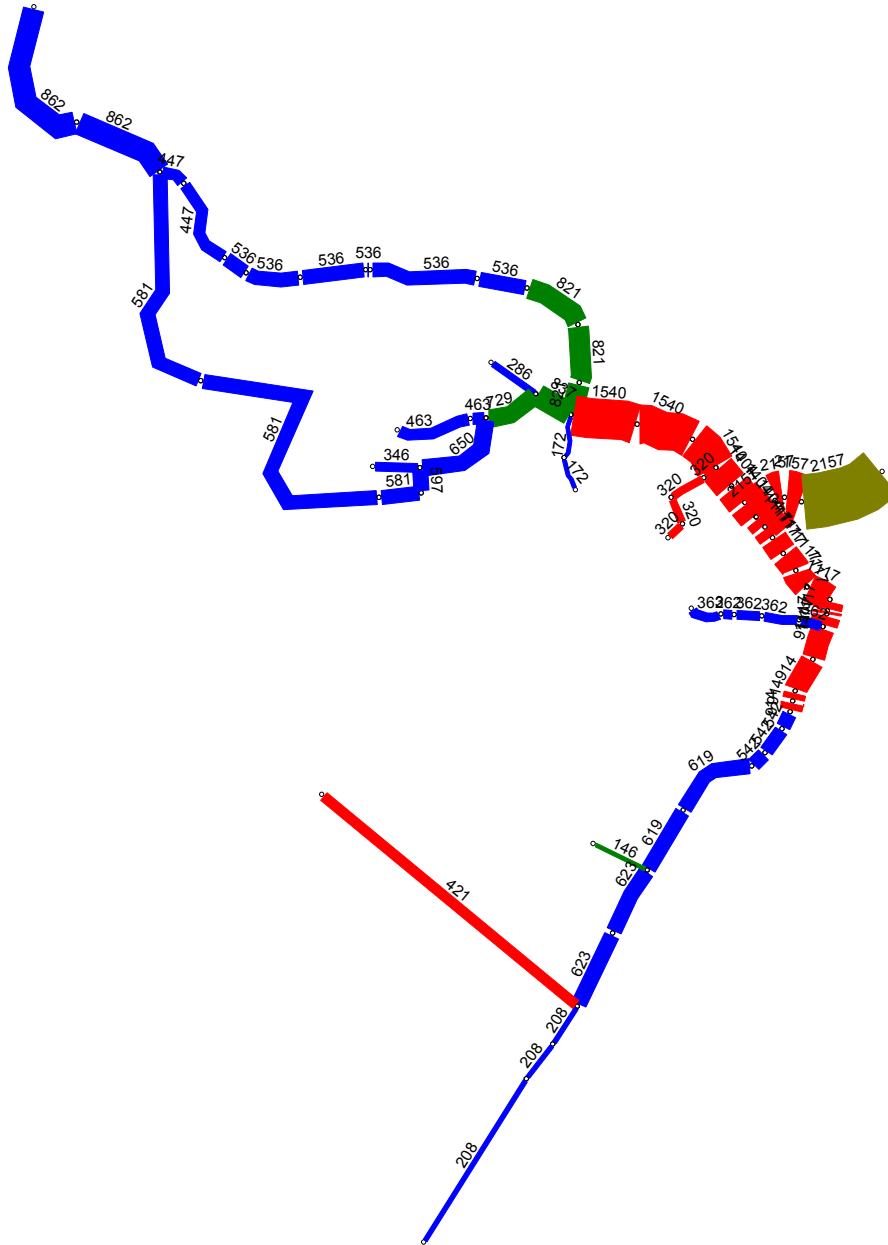
**Figure 4.2-5(2) Traffic Assignment of Case 1:  
 “Kipevu Link Road Only” in 2020**



Source: JICA Survey Team

**Figure 4.2-5(3) Traffic Assignment of Case 1:  
“Kipevu Link Road Only” in 2025**

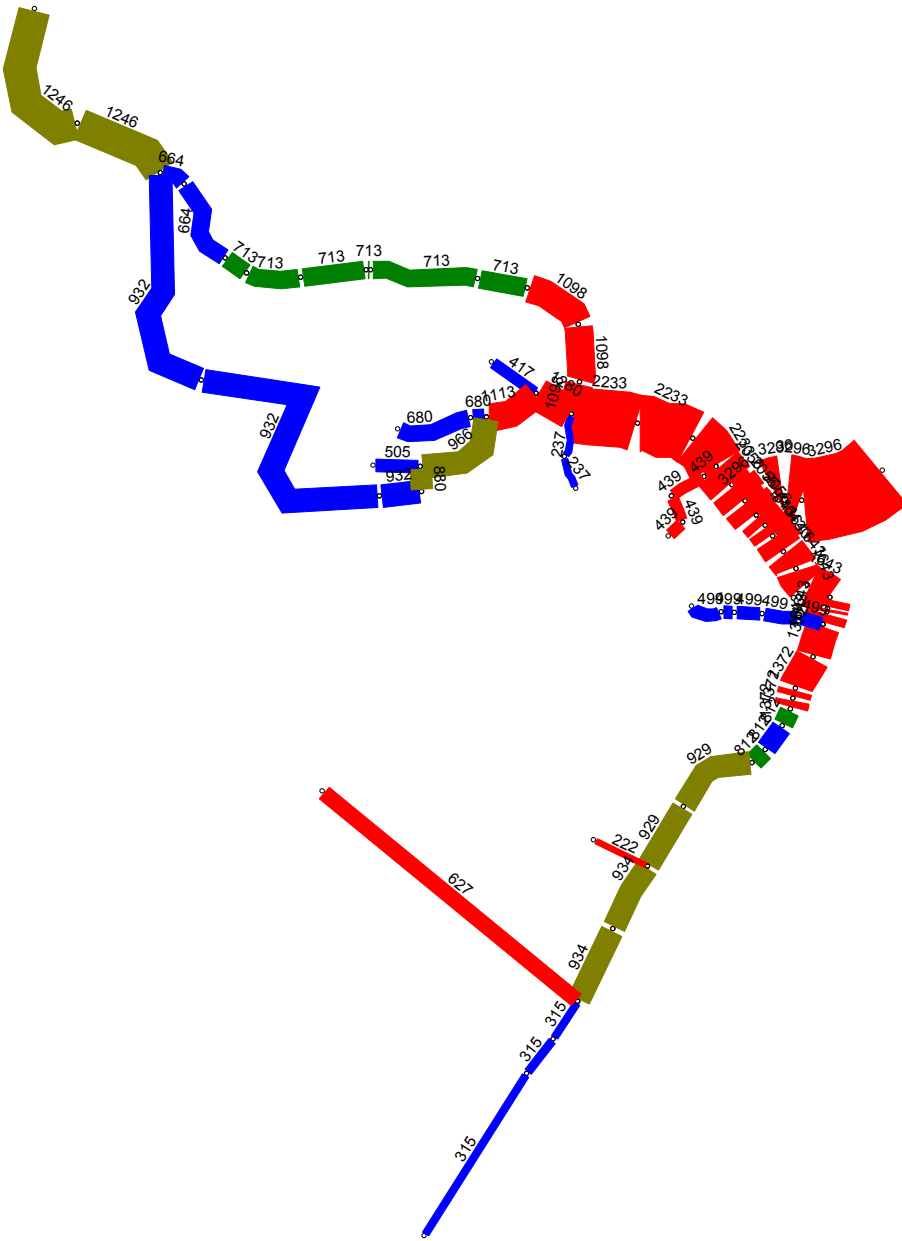
**LEGEND :**  
 ( Mode: + 1 + 2 + 3 + 4 + 5 + 6 )  
**Traffic Flow**  
 VCR<1.00  
 VCR<1.20  
 VCR<1.50  
 1.50<VCR  
 scale: 1mm =20000(pcu)



Source: JICA Survey Team

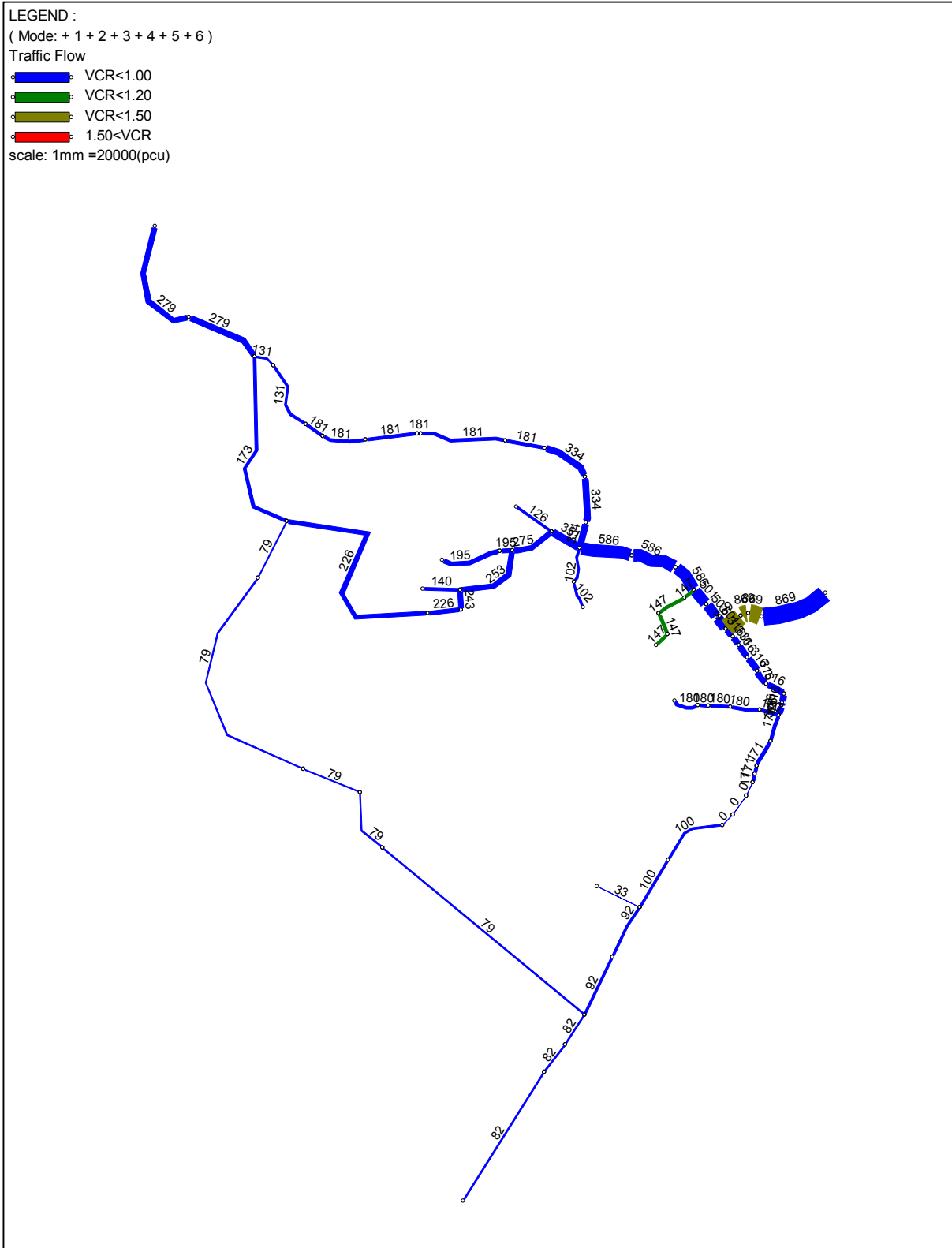
**Figure 4.2-5(4) Traffic Assignment of Case 1:  
 “Kipevu Link Road Only” in 2035**

LEGEND :  
 ( Mode: + 1 + 2 + 3 + 4 + 5 + 6 )  
 Traffic Flow  
 VCR<1.00  
 VCR<1.20  
 VCR<1.50  
 1.50<VCR  
 scale: 1mm =20000(pcu)



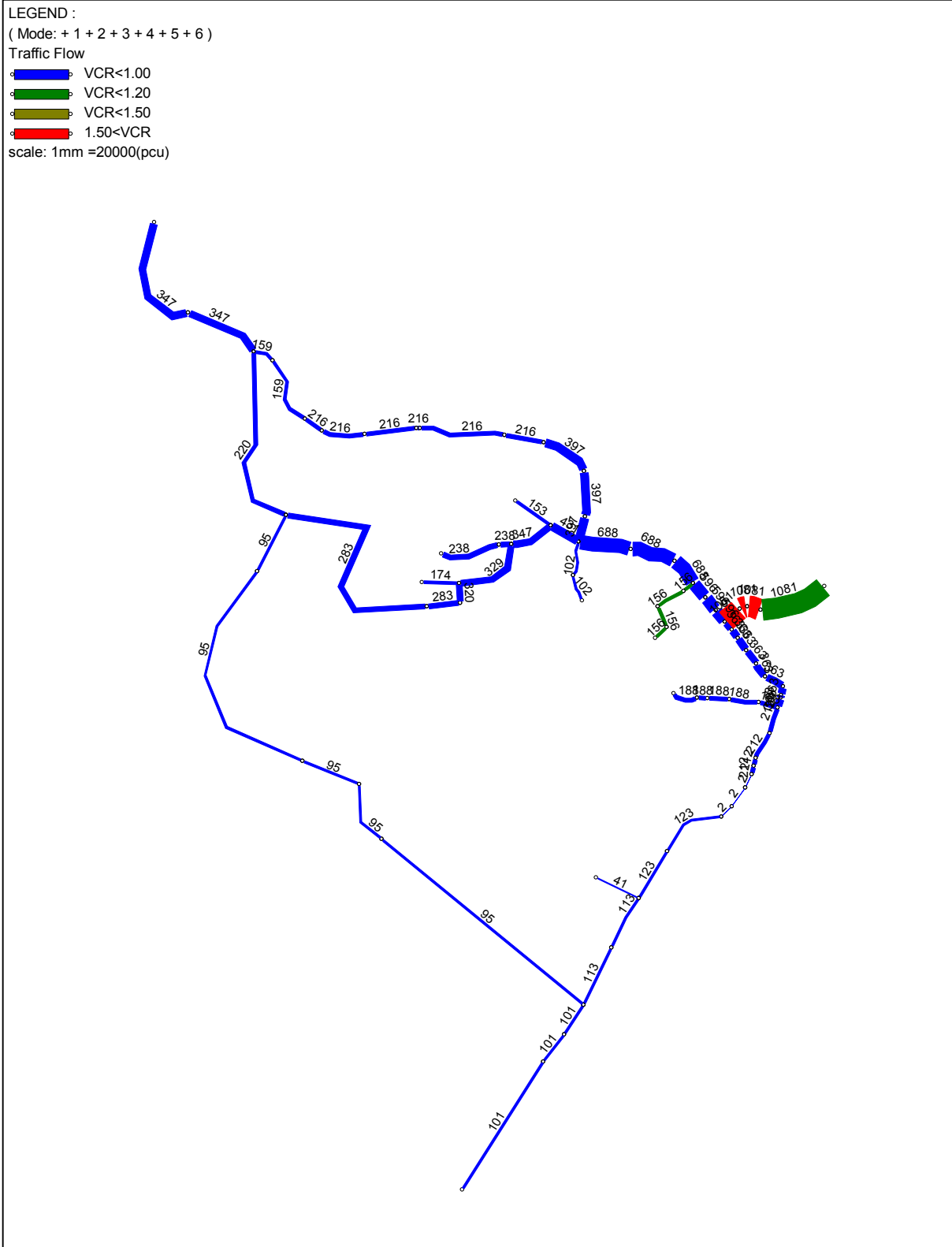
Source: JICA Survey Team

Figure 4.2-5(5) Traffic Assignment of Case 1:  
 “Kipevu Link Road Only” in 2045



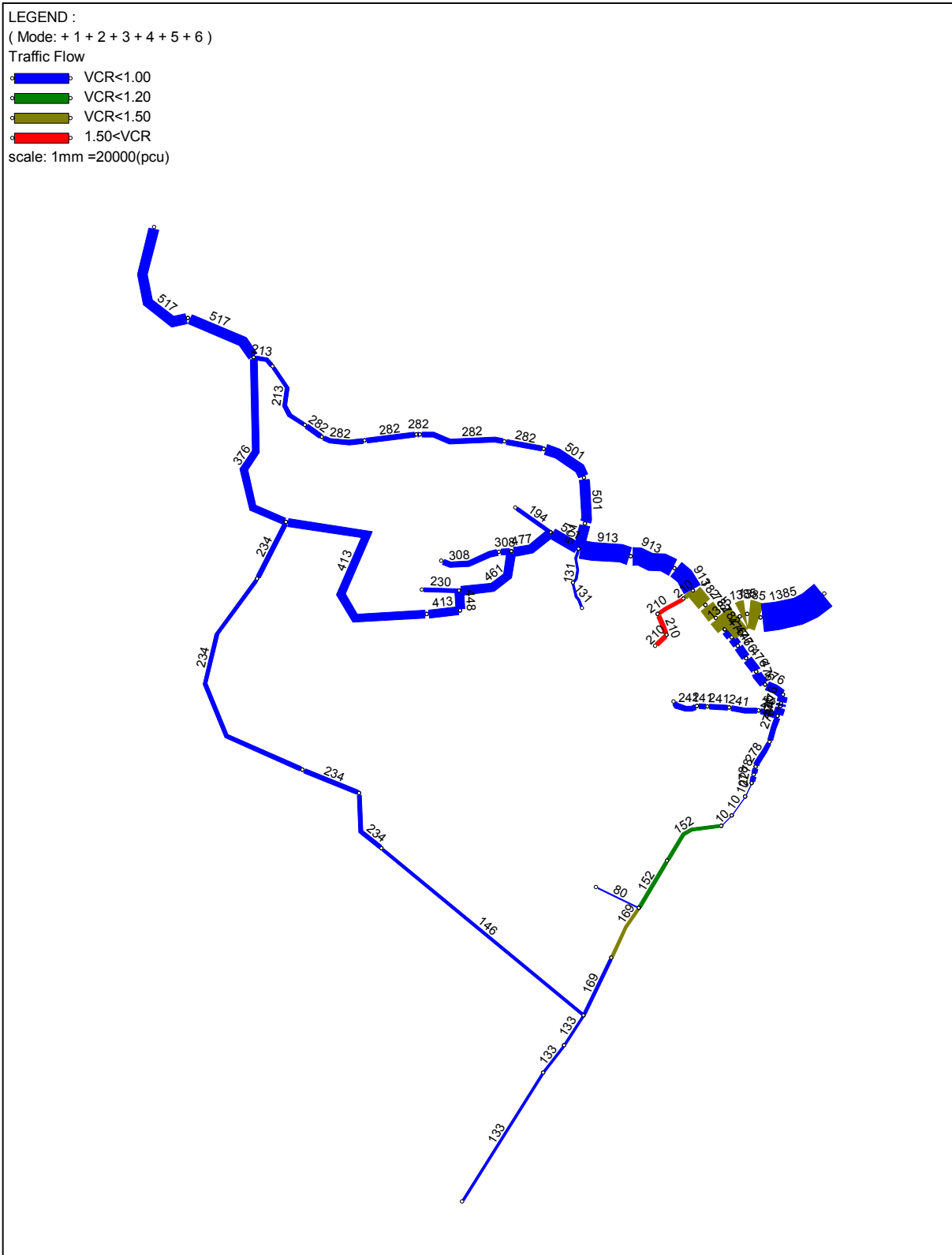
Source: JICA Survey Team

**Figure 4.2-6(1) Traffic Assignment of Case 3:  
 “Kipevu Link Road with Mombasa Southern Bypass Route-B (4&2-lane)” in 2015**



Source; JICA Survey Team

**Figure 4.2-6(2) Traffic Assignment of Case 3:  
 “Kipevu Link Road with Mombasa Southern Bypass Route-B (4&2-lane)” in 2020**

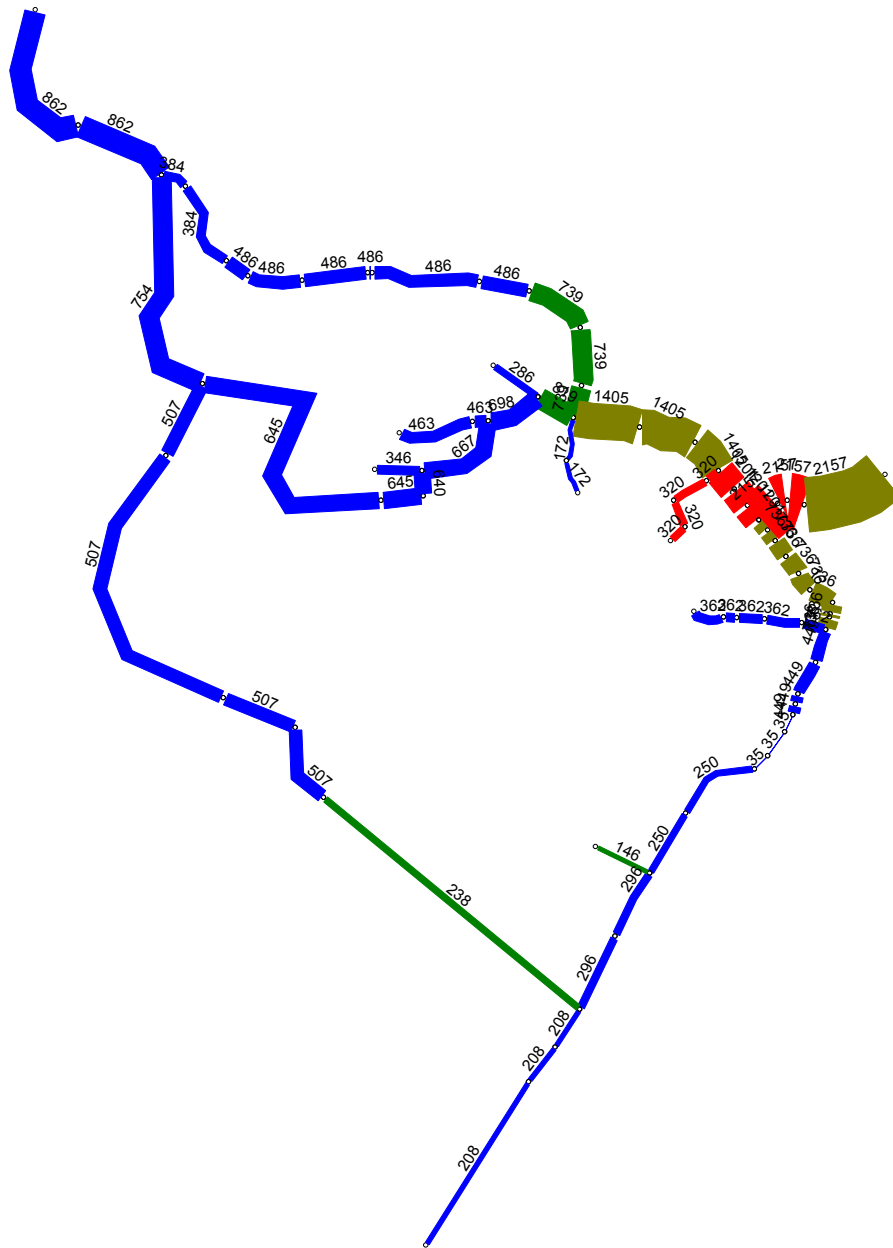


Source: JICA Survey Team

**Figure 4.2-6(3) Traffic Assignment of Case 3:  
 “Kipevu Link Road with Mombasa Southern Bypass Route-B (4&2-lane)” in 2025**

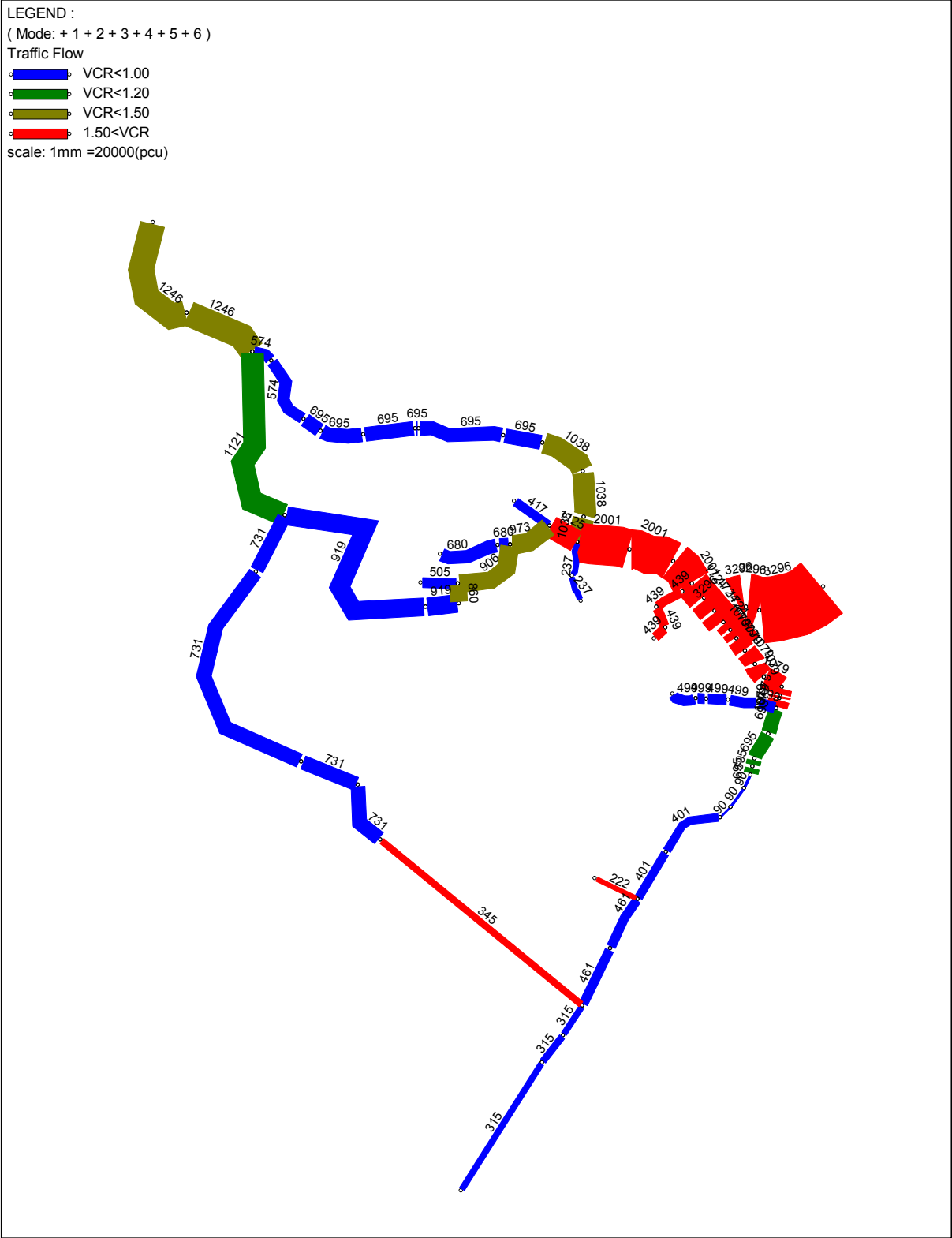


LEGEND :  
 ( Mode: + 1 + 2 + 3 + 4 + 5 + 6 )  
 Traffic Flow  
 VCR<1.00  
 VCR<1.20  
 VCR<1.50  
 1.50<VCR  
 scale: 1mm =20000(pcu)



Source: JICA Survey Team

**Figure 4.2-6(4) Traffic Assignment of Case 3:  
 “Kipevu Link Road with Mombasa Southern Bypass Route-B (4&2-lane)” in 2035**



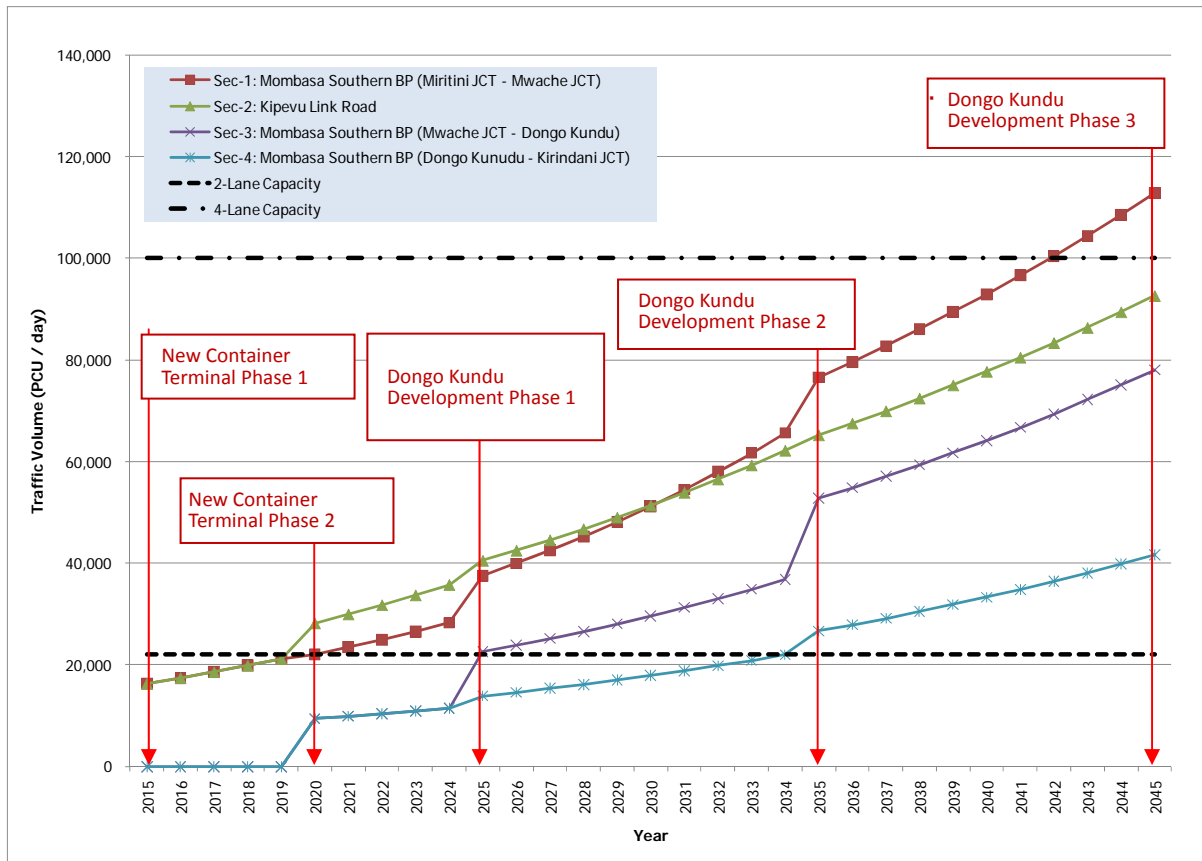
Source: JICA Survey Team

**Figure 4.2-6(5) Traffic Assignment of Case 3:  
 “Kipevu Link Road with Mombasa Southern Bypass Route-B (4&2-lane)” in 2045**

(3) Transition of Future Traffic Volume

Figure 4.2-7 shows the transitions of the forecasted future traffic volume (pcu/day) by the Project road section. The major development projects scheduled in the area influence to the traffic demand are shown in the figure. In the forecast, the opening timing of the Project road sections is assumed as follows:

- In 2015, Section-1 and Section-2 will be opened to traffic
- In 2020, Section-3 and Section-4 will be opened to traffic



Source: JICA Survey Team

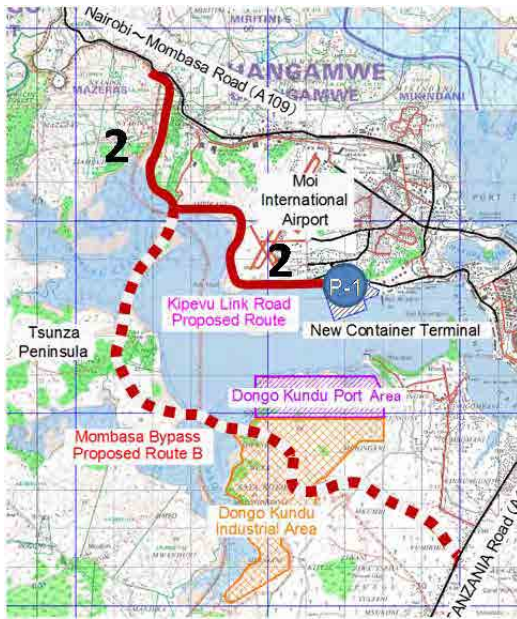
**Figure 4.2-7 Transition of Future Traffic Volume**

(4) Necessary Number of Lanes

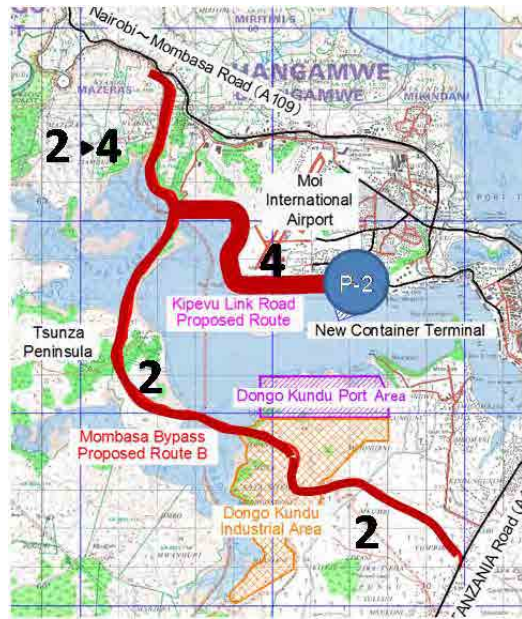
The capacity of 2-lane road capacity is around 22,000 pcu/day and 4-lane road is around 100,000 pcu/day. Based on the road capacity and the transition of the future traffic volume as shown in Figure 4.2-7, the transition of the necessary lane number by road section is analysed as shown in Figure 4.208.

However, the number of lanes of the Project road should be determined not only traffic volume but also with consideration on the economic feasibility, cost, progress of the related development projects and so on.

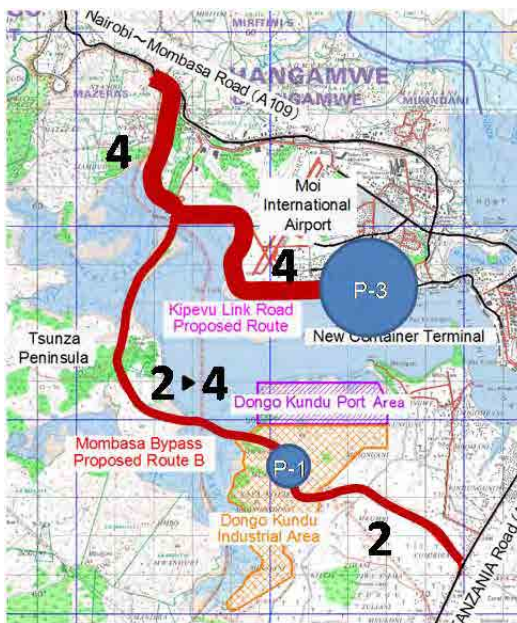
Stage 1: 2015-2019



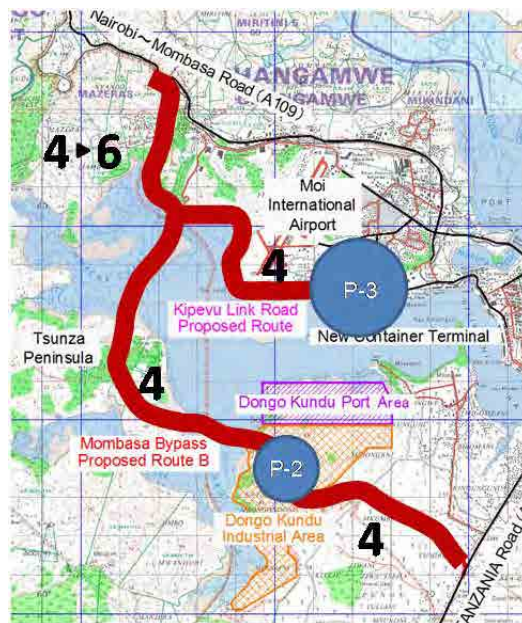
Stage 2: 2020-2024



Stage 3: 2025-2034



Stage 4: 2035-2044



Source: JICA Survey Team

Figure 4.2-8 Transition of Necessary Lane Number



## CHAPTER 5 TRANSPORTATION INFRASTRUCTURE DEVELOPMENT PROJECTS ASSISTED BY OTHER DONORS IN MOMBASA AREA AND ALONG THE NORTHERN CORRIDOR

### 5.1 Expansion of Nairobi - Thika Road (A2)

The Thika Highway Improvement Project is an infrastructure improvement project funded by the African Development Bank (AfDB), the Government of the People's Republic of China and GoK. The Nairobi - Thika Road is part of international trunk road connecting Nairobi City with Ethiopia to the north and is located in Nairobi and Central Provinces of Kenya. It starts in Nairobi on Uhuru Highway at three points namely Haile Selassie Avenue, University Way, and Museum Hill Roundabout and converges at Pangani Roundabout on Thika Road. It then proceeds to Thika via Muthaiga, GSU, Kasarani, Githurai Roundabouts, Kenyatta University, Ruiru Town, Juja Town and ends at the bridge near Blue Post Hotel. The total project length is 50.4 km.

The traffic flow along Nairobi - Thika Road has been spoiled by traffic jams, hence expansion of the road needs to be fulfilled. The road is being improved from the current 4-lane up to 8-lane including provision of cycle tracks and footpaths.



**Figure 5.1-1 Nairobi-Thika Road (A2)**

To the Design, the traffic capacity of the Nairobi - Thika will be increased by expanding the roads as follows;

- Juja - Thika: 2-lane dual carriageway including service roads, cycle tracks and footpaths
- Kasarani - Juja: 3-lane dual carriageway including service roads, cycle tracks and footpaths
- Muthaiga - Kasarani: 4-lane dual carriage way including service roads, cycle tracks and footpaths
- Pangani - Muthaiga: 4-lane dual carriageway including cycle tracks and footpaths
- Museum Hill - Pangani: 3-lane dual carriageway
- Ring Road Ngara - Kariokor - Pangani: 2-lane carriageway

The contracts for the works have been awarded as follows;

Lot No.	Length (km)	Contractor	Contract Sum (Ksh Million)
LOT 1: City Arterial Connectors	12.4	M/S China Wu Yi Company Ltd.	8,030.4
LOT 2: Muthaiga - Kenyatta University	14.1	M/S Synohydro Corporation Ltd.	8,690.6
LOT 3: Kenyatta University - Thika	23.9	M/S Shengli Engineering Construction Group Co. Ltd.	9,441.7

Note: Lot 1 and Lot 2 are financed by African Development Bank and Lot 3 is financed by Chinese Government.

The construction includes the improvement of all intersections through interchanges, overpasses and underpasses. The Proposed improvements include:

- Four lane flyovers at Globe Cinema, Museum Hill and Limuru Junction
- Six lane flyovers at Muthaiga, Survey of Kenya, Kahawa Sukari, Kasarani, Githurai, Kimbo, Ruiru Bypass Junction, Gatundu and Mangu
- An underpass at Pangani

The project was commenced on 28th January 2009 with the construction periods of 30 months. The originally scheduled completion date is 27th July 2011. However, it was delayed and the actual progress as of September 2011 is 72% (Lot 1), 89.4% (Lot 2) and 57.7% (Lot 3).

## **5.2 Northern Corridor Transport Improvement Project (NCTIP)**

### **5.2.1 NCTIP and Its Objectives**

One of the main objectives of the Government in the transport sector is to stimulate private sector led economic growth through reducing the cost of doing business in Kenya and increasing its competitiveness in the domestic, regional and international markets.

Northern Corridor Transport Improvement Project (NCTIP) is an infrastructure improvement project co-financed by the World Bank through a Development Credit from the International Development Association (IDA) and the Nordic Development Fund (NDF). The project covers both road and air transport programs. The roads component is administered by KeNHA while air transport is administered by Kenya Civil Aviation Authority (KCA) and Kenya Airports Authority (KAA).

### **5.2.2 Overall Project Objectives**

The project development objectives are:

- i. To enhance domestic and regional trade and create job opportunities in the construction industry through improving the Northern Transport Corridor which connects the port of Mombasa with Nairobi, Uganda, Rwanda, Burundi, DR. Congo, Sudan and Ethiopia.

- ii. To enhance the safety and security status of civil aviation and major airports and to enable direct flights to and from USA, this would promote tourism and increase trade under the African Growth Opportunity Act (AGOA).

### 5.2.3 Projects Implemented under NCTIP

Roads component projects implemented under NCTIP includes the followings:

- Road Rehabilitation Works (Civil Works)
- Consultancy Services

In addition to civil works for road rehabilitation, the projects involve works for socio-economic enhancement and construction of roadside amenities at important market centers and weighbridges along the routes. These facilities include:

- Service Roads, Cycle Tracks, and Pedestrian Walkways
- Market Improvement
- Heavy Goods Vehicles (Trucks) Parking
- Lay-by Parking
- Weighbridges
- Improvement and Grade Separation Junctions



**Figure 5.2-1 Section of the Completed Lanet - Njoro Turn Off / Dual Carriageway Road (A104)**

### 5.2.4 Project Implementation Status

The current status of implementation of projects within Northern Corridor is as follows:

#### Completed Rehabilitation Works

Contract	Length (km)	Progress Status
Rehabilitation of Maji Ya Chumvi - Miritini (A109)	35.2	The project was successfully implemented and handed over to the GoK on 6th September 2008
Rehabilitation of Lanet - Njoro Turnoff (A104)	31.0	The project was successfully implemented and handed over to GoK on 19th December 2009

### Ongoing Rehabilitation Works

Contract	Length (km)	Progress Status
Rehabilitation of Sultan Hamud - Machakos Turnoff (A109)	55.0	Rehabilitation work is ongoing. Physical progress of permanent works as of 31st January 2010 is 93%
Rehabilitation of Machakos Turnoff - Embakasi (A104)	33.2 (12.5 - Dual)	Rehabilitation work is on-going. Physical progress of permanent works as of 31st January 2010 is 83%
Rehabilitation of Njoro Turnoff - Mau Summit - Timboroa (A104)	83.0	Rehabilitation work is on-going. Progress of permanent works as of 31st January 2010 is 95%

### Ongoing Consultancy Contracts

Contract	Scope	Progress Status
Best alternative route linking Lakeside Northern Tanzania to Narok Town.	Feasibility Study, Environmental and Social Impact Assessment, Preliminary and Detailed Engineering Design and Tender Documentation	Consultancy services now in Phase II - Detailed Engineering Design
Kibwezi - Isiolo Road	Feasibility Study, Environmental and Social Impact Assessment, Preliminary and Detailed Engineering Design and Tender Documentation	Consultancy services now in phase II - Detailed Engineering Design
Mombasa Bypass Road	Feasibility study, Environmental and Social Impact Assessment, Preliminary Design	Consultancy services completed
Nairobi Urban Toll Roads Concession	Technical Advisory Services of on Financial, Legal, Commercial and Engineering	Contract document has been drafted and approved by both the Cabinet and the AG. Awaiting signing of the contract between the Government and the concessionaire
Output and Performance based Pilot Road Contract for the Management of Roads (OPRC)	Consulting Services and Supervision of Output and Performance Based Pilot Road Contract for the management and maintenance of Roads (OPRC)	Documents for procurement of contractors have been finalised and procurement process to commence soon
National Road Safety Program	Consultancy Contract for Formulation of a National Road Safety Program is ongoing	In progress. Stakeholder's workshops were held in Nairobi, Mombasa and Kisumu in January/ February 2010

### Upcoming Works Contracts

Contract	Length (km)	Progress Status
Rehabilitation of Mau Summit - Kericho (B1)	58.0	Rehabilitation works contract has been awarded and signed. Construction works commencing in March 2010
Rehabilitation of Kericho - Nyamasaria (B1/A1)	76.0	Rehabilitation works contract has been awarded and signed. Construction works commencing in March 2010



### 5.3 Other Projects

#### 5.3.1 Development of a New Transport Corridor to South Sudan and Ethiopia

This corridor will link Lamu, Kenya's North Eastern province, Ethiopia and South Sudan. The project involves the development of a new transport corridor from the new port at Lamu through Garrisa, Isiolo, Mararal, Lodwar, and Lokichogio to branch at Isiolo to Ethiopia and South Sudan. This will comprise a new road network, a railway line, an oil refinery at Lamu, an oil pipeline, Lamu Airport and a free port at Lamu (Manda Bay) in addition to resort cities at the coast and in Isiolo. In addition to raising the scope for this region's tourism, agriculture and industrial potential, the project will open up access to South Sudan, which has huge unexploited natural resources including oil.

**Table 5.3-1 Proposed Lamu Port Development Plan**

No.	Type of Ship	Berth Dimension	2012	2030
		Length Depth	Berth Nos.	Berth Nos.
1	Container Ship 100,000 dwt	400 m / 16 m	1 / 400 m	6 / 2,400 m
2	General Cargo Ship 30,000 dwt	240 m / 12 m	1 / 240 m	17 / 4,080m
3	Bulk Cargo Ship 100,000 dwt	330 m / 17.5 m	1 / 330 m	5 / 1,650m
4	Crude Oil Carrier 200,000 dwt	22m	-	2
5	Oil Product Carrier 30,000 dwt	230 m / 12 m	-	1
6	Coal Carrier 30,000 dwt	240 m / 14 m	-	-

Source: Kenya Port Authority

#### 5.3.2 Computerized Information Management System

This will cover the development of an integrated computerized system to manage efficiently and effectively development projects on roads, bridges, weighbridges, buildings and pavements. The Roads Information Management System (RIMS) will be used to manage information on all roads development and maintenance projects. The Bridge Maintenance Management System (BMMS) will be used to monitor the condition of bridges on the main roads network and manage maintenance works on the bridges. The Building Sector Information Management System (BSIMS) will be used to manage information on all the development works and maintenance of projects under the building sector. The Weigh Bridge Information Management System (WBIMS) will be used to capture and manage information on operations at all the weigh bridges across the country. The Pavement Maintenance Management System (PMMS) will be used for the short- and long-term planning of road resurfacing and rehabilitation works.

#### 5.3.3 Nairobi Metropolitan Region Rapid Bus Transit System

The Government has laid the plans for the development of a rapid bus transport system

starting with the following three transport corridors: Athi River Town to Kikuyu Town (approximately 38 km), Thika Town to Nairobi CBD (approximately 50 km) and JKIA to Nairobi CBD (approximately 25 km). The sector will be expected to construct special roads to accommodate the buses that will be introduced. The Nairobi Metropolitan Region Rapid Bus Transit is expected to be operational in four years' time.

## **5.4 Other Programmes to be implemented in 2008 - 2012**

### **5.4.1 Maintenance of Existing Road Network**

The current poor state of the road network in Kenya is a great impediment to socio-economic growth leading to high production costs, uncompetitive exports and low productivity. During the plan the focus will be on this area and aims to bring the existing road network to motorable state.

To achieve this goal, key measures will be pursued during the plan period which will include sourcing for alternative financing and implementation mechanisms such as partnerships, concessions and labor-intensive technologies. Maintenance of the rehabilitated and upgraded roads and other existing roads will be intensified across the country.

### **5.4.2 Expansion of the Road Network**

The GoK recognizes that the current road network in the country is inadequate in terms of coverage to meet current and future demands under Vision 2030. In particular, there is a heavy congestion on the roads especially in urban areas. The GoK will undertake to expand the coverage during the plan period by implementing various initiatives including the implementation of various institutional reforms in the sector and construction of bypasses in Nairobi and Mombasa to ease congestion. In Nairobi and other major urban areas, other transport modes will be developed to relieve traffic congestion.

### **5.4.3 Construction of Bypasses and Missing Links**

Bypasses will be constructed to ease congestion in the major cities. Funding for the construction of the Northern and Eastern Bypasses has been secured from the Chinese Government (Ksh 8 billion) while plans are underway to grant a concession to the Southern Bypass under Nairobi Urban Tolls Project. Once the bypasses are constructed, they will form a ring-road around Nairobi and this will help to ease congestion in the city of Nairobi. Plans are also underway to construct the Dongo Kundu-Miritini Bypasses in Mombasa during the next five years under the Northern Corridor Transport Improvement Programme.

#### 5.4.4 Use of Machinery and Labour Intensive Techniques to Promote Employment and Income Earning

Over the 2005-2010 Roads 2000 Strategy period, the development partners have pledged over Ksh. 7.3 billion while the GoK through the Kenya Roads Board's Road Maintenance Levy Fund (RMLF) shall support the strategy to the tune of Ksh. 18 billion over the same period. The targeted results of implementing the Roads 2000 Strategy with the current commitments over the next five years include gravelling of 5,000 km of unpaved roads, routine maintenance of 20,000 to 37,000 km of unpaved roads per year, provision of 150,000 part time jobs (equivalent to 35,000 full time jobs) annually, development of 1,250 active labor-based contractors, and improved quality and cost effectiveness of road works.

#### 5.4.5 East African Road Network Project (EARNP)

This project is critical to the facilitation of trade and investments in the region as well as enhancement of the regional integration process. The East African partner states with the support of development partners have prioritized the development of priority links in order to hasten the integration process both within East Africa and with the neighboring countries and regions.

The partner states have jointly identified five (5) corridors which were selected in view of their importance in the region. The projects also constitute priority areas of investment under the New Partnership for Africa's Development (NEPAD) initiative.

The implementation of the EARNP will be accorded priority during the plan period. Over 3,000 kilometers of regional roads in Kenya have been prioritized and will be targeted for improvement.

Some of ongoing EARNP road projects include; Nairobi – Ruiru - Thika (50 km), Isiolo - Merile River (136 km), Athi River - Namanga (136 km), and Emali - Oloitoktok (100 km).

#### 5.4.6 Post-Election Reconstruction

The roads infrastructure was identified as one of the areas affected by the post-election crisis. This includes ongoing roads projects where higher than expected costs are anticipated, and destruction of roads offices and equipment in the affected districts. During the plan period emphasis will be placed on reconstructing and rehabilitating the affected infrastructure including destroyed road sections and bridges.

#### 5.4.7 Roads Investment Policy

During the plan period, the following will be undertaken:

- The preparation and implementation of road investment plan (2008-2018)
- Active operation by the three road sector agencies (KeNHA, KERRA and KURA)
- Full harmonization of legislative framework governing roads

#### 5.4.8 Private Sector Participation

Given the network size, traffic composition and projected future growth rates, the demand for infrastructure investment in Kenya exceeds budgetary financing capacity. Off budgetary financing has therefore become of necessity in order to meet the challenge of the growing road traffic. Private sector participation in financing infrastructure delivery on commercially viable terms has been found to be critical in bridging the financing gap.

#### 5.4.9 Concessioning (Build Own Operate and Transfer Framework)

Kenya Roads Act (2007) allows for private sector participation in road sector improvement through Concessioning (BOOT Framework). Currently the GoK is procuring private financing (Southern Bypass) for a contract of the first Nairobi Urban Toll Road Concessioning Project. The Southern Bypass (30 km) starts on Mombasa Road near the former American Embassy and ends on Naivasha Road after Kikuyu Town. The other concessioning arrangements will be implemented during the plan period.

### 5.5 Projects sponsored through East African Community (EAC)

#### 5.5.1 Multi-National Malindi – Lunga Lunga / Tanga – Bagamoyo Road (Coast Highway)

EAC appointed a South African firm in association with Kenyan and Tanzanian firms to carry out the feasibility study and detailed engineering design for the subject road which connect Malindi in Kenya via Mombasa and Lunga Lunga / Tanga (border post for both countries) with Bagamoyo in Dar-es-Salaam, Tanzania. According to its inception report, the project will improve the existing coast road (A14 and B8) except Malindi section where a bypass is proposed.

Following mile stones are proposed by those firms;

- |                             |                   |
|-----------------------------|-------------------|
| ➤ Inception Report;         | 17 March 2011     |
| ➤ Draft Feasibility Report  | 11 September 2011 |
| ➤ Final Feasibility Report; | 25 November 2011  |
| ➤ Draft Design Report;      | 12 March 2012     |
| ➤ Final Design Report;      | 17 May 2012       |

## 5.5.2 Corridor Diagnostic Study of the Northern and Central Corridors of East Africa

Followings are citation from the Main Report of Action Plan for the subject study:

The Northern Corridor, anchored by Mombasa Port in Kenya, and the Central Corridor, anchored by Dar-es-Salaam port in Tanzania, is the principal transport routes for national, regional, and international trade of the five East African Community countries

Modernization of transport infrastructure and removal of nontariff barriers along these corridors are critical for trade expansion and economic growth, which are the key to success of regional integration, the creation of wealth, and poverty alleviation in these countries.

The Heads of State in the COMESA, EAC and SADC, the Tripartite, have determined that the transport inefficiencies are among the biggest impediments to realizing their vision to lead their countries out of poverty. Transport costs are prohibitively high and are a barrier to trade and investment, which form the cornerstone for economic growth and regional prosperity.

Having had the experience of successful development of an action plan to eliminate transport bottlenecks on the North-South Corridor, the Tripartite has ordered the preparation of a similar action plan for the key trade routes of Eastern Africa. As a technical foundation for the action plan, regional stakeholders in March 2009 agreed to carry out a corridor diagnostic study (CDS) with funding from the U.S. Agency for International Development (USAID) and the U.K. Department for International Development (DFID). EAC sponsored by USAID and DFID appointed an American Firm to carry out the subject study.

Some outputs of the Action Plan are shown in Table 5.5-1 and 5.5-2.

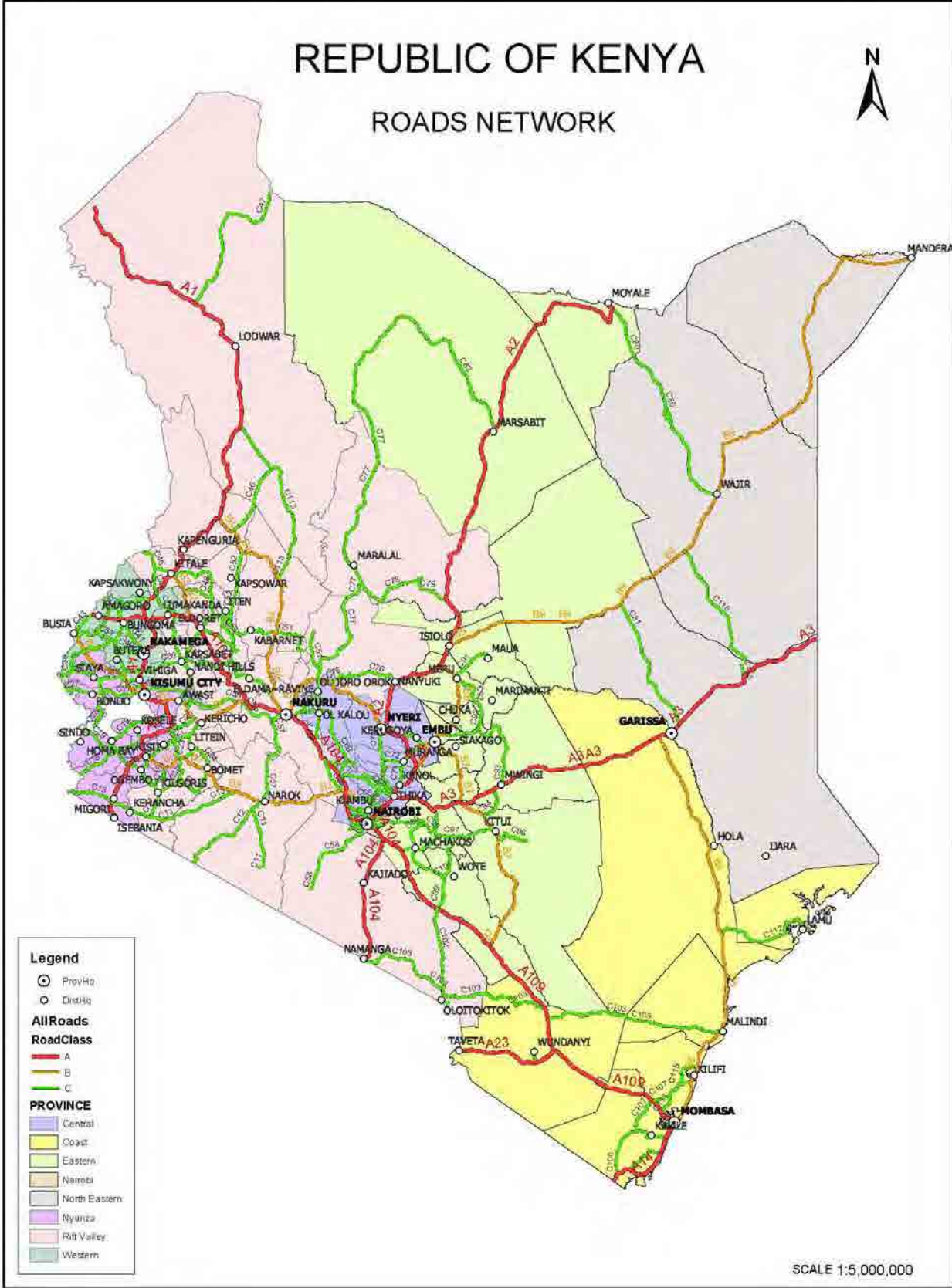


Figure 5.5-1 Roads Network in Kenya

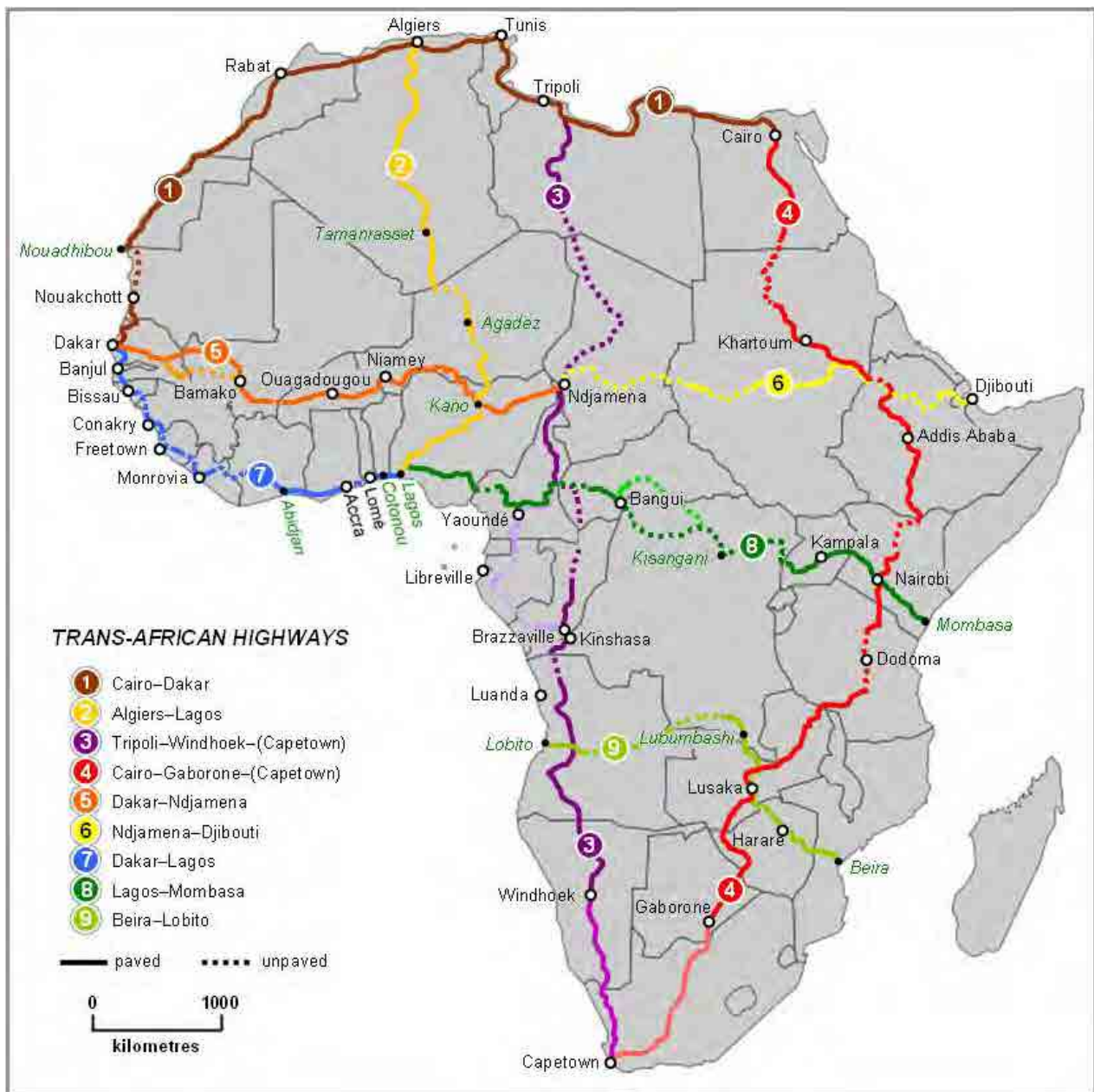


Figure 5.5-2 Trans-African Highways

**Table 5.5-1 Proposed Infrastructure Projects by Corridor by Mode**

Proposed Infrastructure Projects by Corridor by Mode	Cost (US\$ mil.)	
Northern Corridor (NC)	1,958.1	48.1%
Port Projects	442.0	10.9%
Mombasa		
Short-Term Container Handling Capacity Enhancement with ICDs	35.0	
New Container Terminal - Kipevu West	342.5	
New Petroleum Facility	55.8	
Dry Bulk and General Cargo Facilities	1.7	
Lamu		
New Port and Associated Infrastructure	7.0	
Railway Projects	775.0	19.1%
Rift Valley Railways (RVR)		
Infrastructure Upgrade 1-3 Years	250.0	
Locomotive Rehabilitation -3 Years	20.0	
Infrastructure Upgrade 3-5 Years	150.0	
Mombasa Intermodal Yard and Equipment	20.0	
Kampala ICD Development	10.0	
Reconstruction of Tororo-Gulu-Pachwach Railway	325.0	
Road Projects	741.1	18.2%
Northern Corridor		
Capacity Upgrades	234.5	
Road Rehabilitation	362.9	
Upgrade to Paved	143.7	
Central Corridor (CC)	2,109.4	51.9%
Port Projects	599.5	14.7%
Dar-es-Salaam		
Short-Term Container Handling Capacity	26.0	
Container Terminal (Berth 13 & 14)	500.0	
Dry Bulk and Break Bulk Facilities	5.0	
Single Point Mooring	68.5	
Railway Projects	537.0	13.2%
Tanzania Railway Limited (TRL)		
Revival Infrastructure, Rolling Stock and Working Capital and Isaka ICD	185.0	
Track Infrastructure Upgrade 3-5 Years	350.0	
Dar-es-Salaam CFS Site Selection Design and Project	2.0	
Road Projects	936.5	23.0%
Central Corridor		
Capacity Upgrades	61.7	
Road Rehabilitation	331.0	



Proposed Infrastructure Projects by Corridor by Mode	Cost (US\$ mil.)	
Upgrade to Paved	543.8	
Lake Transport Projects	36.4	0.9%
Lake Ports Rehabilitation, Dredging and Siltation Protection	14.0	
Provision of RoRo Services on Lakes Tanganyika and	15.4	
Restructuring Wagon Ferries to Carry MAFI Trainers	7.0	
<b>Total Infrastructure Projects by Mode</b>	<b>4,067.5</b>	<b>100.0%</b>
Port Projects	1,041.5	25.6%
Railway Projects	1,312.0	32.3%
Road Projects	1,677.6	41.2%
Lake Transport Projects	36.4	0.9%

Source: Nathan Associates Inc., C. Corridor Diagnostic Audit, Volume 2: Technical Papers, Action Plan, Corridor Diagnostic Study of the Northern and Central Corridors of East Africa, April 15, 2011

**Table 5.5-2 Cargo Traffic Volume Forecast by Corridor by Mode**

('000 tons)

2009	Northern Corridor Traffic			Central Corridor Traffic			Both Traffic Total		
	Road	Rail	Total	Road	Rail	Total	Road	Rail	Total
Transit	5,509	417	5,926	357	111	468	5,866	528	6,394
Regional	2,974	151	3,125	658	32	690	3,632	183	3,815
Domestic	11,817	622	12,439	5,617	296	5,913	17,434	918	18,352
<b>Total</b>	<b>20,300</b>	<b>1,190</b>	<b>21,490</b>	<b>6,632</b>	<b>439</b>	<b>7,071</b>	<b>26,932</b>	<b>1,629</b>	<b>28,561</b>
Distribution	71.1%	4.2%	75.2%	23.2%	1.5%	24.8%	94.3%	5.7%	100.0%

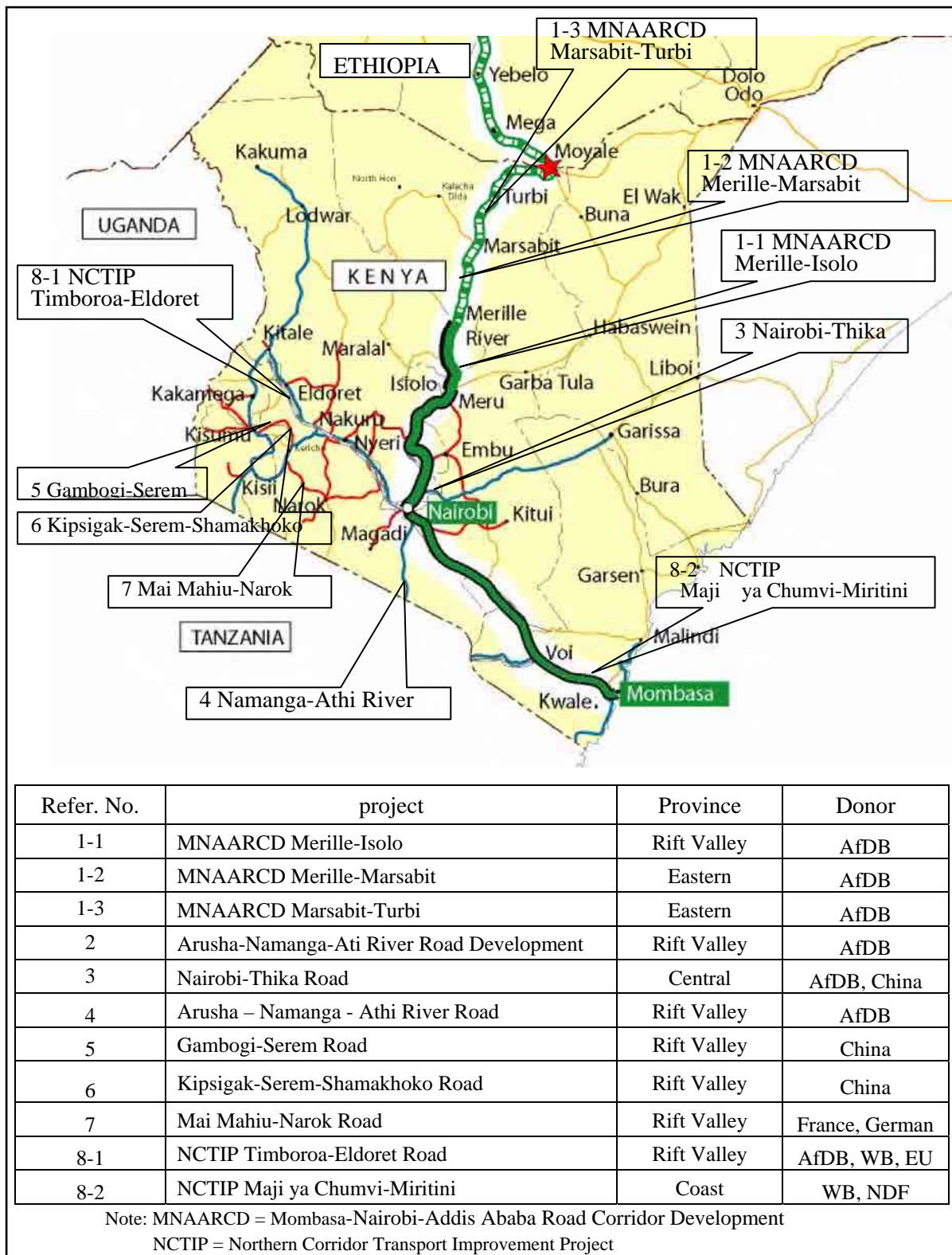
2015	Northern Corridor Traffic			Central Corridor Traffic			Both Traffic Total		
	Road	Rail	Total	Road	Rail	Total	Road	Rail	Total
Transit	6,883	3,142	10,025	1,584	1,440	3,024	8,467	4,582	13,049
Regional	4,764	202	4,966	1,417	58	1,475	6,181	260	6,441
Domestic	19,259	1,014	20,273	12,138	639	12,777	31,397	1,653	33,050
<b>Total</b>	<b>30,906</b>	<b>4,358</b>	<b>35,264</b>	<b>15,139</b>	<b>2,137</b>	<b>17,276</b>	<b>46,045</b>	<b>6,495</b>	<b>52,540</b>
Distribution	58.8%	8.3%	67.1%	28.8%	4.1%	32.9%	87.6%	12.4%	100.0%

2030	Northern Corridor Traffic			Central Corridor Traffic			Both Traffic Total		
	Road	Rail	Total	Road	Rail	Total	Road	Rail	Total
Transit	16,524	8,145	24,669	6,341	4,450	10,791	22,865	12,595	35,460
Regional	10,517	442	10,959	2,479	91	2,570	12,996	533	13,529
Domestic	51,253	2,698	53,951	38,320	1,888	40,208	89,573	4,586	94,159
<b>Total</b>	<b>78,294</b>	<b>11,285</b>	<b>89,579</b>	<b>47,140</b>	<b>6,429</b>	<b>53,569</b>	<b>125,434</b>	<b>17,714</b>	<b>143,148</b>
Distribution	54.7%	7.9%	62.6%	32.9%	4.5%	37.4%	87.6%	12.4%	100.0%

Source: Nathan Associates Inc., B. Trade and Traffic Forecast, Volume 2: Technical Papers, Action Plan, Corridor Diagnostic Study of the Northern and Central Corridors of East Africa, April 15, 2011

### 5.5.3 Related Projects Financed by Other Donors

Following map shows related major projects financed by other donors.



**Figure 5.5-3 Related Project Location Map**

## **5.6 Railway Development**

The Northern Corridor rail system extends from the port of Mombasa to Nairobi and connecting to Uganda rail system. Due to the old and poor condition of the tracks and locomotives, rail share of the Northern Corridor transportation is only 6 % or 1.2 million tons in 2009. However, rail system is important for long distance and heavy good transportation. The railway development projects scheduled are as shown in Table 5.5-1.