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Mombasa Port Master Plan including Dongo Kundu

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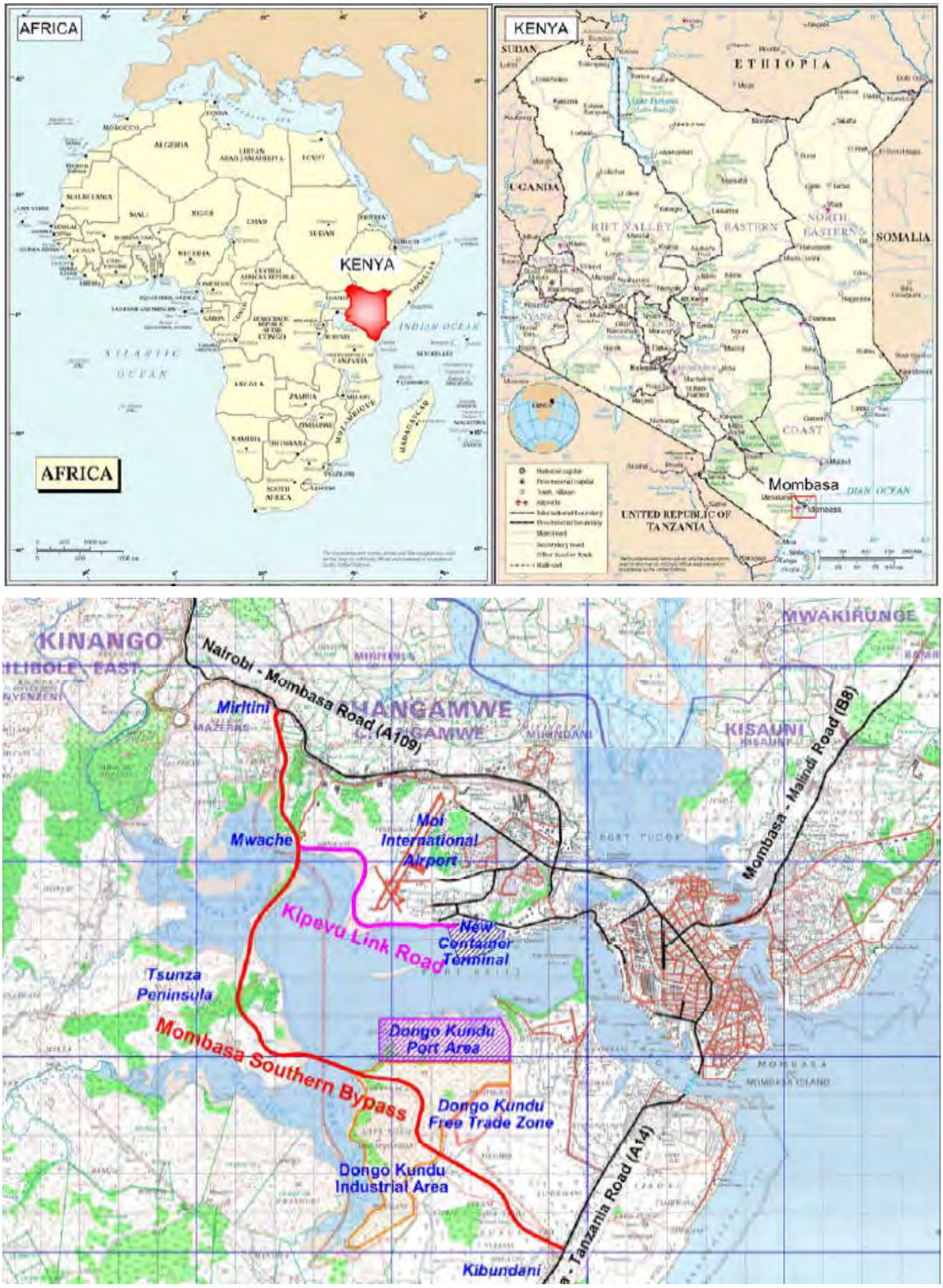
The Overseas Coastal Area Development Institute of Japan

Oriental Consultants Global Co., Ltd.

Nippon Koei Co., Ltd.



Location Map

Abbreviations

Abbreviation	Description
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AfDM	African Development Bank
AMO	ICAO Approved Maintenance Organization
ASD	Azimuth Stern Drive
ATIS	Automatic Terminal Information Service
BMU	Beach Management Unit
B/O	Berth Occupied
BOOT	Build-Own-Operate-Transfer
BOR	Berth Occupancy Ratio
BPO	Business Process Offshoring
C/P	Counterpart
CCCC	China Communications Construction Company
CD	Chart Datum
CDA	Coastal Development Authority
CDO	Central Document Office
CDS	Corridor Diagnostic Study
CFS	Container Freight Station
CIF	Cost, Insurance and Freight
CNS/ATM	Communication, Navigation, Surveillance / Air Traffic Management
COMESA	Common Market for Eastern and South Africa
CY	Container Yard
C&F	Cleaning and Forwarding
DFID	U.K. Department for International Development
DGPS	Differential Global Positioning System
DIW	German Institute for Economic Research
DME	Distance Measuring Equipment
DWT	Deadweight Tonnage
EAC	East African Community
EAR&H	East African Railways and Harbours Corporation
EATTFP	East Africa Trade and Transport Facilitation Program
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
E/N	Exchange of Notes
ESS	Employee Self-Service
EUCAP Nestor	European External Action Service
FIRR	Financial Internal Rate of Return
FCL	Full Container Load

Abbreviation	Description
FDI	Foreign Direct Investment
FOB	Free on Board
FS	Feasibility Study
FSCM	Financial Supply Chain Management
FTZ	Free Trade Zone
GBHL	Grain Bulk Handlers Ltd.
GDP	Gross Domestic Product
GFEGP	Gas Fired Electricity Generation Plant
GIS	Geographical Information Systems
GMDS	Global Maritime Distress and Safety System
GOJ	Government of Japan
GOK	Government of Kenya
GRT	Gross Register Tonnage
IALA	International Association of Lighthouse Authorities
IASA	Federal Aviation Administration's International Aviation Safety Assessment
ICAO	International Civil Aviation Organization
ICD	Inland Container Depot
ICT	Information and Communication Technology
ICS	Mombasa Information Sharing Center
IDA	International Development Association
IDPs	Internally Displaced Persons
IFC	International Finance Corporation
IFDC	International Fertilizer Development Center
ILS	Instrument Landing System
IMB	International Maritime Bureau
IMF	International Monetary Fund
IMO	International Maritime Organization
IOMOU	Indian Ocean Memorandum of Understanding
ISO	International Organization for Standardization
ISPS	International Ship and Port Facilities Security
ISS	Integrated Security System
IT	Information Technology
JCC	Joint Coordination Committee
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JKIA	Jomo Kenyatta International Airport
JPC	Japan Port Consultants Ltd.
KAA	Kenya Airport Authority
KARI	Kenya Agricultural Research Institute
KCAA	Kenya Civil Aviation Authority
KEFRI	Kenya Forestry Research Institute

Abbreviation	Description
KeNHA	Kenya National Highways Authority
KenTrade	Kenya Trade Network Agency
KeRRA	Kenya Rural Road Authority
KFS	Kenya Ferry Services
Kihbt	Kenya Institute of Highways & Building Technology
KMA	Kenya Maritime Authority
KMFRI	Kenya Maritime and Fisheries Research Institute
KNESW	Kenya National Electronics Single Window
KNSL	Kenya National Shipping Line
KOT	Kipevu Oil Terminal
KPA	Kenya Port Authority
KPC	Kenya Pipeline Company
KRA	Kenya Revenue Authority
KRB	Kenya Road Board
KRC	Kenya Railway Corporation
KURA	Kenya Urban Road Authority
KWATOS	Kilindi Waterfront Automated Terminal Operations System
KWS	Kenya Wildlife Service
LAN	Local Area Network
LAPSSET	Lamu Port and New Transport Corridor Development to South Sudan and Ethiopia
LCDA	LAPSSET Corridor Development Authority
LNG	Liquefied Natural Gas
LOA	Length Overall
LPP	Length between Perpendiculars
M/P	Master Plan
MICE	Meetings, Incentives, Conferences, Exhibitions
MIED	Ministry of Industrialization and Enterprise Development
MOTI	Ministry of Transport and Infrastructure
MPDP	Mombasa Port Development Project
MSC	Mediterranean Shipping Company
MSS	Manager Self-Service
MTO	Middle Term Plan
MTP2	2nd Middle Term Plan
NAVFOR	Naval Force
NCL	National Land Commission
NCTA	Northern Corridor Transit Agreement
NEMA	National Environment Management Authority
NDB	Non Directional Beacon
NDF	Nordic Development Fund
NK	Nippon Koei Co., Ltd.
NMK	National Museums of Kenya

Abbreviation	Description
NPV	Net Present Value
NSW	National Single Window System
NTSA	National Transport and Safety Authority
OBP	Oceans Beyond Piracy
OC	Oriental Consultants Global Co., Ltd.
OCDI	Overseas Coastal Area Development Institute of Japan
OD	Origin and Destination
ODA	Official Development Assistance
OSBP	One Stop Border Post
PCBS	Ports Community-Based System
PDM	Project Design Matrix
PIC	Public Investment Committee
PMPF	Puntland Maritime Police Force
PO	Plan of Operation
POL	Petroleum, Oil & Lubricants
PPP	Public Private Partnership
RAF	Royal Air Force
RAP	Resettlement Action Plan
R/C or RC	Reinforced Concrete
R/D	Record of Discussion
RFP	Request for Proposal
RICS	Road Inventory and Condition Survey
RMG	Rail Mounted Gantry Crane
RMRCC	Regional Maritime Rescue Co-ordination Center
RTG	Rubber Tired Gantry Crane
Ro/Ro	Roll on/ Roll off
RVR	Rift Valley Railway
RVRK	Rift Valley Railway Kenya Ltd.
RVRU	Rift Valley Railway Uganda Ltd.
SADC	Southern African Development Community
SAPROF	Special Assistance for Project Formation
SAP/ERP	Enterprise Resource Planning Software by SAP
SARPs	ICAO Standards and Recommended Practices
S/C	Ship Convenience
SCEA	Shippers Council of East Africa
SCT	Single Custom Territory
SEA	Strategic Environmental Assessment
SEZ	Special Economic Zone
SGR	Standard Gauge Railway
SME	Small and Medium Enterprise
SOT	Shimanzi Oil Terminal

Abbreviation	Description
SRM	Supplier Relationship Management
SSG	Ship to Shore Gantry Crane
STS	Ship to Shore
TEU	Twenty-Foot Equivalent Unit
TMEA	Trademark East Africa
TPA	Tanzania Port Authority
TSCPHF	Technical Standard and Commentaries for Port and Harbor Facilities
TTCA-NC	Northern Corridor Transit Transport Coordination Authority
TWG	Technical Working Group
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNRA	Uganda National Road Authority
URC	Uganda Railway Corporation
USAID	United States Agency for International Development
VOR	VHF Omni Directional Radio Range
VTMS	Vessel Traffic Management System
VTMIS	Vessel Traffic Management Information System
VTS	Vessel Traffic Service
WACC	Weighted Average Cost of Capital
WAN	Wide Area Network
WB	World Bank
WBS	Work Breakdown Structure
WFP	World Food Program
WKPE	Western Kenya Pipeline Extension
WOMESA	Association of Women in the Maritime Sector in East and South Africa

Executive Summary

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1. Background and objectives of the Project

Mombasa Port, located in Mombasa City, is the largest port in the East Africa region. Mombasa port is used not only for the trade of Kenya, but also for inland countries such as Uganda and Rwanda. Due to the rapid economic development in the region and the increasing container handling volume, the Japan International Cooperation Agency (hereinafter referred to as "JICA") is supporting Kenya Ports Authority (hereinafter referred to as "KPA") in expanding the container terminal on the northern side of the port under the "Mombasa Port Development Project" (hereinafter referred to as "MPDP") of which a loan agreement was signed in November 2007 for the amount of 26.7 billion Japanese Yen. In addition, at the request of the Government of Kenya (hereinafter referred to as "GOK"), JICA commenced "The Project on Master plan for Development of Dongo Kundu, Mombasa Special Economic Zone" which is expected to contribute to the acceleration of economic growth in Kenya and the East African region.

In recent years, the cargo handling volume of Mombasa port has been increasing much more than forecast. Taking the current situation into consideration, it is required to formulate the Master Plan for the Development of Mombasa Port which contains the vision and concept of Mombasa Port development after completion of the above mentioned Yen loan project. A Detailed Planning Survey Team was dispatched to Kenya in November 2013 and held a series of discussions with Kenyan authorities on formulation of the Project. Based on the discussions, a consensus was reached on the objectives and methodology of the Project.

1.1 Purpose of the project

The project shall be implemented based on the Record of Discussions (hereinafter referred to as "RD") signed by the Ministry of Transport and Infrastructure (hereinafter referred to as "MOTI"), KPA and JICA on May 29, 2014 including the Project Design Matrix (hereinafter referred to as "PDM") and Plan of Operation (hereinafter referred to as "PO").

1.2 Overall goal

For the purpose of developing Mombasa Port, projects are to be implemented in accordance with the Mombasa Port Master Plan.

1.3 Project purpose

Capacity of KPA staff regarding port development is enhanced.

1.4 Outputs

Outputs based on the PDM are as follows;

- Mombasa Port Master Plan (revised in 2009 by KPA) is reviewed and revised.
- Strategic planning and management system in KPA is improved.
- Future capacity and forecast method in KPA is improved.
- Comprehensive Mombasa Port development implementation/investment plan is prepared.

2. Maritime Traffic in East Africa

2.1 Djibouti Port

Djibouti is a main gateway port for Ethiopia connected through the Addis Ababa corridor (which has been operating since 1998).

Table 2.1.1 below shows all types of vessels that called Djibouti from 2010 to 2014. General cargo vessels increased by 48% from 2010 to 2014 while container vessels increased by about 36% during the same period. A total of 1,406 commercial vessels called in 2014.

Table 2.1.1 Calling Record in Djibouti

Type of Vessels	2010	2011	2012	2013	2014
Container vessels	531	684	594	643	720
General Cargo	158	171	205	217	235
Car Carrier/RoRo	105	81	84	66	65
Bulk Carrier	61	79	86	76	61
Tankers	109	97	91	99	86
Livestock	115	117	90	46	80
Navy Vessels	411	382	327	367	288
Others	60	119	100	130	159
Total	1550	1730	1577	1644	1694

Source; Djibouti Harbour Control Office

Length Overall (LOA), Dead weight tons (DWT), draft & TEU particulars of all vessels which called Djibouti in April 2015 are shown in Table 2.2.3.

Table 2.2.3 Actual Vessel Size & Type at Djibouti

Type of Vessels	Vessel Name	DWT	LOA(m)	Draft(m)	TEU
General Cargo	LE CONG	29,108	182	9.6	
	MEKELE	28,066	166	9.1	
	GAMBELLA	28,119	166	7.4	
	ADMAS	13,593	137	8.7	
	SHEBELLE	27,391	178	9.0	
Car Carrier	MORNING CHANT	20,190	200	8.2	
Bulk Carrier	TALENT	47,574	190	11.5	
	MAINE DREAM	58,105	189	11.7	
	SEA QUEEN II	57,000	183	10.1	
Full Container	MSC NOA	44,552	241	10.5	3,044
(Djibouti Container Terminal)	KOTA CARUM	**83,963**	**299**	**10.3**	**6,600**
	STADT KOLN	44,234	222	9.2	3,398
	KOTA KASTURI	39,916	233	10.3	3,091
	MAERSK UTAH	61,454	292	11.0	4,400
	KOTAMAIM	39,763	233	8.8	3,080
	MAESRK DETROIT	**84,688**	**299**	**10.4**	**6,200**
	APL GERMANY	67,009	280	12.0	5,888
	BARBADOS	52,325	258	10.2	4,308
	SAFMARINE CHAMBAL	65,458	249	9.0	4,496
Tankers	ETC NEFERTARI	49,749	189	11	
(Djibouti Oil Terminal)	UACC HARMONY	45,913	179	12	
	CHANG HNG KAI TUO	45790	185	12	

Source: Dibouti Port Authority

General cargo vessels and bulk carriers are of similar size as those currently calling Mombasa but container vessels are larger than those calling Mombasa because of differences in berth depths (3 berths with depths of 17~18m are available in Djibouti which were built in April 2008 to accommodate 6,600TEU type vessels which have a DWT of 84,000 tons and LOA of nearly 300 meters).

2.1.1 Comparison between berth capacity at Djibouti and Mombasa ports

Djibouti is already able to accommodate 6,000-6,600 TEU sized container vessels. The differences between the container berths in Djibouti and Mombasa ports are indicated in Table 2.2.4.

Table 2.1.2 Djibouti and Mombasa Berths

Djibouti Berth	Ro-Ro	General	Container	Container	Oil	Total
Numbers	1	10	3	3	5	22
Depth (m)	11	7.8-11.3	9.5-12	17-18	12-19	
Mombasa Berth	Ro-Ro	General	Container		Oil	Total
Numbers	2	9	6		2	19
Depth (m)	10.5	10.5-11.5	10.5-13.5		9.76-13.4	

Source: JICA Study Team

2.1.2 Main regular services

There are scheduled services by main carriers such as Maersk, MSC, PIL and ad-hoc by Evergreen and COSCO for which the route maps are shown below.

(1) Maersk Line

Maersk Line employs a 6200TEU (LOA 299m) type on the Suez Canal-Djibouti- Salalah-Jebel-Ali-Port Qasim - Pipavav-Jawaharlal Nehru- Salalah route, the details of which are listed below.

Table 2.1.3 Maersk Schedule

Port	Terminal	Arrival	Departure
Suez Canal	Canal Zone Terminal	2015/4/27 19:00	2015/4/28 17:00
Djibouti	Djibouti Dorale Container Terminal	2015/5/2 20:00	2015/5/3 9:00
Salalah	Salalah Terminal	2015/5/6 1:00	2015/5/6 11:00
Jebel Ali Dubai	Jebel Ali Terminal 2	2015/5/10 9:00	2015/5/10 21:00
Port Qasim	Port Qasim Terminal	2015/5/13 18:00	2015/5/14 14:00
Pipavav	Pipavav Terminal	2015/5/15 22:00	2015/5/16 13:30
Jawaharlal Nehru	Jawaharlal Nehru NSICT	2015/5/17 6:00	2015/5/18 18:00
Salalah	Salalah Terminal	2015/5/21 8:00	2015/5/21 20:00

Source: Maersk Line Web Site

(2) PIL

PIL has three services 1) PIL employs a 6600TEU vessel for China direct service and a 3,000 TEU vessel for Indian Sea service, which regularly calls at Singapore – Nansha – Shanghai – Ninbo – Chiwan – Singapore – Djibouti – Aden – Jeddah – Sokhna - Aqaba. 2) Indian Sea calls at Mundra – Karachi - Jebel Ali – Aden – Jeddah - Port Sudan - Djibouti. 3) PIL also operates gulf feeders between Djibouti – Hodeidah port.

2.2 Tanzania

Table 2.2.1 shows ships calling at major ports in Tanzania in 2012/2013 and 2011/2012. In 2012/2013, 347 vessels for dry bulk/general cargo, 477 container ships and 138 tankers called at the three ports, namely Dar es Salaam, Tanga and Mtwara in Tanzania.

Table 2.2.1 Ship Calling at Major Ports in Tanzania

Tanzanian Major Ports	DAR ES SALAAM		TANGA		MTWARA		TOTAL	
	2012/13	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13	2011/12
(a) Dry General Cargo Vessels								
Number of Calls	329	342	7	2	11	34	347	378
GRT ('000)	12,772	12,201	200	29	91	256	13,063	12,486
(b) Container Vessels								
Number of Calls	370	419	78	93	29	28	477	540
GRT ('000)	8,166	8,610	1,228	1,445	446	398	9,840	10,453
(c) Tankers								
Number of Calls	136	120	1	2	1	-	138	122
GRT ('000)	3,541	3,015	28	59	3	-	3,572	3,074
Total -ship call	**835**	**881**	**86**	**97**	**41**	**62**	**962**	**1,040**
Total GRT('000)	**24,479**	**23,826**	**1,456**	**1,533**	**540**	**654**	**26,475**	**26,013**

Source: TPA Statistics

Based on the report of "Port of Dar es Salaam, due partly to the modernizing of Berths 1-7 in 2013" by Tanzania Port Authority (TPA), a total of 781 vessels called at Berths 1 to 11 in Dar es Salaam Port from July 2010 to June 2011 (Year 2010/2011); 467 were container vessels, 54 dry cargo vessels, 81 general cargo vessels and 178 Ro-Ro vessels. Table 2.2.2 shows average and maximum size for various types of vessels calling at Dar es Salaam Port

Table 2.2.2 Average and Maximum Vessel Calling at Dar es Salaam Port in 2010/2011

Vessel Type		DWT	LOA (m)	Beam (m)	Draft (m)	Parcel Size
Container (Berth 1-7)	Average	24,907	181	27.1	8.8	1,200TEU
	Maximum	34,682	212	32.0	11.4	
Container (Berth 8-11)	Average	24,041	176	26.3	8.9	1,200TEU
	Maximum	55,321	234	32.3	11.9	
Dry Cargo	Average	32,269	171	26.7	9.2	23,000t
	Maximum	58,020	190	32.3	11.4	
General Cargo	Average	21,377	155	24.5	7.6	11,000t
	Maximum	53,565	199	32.3	10.5	
RoRo	Average	29,217	201	31.1	9.7	
	Maximum	41,373	217	32.3	10.8	
Car Carrier	Average	17,868	191	31.3	8.3	490nos.
	Maximum	36,837	232	33.0	9.7	

Source: "Port of Dar es Salaam Modernizing of Berth 1-7 in 2013" by Tanzania Port Authority

A 58,020 DWT bulk carrier was the maximum size in Dar es Salaam Port, followed by a container

ship (55,321 DWT), a general cargo ship (53,565 DWT), a RoRo ship (41,373 DWT), and a car carrier (36,837 DWT).

Current TPA regulations allow a maximum length over all of only 234 m, whereas vessels with a draft of more than 9.4 m or a length over 200 m are restricted to high tides adding approximately 2 m water depth for the passage through the entrance channel. However the deepest draft ship at a TPA berth during the reporting period ending June 2011 had a draft of 11.9 m.

Size of a bulk carrier calling into Tanzania is limited and a Handy-Bulker or Handy-Max type is the maximum size under the present port condition. A bulk carrier such as over 55,000 DWT needs to reduce its cargo to half loaded condition (or call at multiple ports in advance) to reduce its draft. Dry/liquid bulk trade business has totally different characteristics compared to the container trade business. Bulk commodities are often traded on spot market basis and carriers do not follow a schedule. Further, bulk trade business is served using dedicated carrier lines between sources and destinations. Tankers move on a regular basis to supply their own land side storage tanks without missing the supply chain under a contract basis or their own internal supply systems.

TPA has already started port development under a Master Plan in 2009 in Dar es Salaam Port with main funds being supplied through the World Bank (EATTFP). The main development is the container terminal refurbishment aiming at container handling over 650,000 TEUs. Mtwara Port also has a development plan for gas, coal and iron ore. It is expected that the above development will require more ship calls and the deployment of larger size vessels.

2.3 Mozambique

Table 2.3.1 shows ship calls at major ports in Mozambique in 2008 and 2009.

Table 2.3.1 Ship Calling at Major Ports in Mozambique in 2008 and 2009

Vessel Type	Nacala		Beira		Maputo	
	2008	2009	2008	2009	2008	2009
Container	97	108	114	144	N/A	N/A
General Cargo	41	37	118	139	N/A	N/A
Bulk Cargo	3	10	-	-	N/A	N/A
Tanker	58	71	98	103	N/A	N/A
Others	64	73	66	152	N/A	N/A
Total	263	299	396	538	761	613

Source: The Preparatory Survey on Nacala Port Development Project in the Republic of Mozambique in 2011 by JICA

Nacala Port received 299 vessels including 108 container vessels in 2009 and the average cargo handling volume per vessel call is around 4,000 tons or 480 TEUs inbound and outbound. The total number of cargo vessels calling in Beira Port in 2009 was 386 of which 27 % were container vessels. The number of container vessels increased by 26 % compared to the previous year. The number of vessels calling at Maputo Port was 761 in 2008 and 613 in 2009. Thirteen container lines called at the port in 2009, whereas only 5 lines called in 2007.

Dimensions of maximum sized vessels calling at Nacala Port are shown in Table 2.3.1. As shown in Table 4.5.15, 50,000 DWT class vessels call at the port almost every month and occasionally even larger vessels enter the port. Though all these large vessels are conventional vessels such as grain bulkers, they berth at container quays due to the shortage of water depth at general cargo quays. This mixed operation makes port traffic very complicated and hampers container operation.

Table 2.3.2 Dimensions of Maximum-Sized Vessels Calling at Nacala Port

	Year 2008	Year 2009											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LOA	228	185	190	197	200	186	189	187	193	190	196	190	190
Draft	12.0	10.2	10.4	10.5	11.2	11.6	8.9	11.0	10.5	10.9	10.1	10.8	12.5
GT	43,793	30,06	30,963	29,828	24,679	29,733	30,751	30,081	29,998	29,130	30751	28,097	31,236
DWT	76,520	43,245	55,541	50,242	47,512	51,603	47,463	49,999	23,076	74,141	41,035	47,401	56,057

Source: The Preparatory Survey on Nacala Port Development Project in the Republic of Mozambique in 2011 by JICA

For reference, vessels calling in January 2015 into Mozambican ports are shown in Table 2.3.3.

Table 2.3.3 Calling Vessels in Mozambican Ports in January 2015

Port	Vessel Type	DWT	LOA (m)	Beam (m)	Draft (m)
Nacala	RoRo	45,200	240.0	37.5	8.9
	Tanker	31,975	177.0	30.0	7.2
	Tanker	32,127	177.2	30.0	7.0
	Container	33,995	208.0	29.8	8.5
	Container	25,985	179.7	27.6	8.1
	Container	34,333	208.9	29.9	8.6
	Container	35,926	199.9	29.8	9.7
	Bulk	58,780	189.9	32.3	12.6
	General Cargo	14,386	127.6	20.0	6.4
Beira	Tanker	50,386	189.0	32.0	7.8
	Tanker	47,128	183.2	32.2	10.0
	Tanker	47,465	182.4	32.2	9.6
	Tanker	50,013	182.5	32.2	9.5
	Tanker	49,749	189.0	32.2	10.4
	LPG Tanker	26,361	174.0	28.2	10.5
	Container	27,500	181.5	31.5	8.1
	Container	14,148	163.4	22.3	8.1
	Container	13,464	146.7	23.3	6.8
	Container	24,924	193.0	28.0	8.2
	Bulk	53,776	194.0	32.0	7.8
	Bulk	55,783	187.8	32.3	9.6
	General Cargo	12,684	138.0	21.4	8.0
Maputo	Car Carrier	13,363	184.1	30.6	8.4
	LPG Tanker	5,261	106.0	17.6	5.4
	Container	33,796	187.4	30.0	9.7
	Container	41,815	199.0	32.3	12.0
	Bulk	57,552	190.0	32.0	6.7
	Bulk	32,768	179.8	28.0	6.7
	Bulk	28,343	169.3	28.0	9.2
	Bulk	57,800	185.0	32.0	6.5
	Bulk	57,079	189.0	32.3	10.6
	Bulk	28,200	169.3	27.2	5.8
	Bulk	44,062	190.0	30.5	6.6
	Bulk	55,649	190.0	32.3	9.1
	Bulk	58,923	196.0	32.3	6.7
	Bulk	58,686	197.0	32.3	12.1

Source: World's Port Database Internet Service

According to Table 2.3.3, maximum size of vessels in each port is a 58,780 DWT bulk carrier, a 55,783 DWT bulk carrier and a 58,923 bulk carrier in Nacala, Beira and Maputo, respectively. It is expected that maximum size of vessels is a 50,000~60,000 DWT class for bulk carriers, a 40,000~50,000 DWT class for tankers and a 35,000~40,000 DWT class for container ships.

Nacala Port is a natural deep sea port with 15m depth and a new container terminal is planned by modification of the conventional berth. It is expected in the near future that larger size vessels, especially container ships, will call at the port after development of the terminals including Beira and Maputo.

2.4 Category and type of vessels calling at major East African ports

Table 2.4.1 shows the category and type of vessels calling at major East African ports. The biggest container vessel (84,688DWT, LOA 299m, Draft 10.4m) in East African Ports can be accommodated in Djibouti Container terminal in Djibouti.

Table 2.4.1 Category and type of vessels calling at major East African ports

Country	Port	Vessel Type		DWT	LOA (m)	Beam (m)	Draft (m)	Parcel Size
Djibouti	Djibouti Port	General Cargo		13,593~ 29,108	137~200	-	7.4~9.6	
		Car Carrier		20,190	200	-	8.2	
		Bulk Carrier		47,574~ 58,105	183~190	-	10.1~11.7	
		Full Container (Djibouti Container Terminal)		39,763~ **84,688**	222~**299**	-	8.8~**10.4**	3,080TEU~ **6,600TEU**
		Tankers (Djibouti Oil Terminal)		45,913~ 49.749	183~192	-	11~12	
Tanzania	Dar es Salaam Port	Container (Berth 1-7)	Average	24,907	181.0	27.1	8.8	1,200TEU
			Maximum	34,682	212.0	32.0	11.4	
		Container (Berth 8-11)	Average	24,041	176.0	26.3	8.9	1,200TEU
			Maximum	55,321	234.0	32.3	11.9	
		Dry Cargo	Average	32,269	171.0	26.7	9.2	23,000t
			Maximum	58,020	190.0	32.3	11.4	
		General Cargo	Average	21,377	155.0	24.5	7.6	11,000t
			Maximum	53,565	199.0	32.3	10.5	
		RoRo	Average	29,217	201.0	31.1	9.7	
			Maximum	41,373	217.0	32.3	10.8	
		Car Carrier	Average	17,868	191.0	31.3	8.3	490nos.
			Maximum	36,837	232.0	33.0	9.7	
	Tanga Port	LNG Tanker		84,980	285.4	43.4	9.3	
		Container		22,967	184.2	25.3	9.8	
		Bulk		50,271	189.8	32.3	12.3	
	Mtwara Port	Container		18,871	160.0	28.0	6.1	
		Bulk		28,200	169.3	27.2	5.8	
Mozambique	Nacala	RoRo		45,200	240	37.5	8.9	
		Tanker		31,975~ 32,127	177~ 177.2	30.0	7.0~ 7.2	
		Container		25,985~ 35,926	179.7~ 208.9	27.6~ 29.9	8.1~ 9.7	
		Bulk		58,780	189.9	32.3	12.6	
		General Cargo		14,386	127.6	20.0	6.4	
	Beira	Tanker		47,128~ 50,386	182.4~ 189	32.0~ 32.2	7.8~ 10.0	
		LNG Tanker		26,361	174.0	28.2	10.5	
		Container		13,464~ 27,500	146.7~ 193.0	22.3~ 31.5	6.8~ 8.2	
		Bulk		53,776~ 55,732	187.8~ 194.0	32.0~ 32.3	7.8~ 9.6	
		General Cargo		12,684	138.0	21.4	8.0	
	Maputo	Car Carrier		13,363	184.1	30.6	8.4	
		LNG Tanker		5,261	106.0	17.6	5.4	
		Container		33,796~ 41,815	187.4~ 199.0	22.3~ 31.5	6.8~ 8.2	
		Bulk		28,200~ 58,923	169.3~ 197.0	27.2~ 32.3	5.8~ 12.1	

Source: Summarized by the Project Team

Table 2.4.2 shows the summary of container vessels and shipping routes through Mombasa Port by each operator.

Table 2.4.2 Summary of Container Vessels and Shipping Routes by Operator

Operator	Service	Vesel TEU	LOA(m)	DWT	Calling Ports	Remarks
CMA-CGM S/A & Emirates Shipping (CMACGM)	ASEA	2,556~ 2,794 (6 vessels)	208~212 (Width 32.2)	34,248~ 41,411	**Mombasa**~Tanga~Dar Es Salaam~Port Kelang~ Singapore~Colombo~Port Victoria~**Mombasa**	Weekly
	SWAX2	2,600~ 2,650 (5 vessels)	207.9~210.0 (Width 31.3)	34,667~ 35,924	**Mombasa**~Khor Al Fakkan~Jebel Ali~**Mombasa**~ Dar Es Salaam~Zanzibar~Nacala~**Mombasa**	Weekly
Ever Green (EMC)	AEF	2,474~ 2,733 (5 vessels)	199.85~ 212.5 (W 30.1~33)	34,167~ 41,636	**Mombasa**~Dar Es Salaam~Singapore~Tanjung Pelepas~Columbo~**Mombasa**	Weekly by 5 vessels
IGNAZIO MESSINA (MESSINA) Shipping (MSC)	RoRo+ Containers	3,000 (4 vessels)	199.5~239.0 (W 30.1~33)	27,720~ 45,200	**Mombasa**~Dar Es Salaam~Maputo~Durban~ Nakala~Dar Es Salaam~ ~**Mombasa**~Jeddah~Leghorn~Barcellona~Marseille~ Castellon~~Maputo~**Mombasa**	Weekly by 4 vessels
	SALALA Express	2,200~ 2,300 (5 vessels)	195.71 (W 32.23)	34,907~ 41,771	**Mombasa**~Salalah-Dubai~Mundra~Quasim~**Mombasa**	Weekly
MEARSK Line	Mashariki Express	2,496 (7 vessels)	207.3~207.4	33,807~ 33,976	**Mombasa**~Dar es Salaam~Laem Chabang~ Tanjung Pelepas~**Mombasa**	Weekly
	Masika	2,510 (5 vessels)	207.4 (W29.8)	33,501~ 33,976	**Mombasa**~Salalah~Sharjah~Jebel Ali ~Salalah~ ~Dar Es Salaam~**Mombasa**	Weekly
	Mawingu Express	3,500 (5 vessels)	239.5 (W 32.19)	46,925~ 47,027	**Mombasa**~Victoria~Jawaharlal Nehru~Port Qasim~Salalah~**Mombasa**	Weekly
Pacific International (PIL)	AM2	1512 (4 vessels)	182 (Width 27)	23,665	**Mombasa**~Dar Es Salaam~Zanzibar-Mtwra-**Mombasa**~~Pemba~Mombasa	Weekly
	AM1	1,454~ 1,810 (8 vessels)	179.7~182.8 (Width 25)	23,840~ 25,989	**Mombasa**~Durban~Cape Town~Lagos~Lome~Tema~ ~Durban~Colombo~Hazira~Nhava Sheva~Jebel Ali~ Khor Fakkan~Karachi~**Mombasa**	Weekly
	EAS	2,546~ 2,754 (10 vessels)	211.9~226.5 (Width 32)	34,000~ 39,524	**Mombasa**~Singapore~Davao~Shanghai~Dalian~ ~Xingang~Qindao~Ninbo~Singapore~Colombo~ **Mombasa**	Weekly

Source: Summarized by the Project Team

3. Current Port Master Plan (2009)

3.1 Review of traffic forecast

At the beginning, the traffic forecasts were based on Vision 2030 GDP growth assumptions (10% p.a. from 2012-2020). After discussions with KPA about the amount of physical infrastructure that would be required to support the Vision 2030 growth rates, and the risk that these will not be achieved because of the global recession, a more modest GDP growth rate of 7% p.a. between 2012-2020 was agreed for port planning purposes and is referred to in this report as the "base case". This is still slightly above the GDP rates that have been achieved in the recent past.

Table 3.1.1 shows the growth rate of the 1st MTP (2008-2012) Macro-Fiscal targets and actual performance. During the period, the actual growth rate slowed down with a nearly half of the target rate and showed a big fall compared to the target.

Table 3.1.1 Growth Rate of MPT 2008-2012 Targets and Actual Performance

GDP Growth (%)	2008/09	2009/10	2010/11	2011/12	2012/13
Target	6.2	8.3	9.1	9.7	10.0
Actual	2.1	4.2	5.1	4.1	5.4

Source: VISION 2030 "Second Medium Term Plan (2nd MTP) 2013-2017"

The Government projects growth to continue gathering momentum from about 6.1 per cent in 2013 to 10.1 per cent in 2017 as shown in Table 3.1.2. The higher growth is premised on increased investment which is targeted to reach 30.9 per cent of GDP in 2017 from 24.7 per cent in 2013 and mainly contributed to by the private sector including foreign direct investments. The above projections based on the increased investment is rather optimistic considering the past investment level from 19.6 per cent of GDP in 2008 to 20.5 per cent in 2012 and as a result the growth rate of 5 to 7 per cent estimated by IMF is quite reasonable for GDP from 2013 to 2017.

Table 3.1.2 Real GDP Growth Targets 2013-2017

GDP Growth (%)	20013/14	2014/15	2015/16	2016/17	2017/18
Growth Projection	6.1	7.2	8.7	9.1	10.1
IMF Forecast	4.6	5.3	6.2	6.4	6.5

Source: VISION 2030 "Second Medium Term Plan (2nd MTP) 2013-2017" and IMF Database, Oct. 2014

3.2 Review of proposals in the current master plan

3.2.1 Short-term proposal

The short-terms proposals include:

- Investigation of further improvements to the entrance channel and the channel within the port, to determine if it would be possible to accommodate container ships of 6,000+ TEU capacity.
- Transfer of most of the dirty dry bulk operations to Mbaraki Wharf, combined with the construction of wider access bridges and dredging of the wharf to 12.5m CD.
- Repairs to buildings in the Dockyard which are needed for safety reasons.
- Clearing of all of the old buildings from Area G, and conversion of the area into two separate open storage areas, one for vehicles and the other for containers.

This part of the port can be made accessible to the public without putting port security at risk, and developed for commercial uses:

- Improvements in handling efficiency on general cargo Berth 1-10. The need to retain all of the transit sheds should be reviewed, as open storage space for containers and subsequently vehicles would be more useful.
- At Berth 4 GBHL is proposing to install a third grain unloader once there is sufficient demand. Alternatively a second grain operator could be allowed to install unloading equipment at Berth 5, with an elevated conveyor to off-dock silos.
- At Berth 9 Magadi Soda is proposing to upgrade its loading equipment for soda ash. As handling rates for this commodity are very low, this will increase the capacity of the berth.
- Transfer of LPG from Shimanzi Oil Terminal to a new single buoy mooring to be built at Port Reitz by the African Gas and Oil Company Ltd.
- Extension of Berth 14 to join Berth 16, rearrangement of the stockyard area behind Berth 11-15, and improvements to the traffic circulation pattern. This provides an extra 206m of quay and 300 TEU of additional ground slots.
- Construction of Berth 19, rearrangement of the stockyard area behind Berths 16-19, and improvements to the traffic circulation pattern. This provide an extra 160m of quay and 2,050 TEU of additional ground slots, and will allow a further three ships to shore gantries to be installed in addition to the four in use.
- Enlargement of Gate 19 to provide three additional check-out booths, and widening of the truck waiting area near the gate to avoid long queues of vehicles impeding other port operations.
- Widening of the road behind Berths 16-19 to improve access to the Kipevu West container terminal.
- A study of the need for new hydrocarbons berths (LPG, compressed natural gas and petroleum products). If productivity improvements at KOT cannot be achieved quickly, a new oil berth will be needed in the short-term.
- Upgrading of the incoming power supply to 33 kV and provision of a second power line. Other power-related improvements include the purchase of three new generators to provide back-up power to communications equipment.
- Construction of a new water pipeline and upgrading of the sewage system.

Table 3.2.1 shows lists of the short-term proposals for the revised Master Plan for the port of Mombasa where the planning and design should be started in 2009 or 2010 and the work completed by 2012, and the present status of these proposals.

Table 3.2.1 Short Term Proposal and Present Status

Short term proposal	Present status
Entrance channel improvements	The project was divided into two phases. Phase 1 covered the navigational channel, turning basin, the proposed berths 20-23 at the second container terminal and the ancillary works. The first phase commenced in February 2011 and was completed in April 2012. Further dredging for Phase 2 is required to accommodate the development of Dongo Kundu Freeport, Relocation of KOT and the LNG jetty for the Gas Fired Electricity Generation plant. The Government is expected to avail more funds and explore other funding opportunities for the Phase 2 project.
Extension of Mbaraki Wharf	The project is under planning and expected to obtain the external funding source.
G-Section-Holding ground for cars	The project is not determined yet.
Development of additional bulk grain facility	The project is embarked for development under PPP arrangement, in which the private sector will construct, equip, market and operate the proposed facility. A detailed feasibility study has been completed and funding for due diligence and transaction advisory services will be needed to facilitate PPP in the project. Presently the project is pending.
Conversion of berth 11-14 into Container Berths	The project entails infrastructural modification to berths 11 to 14 to support loadings from modern container handling equipment and procurement of handling equipment. The project will be conducted by the PPP scheme and is under planning.
Relocation of Kipevu Oil Terminal	The development of berth 19 and the development of the container terminal West of KOT necessitate re-location of KOT. Niras Port Consultant of Denmark have carried out a feasibility study and further activities require undertaking detailed design study, determine the financing options and funding, and re-location of the terminal facility.

Source: JICA Study team

3.2.2 Long-term proposal

The long-term proposals expand the port further westwards into the Port Reitz area, and across to the other side of the creek at Dongo Kundu. They include:

- Construction of another 1,100m of container berths, either as an extension of the 1.1m TEU p.a. container terminal to be built at Kipevu West or as a new container terminal at Dongo Kundu.
- Construction of a common user terminal for dirty bulks at Dongo Kundu, capable of handling Panamax size vessels.
- Deepening of Berths No. 1-5 at the existing port to allow the use of larger grain and RoRo ships. This would also allow general cargo ships to carry larger consignments of steel, and would be of benefit to the dirty dry bulks (clinker, coal and fertilizers) until the new facility at Dongo Kundu would be built. Berths 1-2 would be deepened to -12.5m CD, and berths 3-5 to -14.5m CD.
- Development of a car import terminal at Dongo Kundu by 2023.
- Construction of a new cruise terminal close to the proposed southern by-pass connecting Dongo Kundu to the north shore of Port Reitz. Although KPA intends to convert the buildings on Berth 1 into a cruise terminal.
- The proposal by Tiomin Kenya Ltd to build a privately-funded berth for mineral exports 500m west of the Likoni Ferry on the south side of Kilindini Harbor.
- Further widening of the entrance channel to allow container ships of 6,000+ TEU and large bulk carriers to enter the port.

Table 3.2.2 shows lists of the long-term proposals and present status including the Consultant's comment.

Table 3.2.2 Long Term Proposal and Present Status

Long term proposal	Present status/Comments
MPDP Phase 4 & 5	A further 1,100 meters of the container berth will be required to provide enough capacity to meet demand in 2030. The project will be studied in "The Project for Technical Assistance to Kenya Ports Authority on Dongo Kundu Port, Mombasa Master Plan" whether additional container berths will be built at Kipevu West or as a new container terminal at Dongo Kundu
Freeport at Dongo Kundu	The project is one of the flagship projects to be implemented during the first Medium Term Plan (2013-2017) under Vision 2030. Development of the container berth, the bulk berth for dirty dry bulk and the car import terminal has been proposed in the revised Master Plan. The feasibility study by JICA is under way and expected to be studied on the berth type to be developed. The immediate handicap to the development is inaccessibility to the area and its development is dependent on the construction of a fixed sea crossing bypass to the south with a bridge/causeway combination from Miritini Station to Dongo Kundu.
Cruise Ship Terminal	As a short term measure limited rehabilitation of the Shed No.1 has been undertaken to provide basic facilities. Conversion of berth No.1 & 2 into a passenger terminal has been carried forward. Though the Port Master Plan has recommended the development of a cruise liner terminal at the western end of Port Reitz, it is advised that its development should be reconsidered due to piracy and security concerns thus adversely affecting the port of Mombasa.
Titanium Ore Terminal	Tiomin, a Canadian company, plans to export 450,000 tonnes p.a. of titanium, zircon etc. from a site at the south of Mombasa port. Though the project was delayed, about 363,000 tonnes of titanium was exported in 2014.
Widening of Entrance Channel Bends	If the study proposed in the short term plan demonstrates that it would be possible to bring container vessels larger than 4,500 TEU capacity safely into the port, there may be a demand from shipping companies to carry out some widening of the entrance channel bends. It is therefore recommended by the revised Master Plan that KPA should carry out further simulations to assess whether or not larger vessels up to 6,000 to 6,500 TEU capacity can enter and leave if the bends in the channel are dredged to allow a larger radius of curvature of the bends. Presently KPA doesn't list up the above project in "The Port Investment Programme 2013-2030". It is advised that environmental impacts should be identified before the project is going on.

Source: JICA Study team

4. Current Situation of Mombasa Port

4.1 Throughput in Mombasa Port

4.1.1 Cargo traffic overview

Cargo traffic is dominated by imports which account for 90% of total cargoes handled at Mombasa Port in 2014. This trend has remained steady in the past decade. Out of total import cargoes, about 30% is transit cargoes destined to hinterland countries and shows a gradual steady increase over the past decade. It is noted that overall cargo traffic at Mombasa Port has been increasing due to growth of the Kenyan economy and landlocked countries as well.

Table 4.1.1 Cargo Traffic in Mombasa Port (Import)
(Unit: 1,000 ton)

Commodity/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Iron & Steel	515	435	493	621	595	780	826	833	854	1,192	1,367
Rice	297	311	311	328	275	387	285	298	340	465	651
Sugar	207	246	289	372	320	281	279	140	102	207	231
Chemicals & Insecticides	169	199	267	299	237	218	244	213	200	254	390
Plastic	218	199	266	308	313	402	454	265	218	398	662
M/Vehicle & Lorries	86	164	202	287	334	296	283	293	332	366	463
Paper & Paper Products	168	143	209	244	208	296	336	265	196	300	503
Cereal Flour	90	92	101	149	143	177	153	91	41	41	49
Fertilizer	140	89	160	103	71	71	59	110	52	80	102
Clothing	74	80	105	115	105	35	105	71	40	132	253
Ceramic	32	52	90	162	143	145	251	246	125	260	415
Edible Vegitables	6	62	70	88	42	45	22	26	30	29	57
Vehicle Tyres & Spares	31	25	37	48	48	30	39	30	11	52	103
Tallow & Oil in Cases & Drums	32	37	35	29	27	33	17	16	15	33	84
Malt	0	32	26	26	30	33	22	9	1	9	2
Maize in Bags	67	22	25	9	15	42	18	50	32	16	37
Wheat in Bags	35	3	13	0	1	6	6	13	7	8	9
Agric. & Other Machinery	36	16	2	3	4	18	4	8	6	10	12
Other Cereals in Bags	17	6	0	0	6	4	5	8	22	2	19
Others	1,571	1,584	1,562	1,883	2,508	2,873	3,105	4,337	5,433	4,792	3,704
Total General Cargo	**3,791**	**3,797**	**4,263**	**5,074**	**5,425**	**6,172**	**6,513**	**7,322**	**8,057**	**8,646**	**9,113**
Motor Vehicle (1,000 cars)											
Wheat in Bulk	543	911	948	858	737	1,074	1,287	1,443	1,559	1,401	1,908
Clinker	164	430	520	1,080	1,013	1,135	1,428	1,368	2,268	2,228	2,065
Fertilizer in Bulk	363	385	337	280	236	388	366	380	336	603	360
Coal	177	137	167	176	174	162	236	346	291	296	436
Other Cereals in Bulk	13	107	204	135	257	103	30	58	104	156	184
Maize in Bulk	206	73	83	0	171	1,561	196	107	33	0	0
Others	122	84	85	193	304	218	284	105	220	229	278
Total Dry Bulk	**1,588**	**2,127**	**2,344**	**2,722**	**2,892**	**4,641**	**3,827**	**3,807**	**4,811**	**4,913**	**5,231**
P.O.L.	4,045	4,320	4,734	4,798	4,889	5,671	5,553	5,783	5,898	5,637	6,286
Other Liquid Bulk	551	598	669	676	552	760	833	824	767	900	906
Total Liquid Bulk	**4,596**	**4,918**	**5,403**	**5,474**	**5,441**	**6,431**	**6,386**	**6,607**	**6,665**	**6,537**	**7,192**
Grand Total	**9,975**	**10,842**	**12,010**	**13,270**	**13,758**	**17,244**	**16,726**	**17,736**	**19,533**	**20,096**	**21,536**

Source: KPA

Table 4.1.2 Cargo Traffic in Mombasa Port (Export)
(Unit: 1,000 ton)

Commodity/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tea	406	405	402	464	421	371	468	433	450	541	554
Soda Ash	185	217	200	309	549	121	391	444	372	423	336
Coffee	180	170	195	235	272	234	199	230	210	264	256
Maize	6	9	17	35	18	17	26	4	0	0	2
Fish & Crustacean	46	35	42	38	28	21	22	17	23	16	20
Tobacco & Cigarettes	32	30	43	42	34	33	38	37	33	28	27
Beans, Peas, Pulses	32	4	12	33	15	17	36	13	27	34	19
Iron & Steel	53	47	42	32	24	15	15	9	5	6	12
Cloths	22	25	22	24	23	18	18	19	21	23	30
Oil Seeds	8	16	27	22	32	59	20	16	15	28	39
Cotton	35	63	22	19	7	14	6	7	4	4	2
Hides & Skins	26	23	32	18	20	18	29	20	26	22	28
Sisal	17	20	22	14	5	5	0	0	0	0	2
Cement Bags	0	0	0	5	2	5	0	0	0	0	1
Casew Nuts	8	4	6	4	8	4	2	1	1	1	0
Rice	2	15	6	4	2	2	2	11	10	7	20
Tinned Fruits, Vegitables & Juices	18	19	18	0	58	43	83	90	71	93	99
Others	166	234	261	278	426	446	422	624	604	578	550
Total General Cargo	**1,242**	**1,336**	**1,369**	**1,576**	**1,944**	**1,443**	**1,777**	**1,975**	**1,872**	**2,068**	**1,998**
Titanium	0	0	0	0	0	0	0	0	0	0	363
Soda Ash in Bulk	92	116	112	77	74	56	0	15	0	0	0
Cement in Bulk	165	92	113	54	10	0	0	0	0	0	0
Flourspar	125	77	87	71	101	6	31	107	106	65	59
Other Dry Bulk	0	0	2	3	15	0	39	0	0	0	0
Total Dry Bulk	**382**	**285**	**314**	**205**	**200**	**62**	**70**	**122**	**106**	**65**	**422**
Bulk Oil	160	104	64	85	122	99	44	95	98	62	19
Bunkers	86	70	68	82	68	68	51	63	62	38	26
Total Liquid Bulk	**246**	**174**	**132**	**167**	**190**	**167**	**95**	**158**	**160**	**100**	**45**
Grand Total	**1,870**	**1,795**	**1,815**	**1,948**	**2,334**	**1,672**	**1,942**	**2,255**	**2,138**	**2,233**	**2,465**

Source: KPA

Table 4.1.3 Berth Performance Overview 2013

Berth No.	No. of Vessel Worked	Berth Hours	Port Hours	Berth Hours per Vessel	Vessel's Turnaround Time (days)	Berth Occupancy (%)	No. of Hours Worked	Ton Handled (Berth Throughput)	Ton/ Working Hour
MBK	9	1,209	1,282	134.4	5.9	13.8	1,126	283,984	252
1	160	5,145	11,174	32.2	2.9	58.7	4,429	673,267	152
2	3	95	220	31.8	3.1	1.1	72	1,027	14
3	69	5,866	9,333	85.0	5.6	67.0	5,295	1,551,456	293
4	88	6,763	14,185	76.9	6.7	77.2	5,352	416,593	78
5	89	6,635	14,141	74.5	6.6	75.7	6,152	1,064,433	173
7	61	7,087	8,285	116.2	5.7	80.9	6,499	834,529	128
8	54	4,592	8,142	85.0	6.3	52.4	3,464	70,103	20
9	56	5,744	7,804	102.6	5.8	65.6	4,830	907,566	188
10	65	6,545	8,743	100.7	5.6	74.7	5,974	1,602,983	268
11	107	6,611	10,363	61.8	4.0	75.5	5,779	635,310	110
12	97	6,502	8,932	67.0	3.8	74.2	5,182	120,129	23
13	97	6,502	8,932	67.0	3.8	74.2	5,182	120,129	23
14	78	4,850	5,687	62.2	3.0	55.4	4,427	91,104	21
16	90	6,962	9,481	77.4	4.4	79.5	6,519	113,027	17
17	111	7,785	10,638	70.1	4.0	88.9	7,346	122,651	17
18	126	8,048	11,160	63.9	3.7	91.9	7,453	153,314	21
19	2	91	127	45.4	2.6	1.0	80	1,996	25

Source: KPA

4.1.2 Container traffic overview

The container traffic at Mombasa Port has also increased since year 2005 and reached 1,012,002 TEUs in 2014. Annual growth of container traffic in the last 9 years shows a remarkable rate of nearly 10%.

The trend of import-dominated trade is also clearly noted. In 2014, about 70% of outgoing containers from the Mombasa Port was empty return. Out of total import containers, about 33% is transit containers.

Table 4.1.4 Container Traffic in Mombasa Port (Unit: 1,000 TEUs)

Container/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Import										
Full	193.2	217.9	277.8	292.3	301.5	338.8	385.9	441.1	441.0	482.1
Empty	14.6	11.6	4.2	5.1	6.4	6.5	6.8	3.7	8.4	6.6
Total	**207.8**	**229.5**	**282.0**	**297.4**	**307.9**	**345.3**	**392.6**	**444.8**	**449.4**	**488.7**
Export										
Full	94.1	86.3	101.3	102.9	95.8	110.3	115.3	120.7	129.5	130.8
Empty	107.5	132.2	165.5	181.0	205.6	225.4	242.9	325.9	298.8	331.7
Total	**201.6**	**218.6**	**266.9**	**283.9**	**301.5**	**335.7**	**358.2**	**446.6**	**428.3**	**462.5**
Transshipment										
Full	22.3	21.8	30.7	30.3	7.4	11.1	16.5	10.6	12.1	52.7
Empty	5.0	9.5	5.8	4.2	2.1	3.5	3.4	1.5	4.2	8.1
Total	**27.3**	**31.3**	**36.5**	**34.5**	**9.5**	**14.6**	**19.9**	**12.1**	**16.3**	**60.9**
Total										
Full	309.7	326.0	409.8	425.5	404.7	460.2	517.7	572.3	582.6	665.5
Empty	127.0	153.3	175.6	190.2	214.1	235.4	253.1	331.1	311.4	346.5
Grand Total	**436.7**	**479.4**	**585.4**	**615.7**	**618.8**	**695.6**	**770.8**	**903.5**	**894.0**	**1,012.0**

Source: KPA

4.1.3 Transit cargo

Transit cargo traffic has also shown steady growth since 2005. Average annual growth rate of total transit cargoes during 2005/2014 was more than 8%. Total volumes reached 7,199 thousand tons in 2014 from 3,534 thousand tons recorded in 2005. Traditionally, Uganda cargoes have comprised an overwhelmingly large share of transit traffic. In 2014, Uganda cargoes totaled 5,522 thousand tons which is 77% of the total transit cargo.

Table 4.1.5 Transit Cargo at Mombasa Port (including Containers)
(Unit: 1,000 tons)

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Uganda										
Import	2,433	2,572	3,100	3,374	3,687	3,942	4,028	4,499	4,508	5,132
Export	247	250	299	327	293	291	347	346	404	390
Total	**2,680**	**2,822**	**3,399**	**3,701**	**3,980**	**4,233**	**4,375**	**4,845**	**4,912**	**5,522**
Tanzania										
Import	246	246	227	236	231	168	151	168	180	173
Export	35	24	22	15	22	11	10	18	12	15
Total	**281**	**270**	**249**	**251**	**253**	**179**	**161**	**186**	**193**	**188**
Burundi										
Import	29	66	50	56	19	6	1	39	66	79
Export	0	1	2	1	1	1	1	0	1	0
Total	**29**	**67**	**52**	**57**	**20**	**7**	**2**	**39**	**67**	**79**
Rwanda										
Import	194	225	263	277	236	275	216	248	223	221
Export	24	28	24	17	15	13	10	13	17	15
Total	**218**	**253**	**287**	**294**	**251**	**288**	**226**	**261**	**240**	**236**
South Sudan										
Import	141	130	145	220	156	190	376	736	717	697
Export	6	8	0	3	12	33	41	30	59	65
Total	**147**	**138**	**145**	**223**	**168**	**223**	**417**	**766**	**775**	**761**
D. R. Congo										
Import	113	203	225	264	263	402	339	465	491	384
Export	21	24	32	40	26	28	16	17	20	24
Total	**134**	**227**	**257**	**304**	**289**	**430**	**355**	**482**	**512**	**408**
Somalia										
Import	43	30	33	43	16	5	29	16	7	5
Export	0	0	0	0	0	0	0	0	0	0
Total	**43**	**30**	**33**	**43**	**16**	**5**	**29**	**16**	**7**	**5**
Others										
Import	2	0	0	1	4	15	25	29	4	0
Export	0	0	1	0	0	1	5	0	0	0
Total	**2**	**0**	**1**	**1**	**4**	**16**	**30**	**29**	**4**	**0**
Transit Cargo										
Import	3,201	3,472	4,043	4,471	4,612	5,003	5,165	6,200	6,196	6,691
Export	333	335	380	403	369	378	430	424	513	508
G. Total	**3,534**	**3,807**	**4,423**	**4,874**	**4,981**	**5,381**	**5,595**	**6,624**	**6,709**	**7,199**

Source: KPA

4.1.4 Transit container

Transit container comprises about 33% (={164,977TEUx2}/{1,012,002TEU}) of total containers handled at Mombasa Port in 2014. Out of total transit containers, about 72% (={119,122TEUx2}/{164,977TEUx2}) is container to/from Uganda. Container export traffic from hinterland countries is minimal. Other hinterland countries who have container traffic are South Sudan, DR Congo, Tanzania and Rwanda. Container activities of other countries are minimal.

Table 4.1.6 Transit Full Containers through Mombasa Port
(Unit: TEUs)

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Uganda										
Import	42,827	50,698	70,188	80,054	81,212	87,474	103,199	107,997	109,050	119,122
Export	16,056	14,099	16,939	17,471	17,146	15,630	19,780	22,035	24,029	22,740
Total	**58,883**	**64,797**	**87,127**	**97,525**	**98,358**	**103,104**	**122,979**	**130,032**	**133,079**	**141,862**
Tanzania										
Import	8,379	7,933	9,829	10,134	10,064	7,953	7,694	7,666	7,267	7,604
Export	2,867	1,732	1,562	1,111	1,003	875	830	1,438	972	1,062
Total	**11,246**	**9,665**	**11,391**	**11,245**	**11,067**	**8,828**	**8,524**	**9,104**	**8,239**	**8,666**
Rwanda										
Import	2,584	3,430	4,462	4,234	4,708	4,844	5,441	5,495	4,361	5,601
Export	1,297	1,416	1,280	849	807	670	562	686	900	808
Total	**3,881**	**4,846**	**5,742**	**5,083**	**5,515**	**5,514**	**6,003**	**6,181**	**5,261**	**6,409**
D. R. Congo										
Import	5,276	5,884	6,389	6,789	6,952	8,738	9,770	12,321	14,729	9,495
Export	1,333	1,427	1,857	2,235	1,518	1,658	1,105	1,203	1,422	1,575
Total	**6,609**	**7,311**	**8,246**	**9,024**	**8,470**	**10,396**	**10,875**	**13,524**	**16,151**	**11,070**
South Sudan										
Import	2,467	4,021	5,578	6,189	6,402	8,695	15,205	27,499	25,981	22,186
Export	332	456	38	191	785	1,603	1,970	1,410	2,564	3,343
Total	**2,799**	**4,477**	**5,616**	**6,380**	**7,187**	**10,298**	**17,175**	**28,909**	**28,545**	**25,529**
Burundi										
Import	143	239	176	56	186	101	44	124	135	609
Export	26	68	159	75	55	53	33	15	9	9
Total	**169**	**307**	**335**	**131**	**241**	**154**	**77**	**139**	**144**	**618**
Somalia										
Import	1,113	1,467	753	1,900	833	401	749	422	463	340
Export	16	0	0	1	22	0	0	5	6	0
Total	**1,129**	**1,467**	**753**	**1,901**	**855**	**401**	**749**	**427**	**469**	**340**
Others										
Import	37	13	29	28	153	15	33	97	18	20
Export	18	14	55	41	3	0	0	1	2	6
Total	**55**	**27**	**84**	**69**	**156**	**15**	**33**	**98**	**20**	**26**
Transit Container										
Import	62,826	73,685	97,404	109,384	110,510	118,221	142,135	161,621	162,004	164,977
Export	21,945	19,212	21,890	21,974	21,339	20,489	24,280	26,793	29,904	29,543
G. Total	**84,771**	**92,897**	**119,294**	**131,358**	**131,849**	**138,710**	**166,415**	**188,414**	**191,908**	**194,520**

Source: KPA

4.2 Number of arriving and departing ships

The number of arriving ships in Mombasa Port was 1,832 nos. in 2014. The total number of arriving and departing ships is double, 3,664 nos. because the number of departing ships is the same with the number of arrival. The average port days per ship are 3.5 days. The above number includes other ships which are not related to cargo transportation. The breakdown of vessel calls in Mombasa Port is shown in Table 4.2.1.

Table 4.2.1 Vessel Calls at Mombasa Port in 2014

Unit: number of ships

Ship Type	Number of Ship	
	Cargo Ship	Other Ship
Container Ship	557	
General Cargo Ship	285	
RO/RO	49	
PCTV (Vehicle Carrier)	155	
Bulk Carrier	210	
Tanker	194	
Barge		26
Fishing		26
Passenger		5
Tug		71
Yacht		3
Naval		17
Others		234
Total	1,450	382

Source: Annual Review and Bulletin of Statistics 2014 by KPA

According to the above table, vessel calls for cargo ships are 1,450 in 2014, representing 79 % of the total vessel calls. A total of 382 'other' vessels called.

The number of arriving cargo ships at Mombasa Port in 2013 is shown in Table 4.2.2.

Table 4.2.2 Number of Arriving Cargo Ships at Mombasa Port in 2013

Unit: number of ships

Ship Size (GRT)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
0~9,999	27	21	24	24	34	26	23	30	22	23	38	29	321
10,000~29,999	55	50	49	57	50	52	56	61	44	64	50	48	636
30,000~49,999	21	18	21	20	23	19	24	31	29	31	26	29	292
50,000~70,000	14	13	15	15	16	15	17	14	13	13	14	19	178
Total	117	102	109	116	123	112	120	136	108	131	128	125	1,427

Source: Prepared by Study Team based on KPA's statistics data

According to data on vessels calling Mombasa Port in Table 4.2.2, vessel calls by month are stable, ranging from 102 and 136 ships. The majority of vessels (957 or nearly 70% of the total) are smaller than 30,000 GRT and 12% are larger than 50,000 GRT.

The number of arriving container ships (500) accounted 28.3 % of the total number of arriving ships. General cargo ships and bulk carriers were the next most frequent callers, accounting 19.4 % and 11.4 % respectively.

Following observations can be made based on KPA data;

- Largest container ship is the "Delphinus Leader" at 57,391 GRT, followed by "Atlanta (48,148 GRT)" and "Hammonia Pacificum (40,438 GRT)". According to information from

"Marine Traffic" on the web site, "Delphinus Leader" is registered as a vehicle carrier and its dead weight tonnage is 21,514 DWT and "Hammonia Pacificum" is 26,435 GRT, not 40,438 GRT. Further the registered "Atlanta" is OOCL "ATLANTA" container ship with 89,097 GRT. "Atlanta" might be a RO/RO vessel because her berthing location is Berth No.1. As a result, it is assumed that a container ship larger than 40,000 GRT did not call at Mombasa Port in 2013.

- Largest general cargo ship is "Usher Sagar" registered in India at 56,152 GRT, but there is no information in "Marine Traffic" on the web site. The "Jolly Quarzo" is a larger ship at 50,722 GRT. She is registered as a vehicle carrier on "Marine Traffic". Two other ships, namely "Filia Glory (32,839 GRT)" and "Wikanda Naree (32,661 GRT)", are registered as a bulk carrier on "Marine Traffic". This means that some bulk carriers having larger dead weight tonnage are categorized as general cargo ship in KPA's statistic data. However, it is difficult to identify ships as bulk or general cargo because the majority of bulk ships are equipped with ship gears. Furthermore, container ships with ship gears are originally general cargo ships into which container cargoes can be loaded as cargoes for developing countries.

In consideration of the above findings, the maximum sizes of arriving ships by cargo type in 2013 are categorized in Table 4.2.3.

Table 4.2.3 Maximum Ships of Arrival by Cargo Type in 2013

Ship type	Name	Dead Weight Tonnage	Remark
Container Ship	MSC America	45,668 DWT	Loaded container: about 2,700 TEU
General Cargo/Bulk Ship	Filia Glory	58,000 DWT	Loaded tonnage: about 50,000 t/
PCTV	B Ladybug	72,408 GRT	Vehicle Carrier
Tanker	FS Endeavor	109,994 DWT	Loaded tonnage: about 100,000 t

Source: Prepared by Study Team based on KPA's statistics data

For reference typical vessels calling in August and September, 2014 are shown in Table 4.2.4 and Table 4.2.5.

Table 4.2.4 Typical Container Ships Calling in 2014

Calling Date	Vessel Name	DWT	LOA (m)	TEU handled
09/Sep/2014	HANSA AMERICA	47,068	240	3,100
29/Aug/2014	MARTHA SCHULTE	46,925	240	3,100
29/Aug/2014	CALANDRA	41,411	213	1,535

Source: KPA's statistic data

Table 4.2.5 Typical Conventional Ships Calling in 2014

Calling Date	Vessel Name	LOA (m)	Draft (m)	Cargo handled (ton)
07/Sep/2014	JS SANAGA	200	11.5	49,500
31/Aug/2014	ELEOUSSA	190	9.5	43,100
30/Aug/2014	DIAMOND SEA	190	9.5	41,380

Source: KPA's statistic data

Table 4.2.6 shows the number of ships worked in Mombasa Port from 2009 to 2014. According to the table, it is clear that the number of ships calling Mombasa Port shows a tendency to increase in the last 5 years although there are some discrepancies between the number of ships worked and number of cargo ships called shown in Table 4.2.1.

Table 4.2.6 Number of Ships Worked in Mombasa Port

Unit: number of ships

Year	2010	2011	2012	2013	2014
Ship worked	1,133	1,169	1,193	1,332	1,378

Source: Annual Review and Bulletin of Statistics 2014 by KPA

4.3 Current Issues of Mombasa Port

Cargo traffic is dominated by imports which account for 90% of total cargoes handled at Mombasa Port in 2014. This trend has remained steady in the past decade. Out of total import cargoes, about 30% is transit cargoes destined to hinterland countries and shows a gradual steady increase over the past decade. It is noted that overall cargo traffic at Mombasa Port has been increasing due to growth of the Kenyan economy and landlocked countries as well. In particular, the container traffic at Mombasa Port has also increased since year 2005 and reached 1,012,002 TEUs in 2014. Annual growth of container traffic in the last 9 years shows a remarkable rate of nearly 10%.

Although the total volume of cargo handled at the port has duplicated over the past decade, various issues witnessed in cargo operation are as follows;

4.3.1 Excessively high berth occupancy ratio (B.O.R) followed by long waiting time for berthing

Table 4.3.1 shows B.O.R, possibility of waiting by berth occupied (B/O), waiting time and average waiting time of each mooring facility in 2014. As mentioned in Chapter 5.3.1, UNCTAD recommends preferable B.O.R for various occasions. In cases where there are 6-10 berths, preferable B.O.R. is 70 %. Since Mombasa Port has more than 10 berths, the preferable B.O.R could be assumed to be approximately 70-75 % at most. Mooring facilities including Berth No. 3, 4, 5, 7, 9, 11, 13, 14, 16, 17 and 18 exceed the recommended B.O.R. by UNCTAD. Moreover, B.O.R of Berth No.10 and 13 is close to 75 %. Extremely high B.O.R. means that Mombasa Port is critically deficient in mooring facilities including berths and wharf. Accordingly, long waiting time for berthing caused by berth occupied (B/O) takes place.

Table 4.3.1 B.O.R of Berths and Other Indicator in 2014

Berth/ Wharf	B.O.R.	Waiting Possibility by B/O*	Waiting Time	Av. Waiting Time
	(%)	(%)	(hour)	(hour/ Vessel)
Mbaraki	11.0	0	0	0
No.1	74.7	22	1,650	41
No.2	4.6	0	0	0
No.3	82.5	40	4,112	133
No.4	79.5	27	1,872	72
No.5	89.6	29	1,607	50
No.7	90.6	24	1,281	85
No.8	36.0	10	212	53
No.9	88.5	31	1,290	68
No.10	72.5	34	1,219	64
No.11	84.2	25	1,473	57
No.12	68.0	5	657	110
No.13	80.2	21	700	32
No.14	86.0	20	595	35
No.16	100.0	57	4,829	78
No.17	89.6	60	5,067	82
No.18	94.9	56	5,243	81
No.19	-	-	-	-
Total			31,807	

Note: *) Percentage of vessels waiting for berthing due to the berth occupied by other vessel
Source: KPA and the Project Team

4.3.2 Excessive mixture of various commodities followed by low cargo handling productivity

Table 4.3.2 shows the allocation of major cargo to berths/wharf in 2014. Motorcars were handled at 11 berths, steel at 9 berths, containers at 15 berths and etc. Only the bulk wheat was handled in a concentrated manner, because efficient wheat unloaders have been installed at berth No.3.

If a designated berth for a commodity is changed on a case-by-case basis, mobilization of stevedoring laborers and preparation of required cargo handling equipment will take longer than in the case of a fixed berth system for a commodity. Extraordinary mixture of various commodities leads to lower productivity in cargo handling.

Table 4.3.2 Allocation of Major Cargo to Berth/Wharf in 2014

Commodity	Berth/Wharf Handled	Total
Motorcars	**No.1**, No.3, No,4, No.5,No,7, No.9, No.10, No.11, No.12,No.13,No.14	11 Berths
Steel	No.1, No.3, **No.4,** No.5, **No,7**, No.8, No.9, **No.10**, **No.11**	9 Berths
Container	No.1, No.3, No.4, No.5, No.7, No.8, No.9, No.10, No.11, No.13, No.14, **No.16-19**	15 Berths
Bulk Wheat	**No.3**	1 Berth
Bulk Clinker	Mbaraki, No.7, No.9, **No.10**	4 Berths
Bulk Fertilizer	No.1, No.5, **No.7**, **No.9**, No.10, No.11	6 Berths
Bulk Coal	Mbaraki, **No.9**, No.10, No.11	4 Berths
Other Liquid Bulk	Mbaraki, No.8, No.9, No.10	4 Berths

Note: Bold character means main berths for major commodities.
Note 2: Data on other liquid bulk is in 2014.
Source: KPA and the Project Team

4.3.3 Inadequate berth length for calling vessels

Table 4.3.3 shows the number of vessels of which LOA exceed originally designed LOA of a berth in 2014. At Berth No.1, almost all vessels have longer LOA than designed LOA. Accordingly, Berth No.2 is also used to accommodate the ships. As a result, the number of calling ships is very limited at Berth No.2. Capacity of Berth No. 2 is not fully utilized. The same phenomenon is also observed at Berth No.16 and 17.

There are officially 18 berths/wharfs in Mombasa Port but that number is misleading as the berths cannot be used effectively due to their inadequate length.

Table 4.3.3 Number of Vessels of which LOA Exceed Originally Designed LOA in 2014

Berth/ Wharf	Allowable LOA.	Number of Calling Ships	Ships with Longer LOA than Designed LOA	Ratio
Mbaraki	276 m	7	0	0 %
No.1	156 m	180	162	90 %
No.2	150 m	4	3	75 %
No.3	150 m	78	72	92 %
No.4	171 m	95	23	24 %
No.5	161 m	111	85	77 %
No.7	187 m	62	23	37 %
No.8	154 m	39	5	13 %
No.9	162 m	62	52	84 %
No.10	184 m	56	37	66 %
No.11	166 m	106	69	65 %
No.12	165 m	113	4	4 %
No.13	157 m	104	84	81 %
No.14	163 m	87	72	83 %

Berth/ Wharf	Allowable LOA.	Number of Calling Ships	Ships with Longer LOA than Designed LOA	Ratio
No.16	160 m	108	101	94 %
No.17	165 m	103	100	97 %
No.18	215 m	116	36	31 %
No.19	216 m	2	-	-
Total		1,433	928	65 %

Source: KPA and the Project Team

4.3.4 Low productivity

Productivities of major cargo in 2014 are summarized in Table 4.3.4. Motorcars are unloaded mainly at Berth No.1. There is no designated large parking area in Mombasa Port; unloaded vehicles park temporarily at various and scattered places in the port. If a large parking area were established for motorcars, productivity would become twice or three times the current level. Steel is handled by ship gear cranes and trucks in a narrow space because vacant transit sheds are located close to the quay-wall. If a wider space were provided for steel handling, productivity could be dramatically improved.

Bulk wheat is unloaded at Berth No.3 where GBHL's unloaders are located in. Long waiting time for berthing takes place at Berth No.3 due to the low capacity of existing equipment.Bulk clinker is unloaded mainly at Berth No.10. Productivity at Mbaraki Wharf is low due to the decrepit structure of the jetty and old cargo handling equipment. Bulk fertilizer is unloaded at Berth No.7 and 9. Additional processing of fertilizer, namely packing, is conducted on the apron. Apron is not a space for processing. If another place for storing and processing were to be acquired, productivity at quay-side could be dramatically improved.

Table 4.3.4 Productivity of Major Cargo in 2014

Commodity	Range of Productivity at Each Berth (ton/day)	Average Productivity (ton/day)
Motorcars	2,600-3,800	3,000
Steel	3,500-4,900	4,000
Container	900,000 TEU/year at Existing Container Terminals	
Bulk Wheat	7,600	7,500
Bulk Clinker	5,900-10,300	10,000
Bulk Fertilizer	2,000-2500	2,500
Bulk Coal	5,400-7,500	6,500
Other Liquid Bulk	3,600-14,700	9,000

Source: SAPROF Review Report, KPA and the Project Team

4.3.5 Capacity saturation with cargo demand

Table 4.3.5 shows the number of required berths in 2013, namely 17 berths. There are officially 18 berths/wharfs in Mombasa Port but that number is misleading as the berths cannot be used effectively due to their inadequate length. Cargo volume has been reaching the port capacity.

Table 4.3.5 Number of Mooring Facilities Required in 2013

	Productivity	2013	
	(1,000 ton/berth/year)	Volume (1,000 ton)	Required Berths
Motor Vehicle	740	366	**0.49**
Steel	1,100	1,192	**1.08**
Other General Cargo	210	1,379	**6.57**
Container	1,390	7,777	**5.59**
Total (General)		10,714	**13.74**

	Productivity	2013	
	(1,000 ton/berth/year)	Volume (1,000 ton)	Required Berths
Bulk Wheat	2,070	1,401	**0.68**
Bulk Clinker	2,620	2,228	**0.85**
Bulk fertilizer	690	603	**0.87**
Bulk Coal	1,700	296	**0.17**
Other Bulk Cargo	1,310	450	**0.34**
Total (Dry Bulk)		4,978	**2.91**
Other Liquid Bulk	2,480	900	**0.36**
Total		16,592	**17.01**

Note: Productivities except container are for existing ordinary berths with180 m length and -10m depth.
Source: KPA and the Project Team

5. Cargo Demand Forecast

Results of Demand Forecast for import, export and transit cargoes including container cargoes are shown below, based on the demand forecast model.

Table 4.3.1 Demand Forecast for Imported Cargoes

(x1,000 tons)

	2014	SAPROF Review 2013				Updated Demand Forecast/Year 2014 Base				
		2015	2020	2025	2030	2015	2020	2025	2030	2035
Iron & Steel	1,367	1,259	1,935	2,684	3,461	1,357	2,067	2,853	3,668	4,397
Rice	651	326	313	210	141	331	316	262	145	0
Sugar	231	427	551	681	819	435	558	688	826	973
Chemicals & Insecticides	390	222	222	222	222	260	260	260	260	260
Plastic	662	330	330	330	330	399	399	399	399	399
M/Vehicle & Lorries	463	529	840	1,184	1,541	487	742	1,025	1,318	1,580
Paper & Paper Products	503	565	905	1,281	1,671	431	645	881	1,127	1,346
Cereal Flour	49	121	121	121	121	75	75	75	75	75
Fertilizer	102	73	73	73	73	81	81	81	81	81
Maize in Bags	37	31	31	31	31	31	31	31	31	31
Wheat in Bags	9	7	7	7	7	9	9	9	9	9
Others	4,649	6,624	10,339	14,454	18,721	6,075	9,152	12,560	16,095	19,256
Total General Cargo	**9,113**	**10,514**	**15,667**	**21,278**	**27,138**	**9,971**	**14,335**	**19,124**	**24,034**	**28,407**
Wheat in Bulk	1,908	2,336	3,380	4,537	5,737	1,981	3,088	4,497	6,203	8,063
Clinker	2,065	3,019	5,184	7,583	10,071	2,690	4,436	6,370	8,375	10,169
Fertilizer in Bulk	360	341	341	341	341	579	579	579	829	829
Coal	436	326	361	396	431	396	582	788	1,001	1,192
Other Cereals in Bulk	184	110	110	110	110	106	106	106	106	106
Maize in Bulk	0	414	414	414	414	485	492	471	466	564
Others	278	362	504	646	788	306	459	629	805	962
Total Dry Bulk	**5,231**	**6,908**	**10,294**	**14,027**	**17,892**	**6,543**	**9,742**	**13,440**	**17,785**	**21,885**
P.O.L.	6,286	7,425	10,048	12,953	15,966	6,757	8,654	10,755	12,933	14,882
Other Liquid Bulk	906	1,043	1,438	1,876	2,330	995	1,324	1,688	2,065	2,403
Total Liquid Bulk	**7,192**	**8,468**	**11,486**	**14,829**	**18,296**	**7,752**	**9,978**	**12,443**	**14,998**	**17,285**
Grand Total	**21,536**	**25,890**	**37,447**	**50,134**	**63,326**	**24,266**	**34,055**	**45,007**	**56,817**	**67,577**

Table 4.3.2 Demand Forecast for Exported Cargoes

(x1,000 tons)

	2014	SAPROF Review 2013				Updated Demand Forecast/Year 2014 Base				
		2015	2020	2025	2030	2015	2020	2025	2030	2035
Tea	554	469	513	558	603	522	605	698	811	912
Soda Ash	336	530	746	962	1,178	355	465	588	737	870
Coffee	256	260	293	326	359	265	313	368	434	493
Others	851	1,183	1,800	2,477	3,178	965	1,269	1,608	2,022	2,391
Total General Cargo	**1,997**	**2,442**	**3,352**	**4,323**	**5,318**	**2,107**	**2,652**	**3,262**	**4,004**	**4,666**
Titanium	363	0	0	0	0	450	450	450	450	450
Soda Ash in Bulk	0	29	29	29	29					
Cement in Bulk	0	2	2	2	2					
Flourspar	59	70	70	70	70					
Other Dry Bulk	0	11	11	11	11	84	84	84	84	84
Total Dry Bulk	**422**	**112**	**112**	**112**	**112**	**534**	**534**	**534**	**534**	**534**
Bulk Oil	19	92	92	92	92					
Bunkers	26	62	62	62	62					
Total Liquid Bulk	**45**	**154**	**154**	**154**	**154**	**112**	**112**	**112**	**112**	**112**
Grand Total	**2,464**	**2,708**	**3,618**	**4,589**	**5,584**	**2,753**	**3,298**	**3,908**	**4,650**	**5,312**

Table 4.3.3 Demand Forecast for Container Cargoes

(x1,000 TEU)

	2014	SAPROF Review 2013				Updated Demand Forecast/Year 2014 Base				
		2015	2020	2025	2030	2015	2020	2025	2030	2035
Import										
Full	482	580	894	1,250	1,628	551	826	1,140	1,473	1,780
Empty	7	18	28	39	51	17	27	38	50	62
Subtotal	**489**	**598**	**921**	**1,289**	**1,678**	**568**	**853**	**1,178**	**1,523**	**1,842**
Export										
Full	131	160	222	290	362	145	183	226	279	326
Empty	332	438	700	998	1,317	424	670	952	1,244	1,517
Subtotal	**463**	**598**	**921**	**1,289**	**1,678**	**568**	**853**	**1,178**	**1,523**	**1,842**
Transshipment										
Full	53	11	22	36	54	11	22	36	54	66
Empty	8	7	13	21	31	7	13	21	31	38
Subtotal	**61**	**18**	**35**	**57**	**85**	**18**	**35**	**57**	**85**	**105**
Total	**1,012**	**1,214**	**1,878**	**2,634**	**3,442**	**1,154**	**1,741**	**2,412**	**3,131**	**3,789**

Note: Future container cargo volumes are forecasted tentatively by regression analysis, based on the relation between GDP and container numbers (TEU).

6. Passenger Demand Forecast

Figure 4.3.1 shows the estimation of cruise ship arrivals/departure in the target years. The average cruise ship size is assumed to increase depend on the scale for the numbers of passengers.

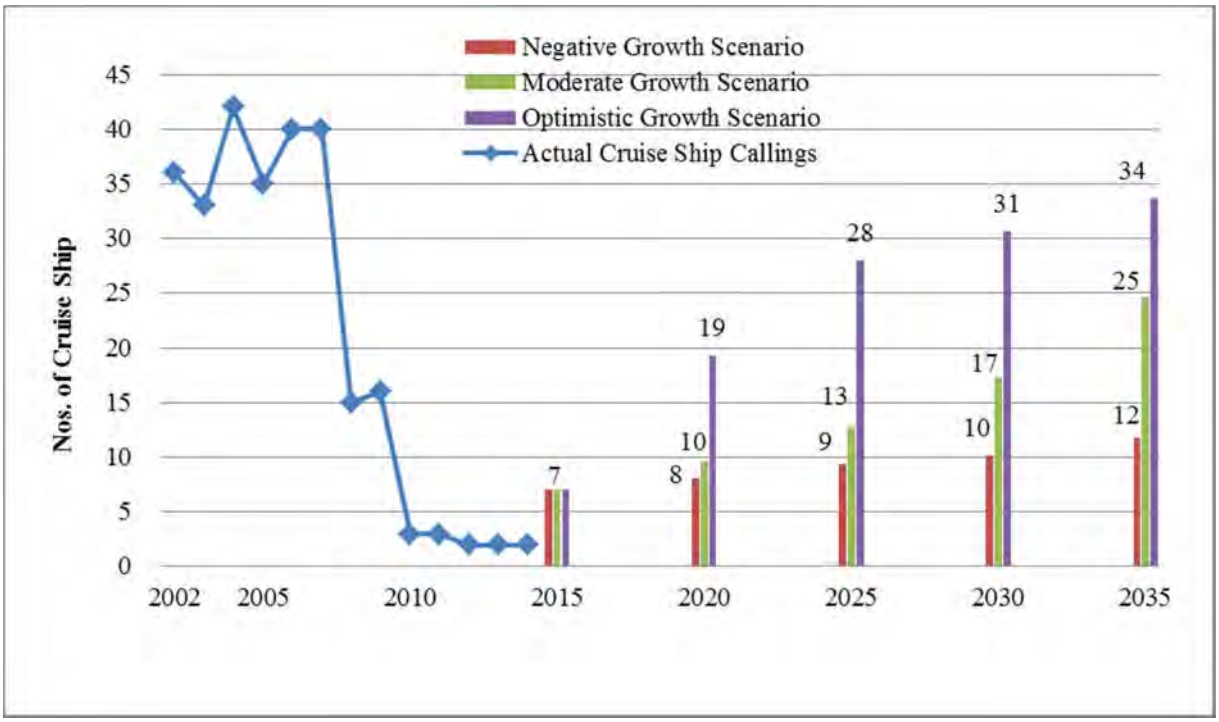


Figure 4.3.1 Forecast of Cruise Ship Callings
Source: JICA Study Team

7. Future Trends of Calling Ships

ship sizes calling at Mombasa port in the future are forecasted by vessel types as shown in Table 4.3.1.

Table 4.3.1 Future Trend of Calling Ships

Vessel type	DWT (Max)	Load (TEU/ton)	LOA (m)	Beam (m)	Draft (m)
Container	60,000	4,300-5,400	275/285	37.2/40.0	12.7/13.8
General cargo	18,000	18,000	156	22.4	9.8
Car carrier	30,000	8,000 units	228	32.3	11.3
Bulk carrier	70,000	70,000	233	32.3	13.0
Tanker	100,000	100,000	250	42.7	14.8

Source: Prepared by the Study Team based on data of "Technical Standard and Commentaries for Port and Harbour Facilities in Japan" in 2009 by OCDI

Following points merit attention:

- Container ship: The size of container ships calling at Mombasa port is expected to increase in line with the world trend. Once the container terminal having a water depth of -15 m in the Mombasa Port Development Project Phase 1 is completed, 60,000 DWT container ships (post-panamax type) will be able to call the port at full draft,
- Car carrier: If the Dongo Kundu Freeport Project is realized and the terminal has a sufficient water depth (more than -12.5 m) and berth length (at least 250 m), car carriers having a loading capacity of 8,000 units will be able to call the port at full draft,
- Bulk carrier: If the Dongo Kundu Freeport Project is realized and the terminal has a sufficient water depth (more than -15.0 m) and berth length (at least 250 m), 70,000 DWT bulk carriers (panamax type) will be able to call the port at full draft,
- The sizes of general cargo vessels and tankers will remain unchanged because the volume of general cargo is expected to increase only marginally while tankers are already sufficiently large given the current volumes.

8. Development Plan

8.1 Basic stance on facility planning

Although the total volume of cargo handled at the port has duplicated over the past decade, various issues in cargo handling are witnessed in the port including absolute shortage of mooring facilities, inadequate staking area, extraordinarily high berth occupancy ratio and mismatch between the length of existing berths and LOA of calling vessels of which dimension has been enlarging. Cargo handling capacity of the port has been saturated with the cargo demand already. Consequently, long waiting time for berthing due to berth occupied by another ship and low productivity in cargo handling take place. Capacity development is an urgent issue to be tackled.

Mombasa Port has various advantages in maritime transport, namely long history as an international port, an international gateway function referred by Kenya and other landlocked countries and plenty of direct hinterland which could be developed as industrial area. Mombasa Port shall be developed taking these advantages into consideration.

In this context, facility planning is conducted based on the following stances and two scenarios.

- To develop Mombasa Port in the most effective and efficient manner utilizing existing resources and potential of the port.
- To maximize cargo handling capacity of the port. Overflowing cargo will be handled in another international port including Lamu Port.
- To develop required mooring and other facilities in a timely manner. These required facilities include terminals for MPDP, Dongo Kundu SEZ Project and other necessary projects.
- To renew existing berths in Kilindini in series. Passenger facilities including a berth and terminal will be developed.
- To introduce more efficient cargo handling equipment to cope with the critical shortage of berths.

8.1.1 Scenario 1

Major characteristics of scenario 1 are as follows;

- Amount of Investment is minimized.
- New berths at Dongo Kundu are deep-water multi-purpose terminals for rapidly increasing commodities including vehicle, wheat and container.
- Other bulk cargo including clinker and coal are handled at existing berths.
- Cargo handling productivities are to increase. Since the productivities of vehicle and grain at deep-water terminal in Japan are three (3) to four (4) times of that in Mombasa Port, productivities at deep-water terminal in Dongo Kundu could be assumed to be three (3) to four (4) times of current productivites at existing terminals.
- Ship waiting time for berthing remains at current level.
- Cargo handling capacity may be saturated with cargo demand at a certain year

8.1.2 Scenario 2

Major characteristics of scenario 2 are as follows;

- Amount of Investment is more than Scenario 1
- New berths at Dongo Kundu are deep-water multi-purpose terminals for rapidly increasing commodities including vehicle, wheat, container, clinker and coal. A terminal for clinker and coal will commence operation in 2026.
- Other bulk cargo is handled at existing berths.
- Cargo handling productivities are to increase. Since the productivities of vehicle and grain at deep-water terminal in Japan are three (3) to four (4) times of that in Mombasa Port, productivities at deep-water terminal in Dongo Kundu could be assumed to be three (3) to

four (4) times of current productivites at existing terminals.

- Ship waiting time for berthing remains at current level.
- Cargo handling capacity may be saturated with cargo demand at a certain year

In order to rationalize spatial utilization in the port, two types of long-term spatial utilization plans are prepared. One is on line with current spatial utilization and the other is modified plan to relocation some kinds of bulk cargo from existing area to Dongo Kundu Area. Figure 8.1.1 shows the former and Figure 8.1.2 shows the latter.

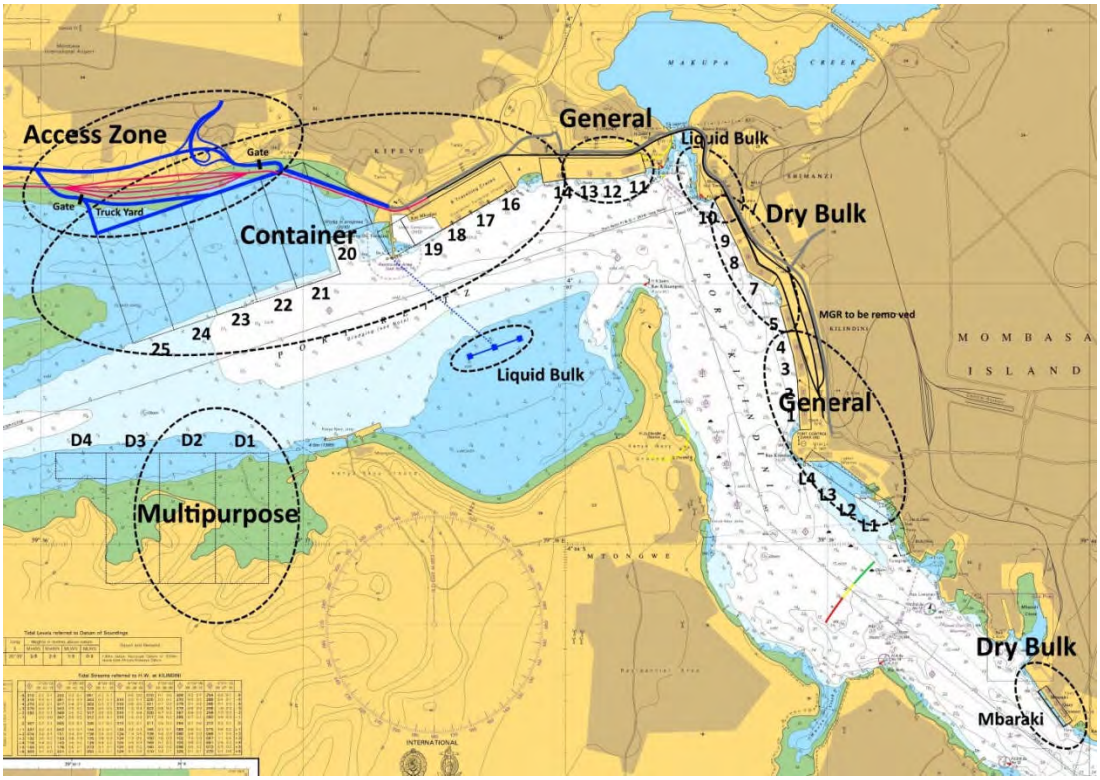


Figure 8.1.1 Spatial Utilization Plan (Base Case (Scenario 1))
Source: The Project Team

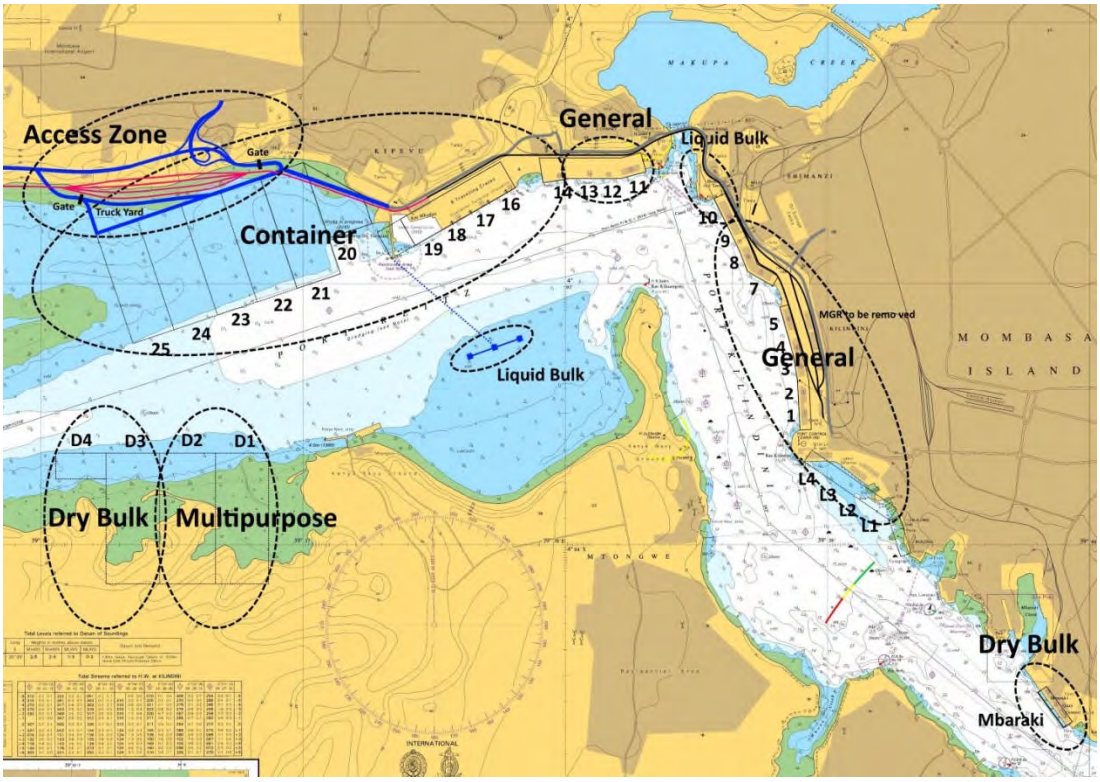


Figure 8.1.2 Spatial Utilization Plan (Alternative (Scenario 2))
Source: The Project Team

8.2 Facility Development Plan and Improvement Plan

8.2.1 Up to 2020

Figure 8.2.1 shows the development plan up to 2020.

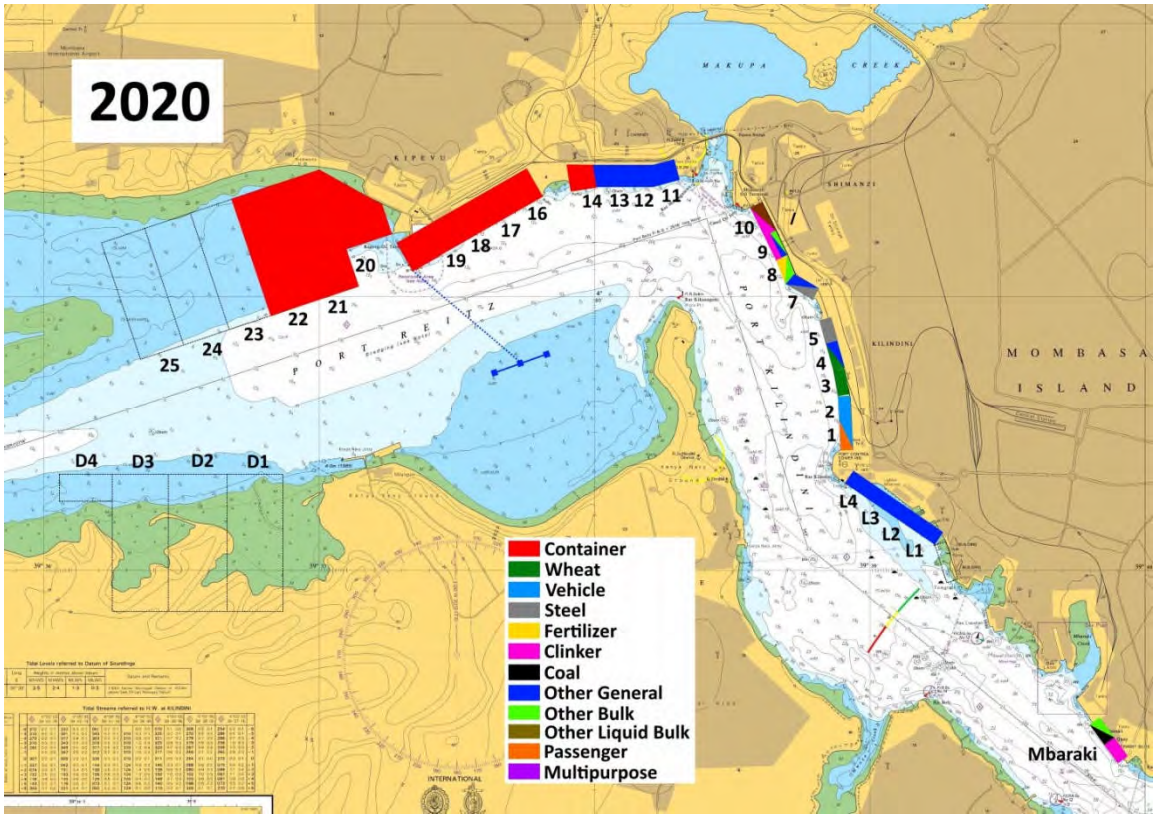


Figure 8.2.1 Development Plan up to 2020
Source: The Project Team

8.2.2 2021-2025

Figure 8.2.2 and Figure 8.2.3 show the development plan in 2021 to 2025.

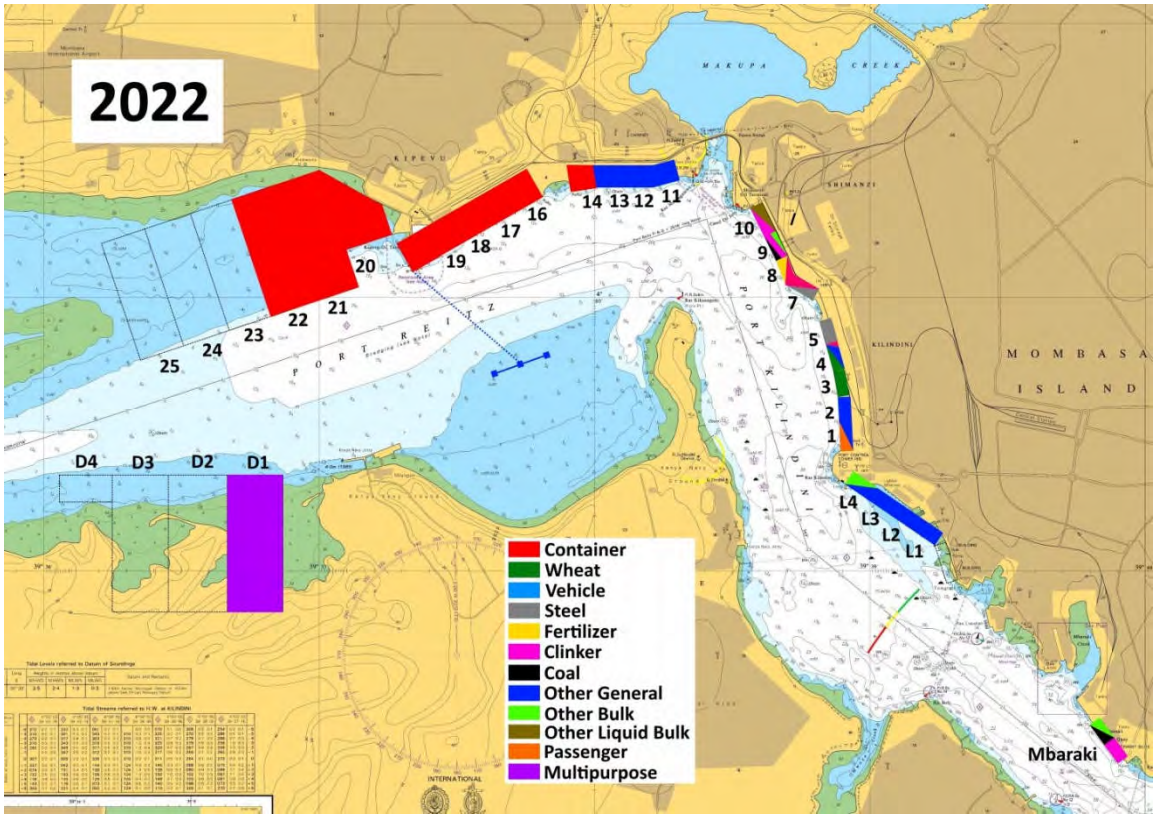


Figure 8.2.2 Development Plan in 2021 to 2025 (1)
Source: The Project Team

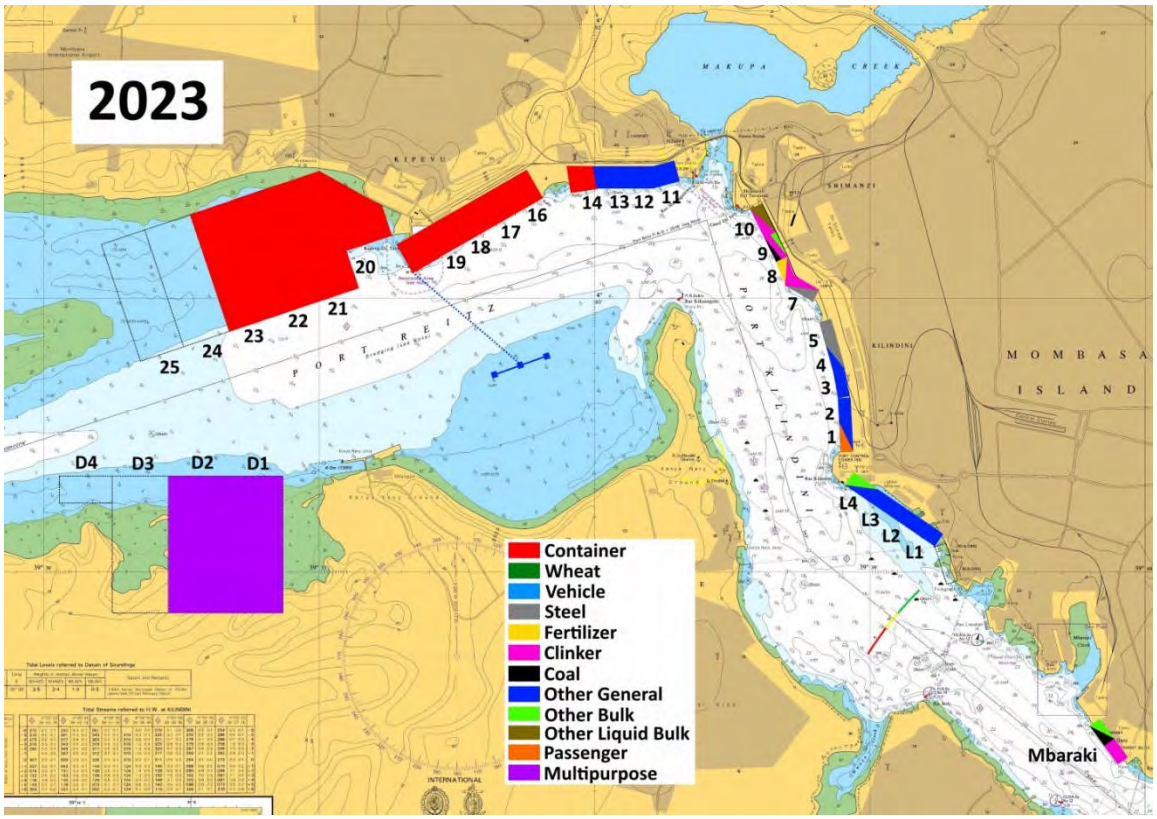


Figure 8.2.3 Development Plan in 2021 to 2025 (2)
Source: The Project Team

8.2.3 2026-2030

(1) Base Case (Scenario 1)

Figure 8.2.4 shows the development plan in 2026 to 2030.

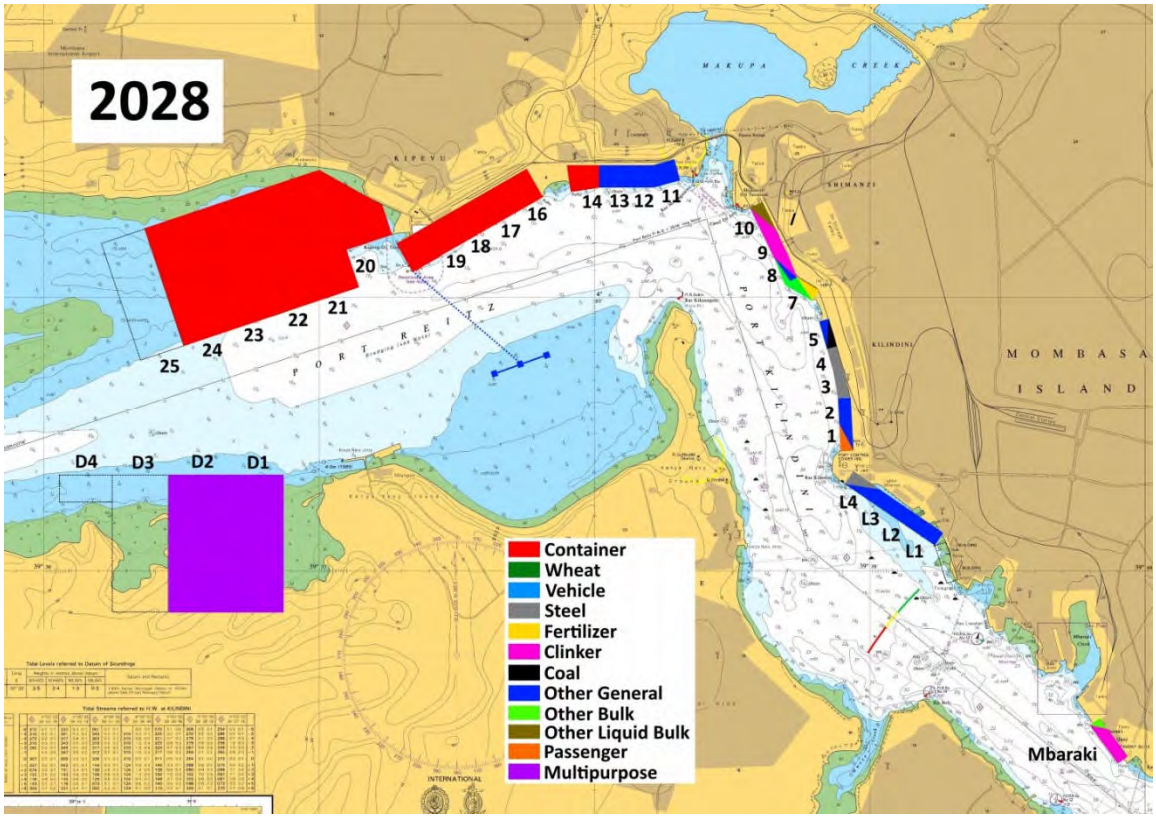


Figure 8.2.4 Development Plan in 2028 (Base Case (Scenario 1)
Source: The Project Team

(2) Alternative (Scenario 2)

Figure 8.2.5 and Figure 8.2.6 show the development plan in 2026 to 2030.

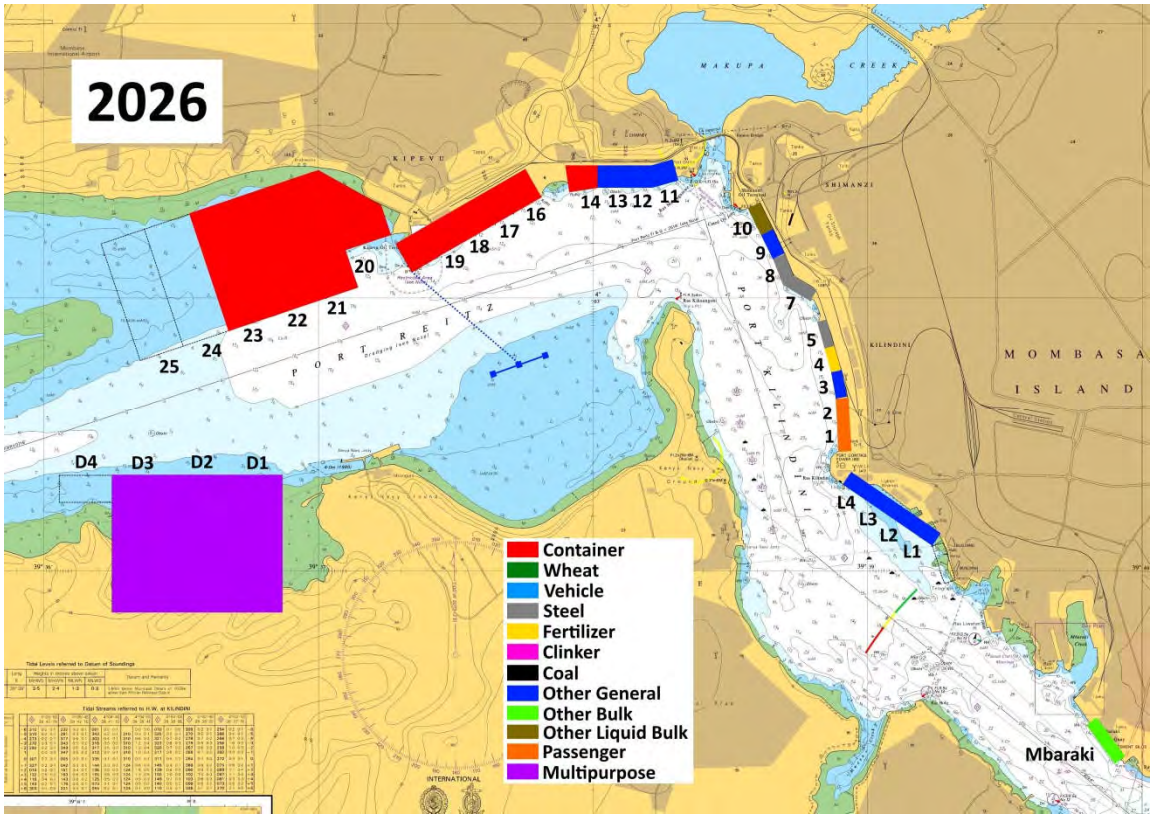


Figure 8.2.5 Development Plan in 2026 and 2028 (Alternative (Scenario 2) (1)
Source: The Project Team

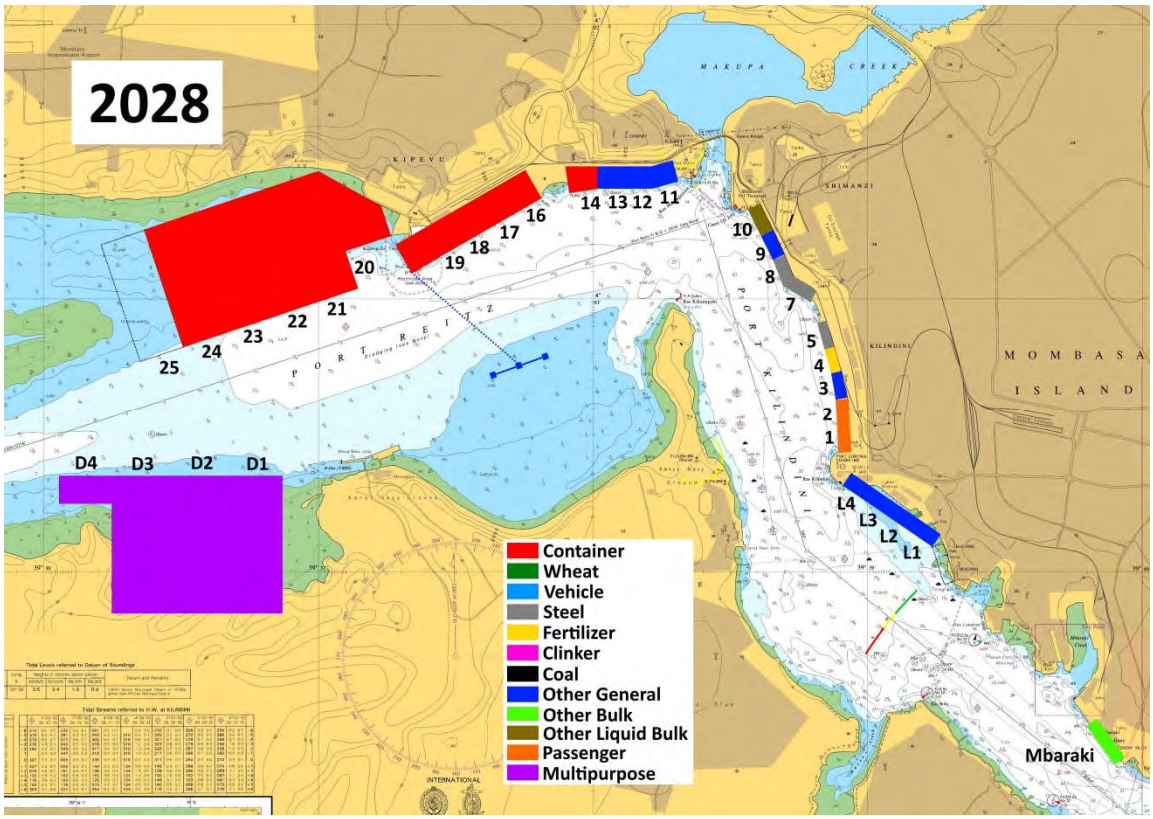


Figure 8.2.6 Development Plan in 2026 and 2028 (Alternative (Scenario 2) (2)
Source: The Project Team

8.2.4 2031-2035

(1) Base Case (Scenario 1)

Figure 8.2.7 shows the development plan in 2026 to 2030.

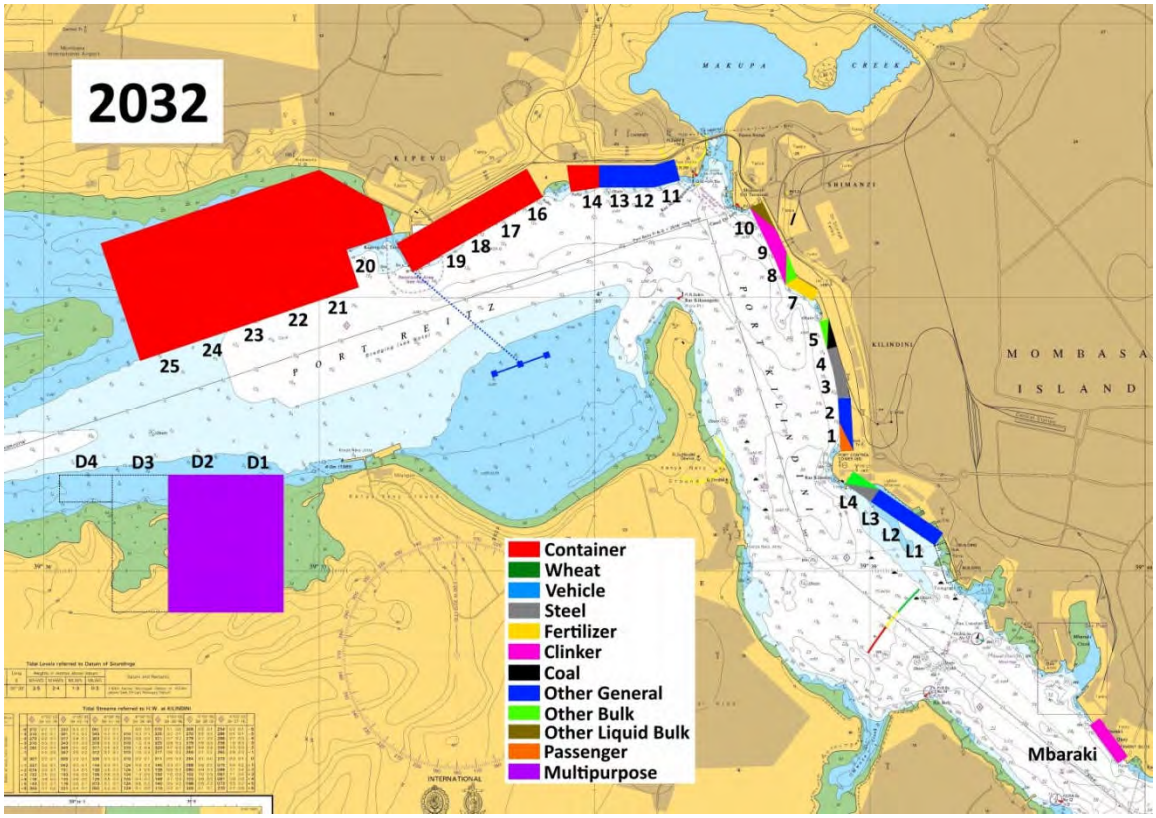


Figure 8.2.7 Development Plan in 2032 (Base Case (Scenario 1)
Source: The Project Team

(2) Alternative (Scenario 2)

Figure 8.2.8 shows the development plan in 2026 to 2030.

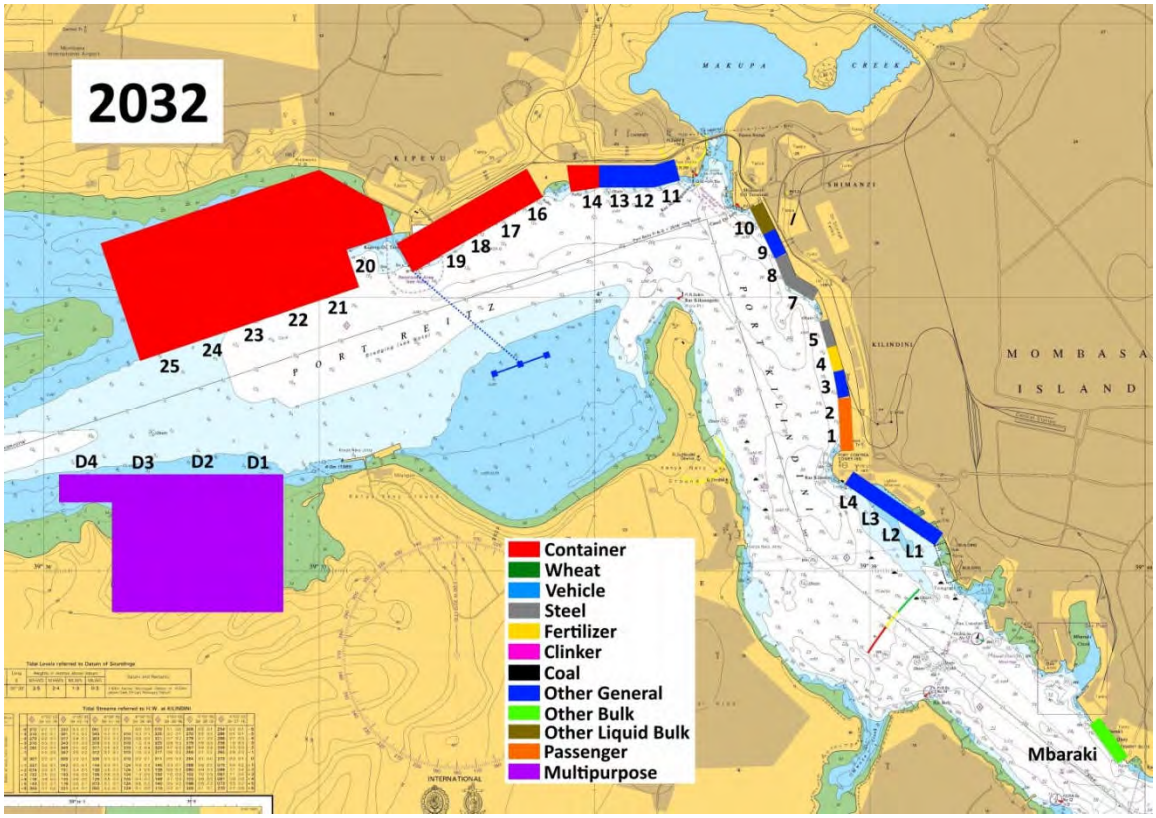


Figure 8.2.8 Development Plan in 2032 (Alternative (Scenario 2)
Source: The Project Team

9. Implementation of Port Development

9.1 Cost

The construction of civil and building works and procurement of equipment for the Mombasa Port development including the Dongo Kundu area have been estimated as below.

- General Requirement (Mobilization/Demobilization, Preparation)
- Dredging
- Reclamation
- Revetments
- Berths (Container, General Cargo, Bulk)
- Soil Improvement
- Pavement
- Utility Works
- Building Works
- Cargo Handling Equipment

Cost estimates for 2 cases namely, Base case and Alternative case, has been established a shown below. However, the costs for construction and equipment procurement are in a preliminary stage and more detailed cost estimation should be conducted in the succeeding feasibility study stage.

Table 9.1.1 Summary of Project Costs (Base Case) (1/2)

Year	Cargo	Dimension	Location	Berths	Remarks	Stage	Costs (US$1Million)
to 2020	Container	210m x -10m	Reitz	20	Yen Loan Phase 1	Construction	-
	Container	300m x -15m	Reitz	21		Construction	-
	Container	300m x -15m	Reitz	22	Yen Loan Phase 2	Design (DD)	4.5
						Tender (TD)	1.0
						Supervision (CS)	6.0
						Construction (CO)	138.0
						Equipment (EQ)	24.0
	Other General	180m x -10m	Lighter Area	4		DD, TD, CS, CO	80.0
2021 to 2025	Container	300m x -15m	Reitz	23		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	150.2
						Equipment (EQ)	48.0
	Various (Multi-purpose)	300m x -14m	Dongo Kundu	D1		Design (DD)	5.5
						Tender (TD)	0.5
						Supervision (CS)	8.0
						Construction (CO)	168.7
	Various (Multi-purpose)	300m x -14m	Dongo Kundu	D2		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	121.3
						Equipment (EQ)	24.0
2026 to 2030	Container	300m x -15m	Reitz	24		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	150.6
						Equipment (EQ)	48.0
2031 to 2035	Container	300m x -15m	Reitz	25		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	163.3
						Equipment (EQ)	48.0
	Passenger	370m x -11m	Lighter Area	1		DD, TD, CS, CO	75.0
TOTAL							1,322.6

Source: JICA Team

Table 9.1.2 Summary of Project Costs (Base Case) (2/2)

Year	Cargo	Location	Improvement Work	Costs (US$1Million)
to 2020	Bulk	Mbaraki	*Structural Improvement of Jetty to Increase Productivity	20.0
			*Introduction of Additional Unloaders	10.0
	Container	Berth No. 19	*Extension of Quay-wall Length (200m) (Relocation of existing oil jetty should be done at first.)	100.0
			*Introduction of New STS Gantry Cranes and Other Equipment	24.0
	Various Cargo	Berth No. 11 to 14	*Deepening Quay-wall Depth (-10m to -12m) (4 Berths to 3 berths) *Renewal of Quay-wall and Pavement	120.0
2021 to 2025	Oil	Offshore	Relocation of KOT	152.0
	Vehicle/Steel/ Other General Cargo	Berth No. 1, 2, 4, 5, 7, 8, 9, 11, 12 and 13	*Introduction of Additional Unloaders to Increase Productivity	30.0
	Wheat, Clinker, Coal, and Other bulk cargo	Berth No. 3, 4, 8, 9 and 10	*Introduction of Additional Unloader to Increase Productivity	30.0
2020 to 2035	Various Cargo	Berth No. 1 to 10	*Renewal of Quay-wall and Pavement (Urgent)	180.0
		Berth No. 16 to 18	*Rehabilitation of Quay-wall and Pavement	30.0
TOTAL				696.0

Source: JICA Team

Table 9.1.3 Summary of Project Costs (Alternative Case) (1/2)

Year	Cargo	Dimension	Location	Berths	Remarks	Stage	Costs (US$1Million)
to 2020	Container	210m x -10m	Reitz	20	Yen Loan Phase 1	Construction	-
	Container	300m x -15m	Reitz	21		Construction	-
	Container	300m x -15m	Reitz	22	Yen Loan Phase 2	Design (DD)	4.5
						Tender (TD)	1.0
						Supervision (CS)	6.0
						Construction (CO)	138.0
						Equipment (EQ)	24.0
	Other General	180m x -10m	Lighter Area	4		DD, TD, CS, CO	80.0
2021 to 2025	Container	300m x -15m	Reitz	23		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	150.2
						Equipment (EQ)	48.0
	Various (Multi-purpose)	300m x -14m	Dongo Kundu	D1		Design (DD)	5.5
						Tender (TD)	0.5
						Supervision (CS)	8.0
						Construction (CO)	168.7
	Various (Multi-purpose)	300m x -14m	Dongo Kundu	D2		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	168.7
						Equipment (EQ)	24.0
	Various (Multi-purpose)	300m x -14m	Dongo Kundu	D3		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	121.3
						Equipment (EQ)	24.0
2026 to 2030	Various (Multi-purpose)	300m x -14m	Dongo Kundu	D4		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	6.0
						Construction (CO)	78.4
						Equipment (EQ)	24.0
	Container	300m x -15m	Reitz	24		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	150.6
						Equipment (EQ)	48.0
2031 to 2035	Container	300m x -15m	Reitz	25		Design (DD)	5.5
						Tender (TD)	1.0
						Supervision (CS)	8.0
						Construction (CO)	163.3
						Equipment (EQ)	48.0
	Passenger	370m x -11m	Lighter Area	1		DD, TD, CS, CO	75.0
TOTAL							1,644.7

Source: JICA Team

Table 9.1.4 Summary of Project Costs (Alternative Case) (2/2)

Year	Cargo	Location	Improvement Work	Costs (US$1Million)
to 2020	Bulk	Mbaraki	*Structural Improvement of Jetty to Increase Productivity	20.0
			*Introduction of Additional Unloaders	10.0
	Container	Berth No. 19	*Extension of Quay-wall Length (200m) (Relocation of existing oil jetty should be done at first.)	100.0
			*Introduction of New STS Gantry Cranes and Other Equipment	24.0
	Various Cargo	Berth No. 11 to 14	*Deepening Quay-wall Depth (-10m to -12m) (4 Berths to 3 berths) *Renewal of Quay-wall and Pavement	120.0
2021 to 2025	Oil	Offshore	Relocation of KOT	152.0
	Vehicle/Steel/ Other General Cargo	Berth No. 1, 2, 4, 5, 7, 8, 9, 11, 12 and 13	*Introduction of Additional Unloaders to Increase Productivity	30.0
	Wheat, Clinker, Coal, and Other bulk cargo	Berth No. 3, 4, 8, 9 and 10	*Introduction of Additional Unloader to Increase Productivity	30.0
2020 to 2035	Various Cargo	Berth No. 1 to 10	*Renewal of Quay-wall and Pavement (Urgent)	180.0
		Berth No. 16 to 18	*Rehabilitation of Quay-wall and Pavement	30.0
TOTAL				696.0

Source: JICA Team

9.2 Schedule

Preliminary project implementation schedules for 2 cases are presented in Table 9.2.1, Table 9.2.2, Table 9.2.3 and Table 9.2.4.

Table 9.2.1 Preliminary Project Implementation Schedule (Base Case) (1/2)

Year	Cargo	Dimension	Location	Berths	Stage	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
to 2020	Container	210m x -10m	Reitz	20	Construction																					
	Container	300m x -15m	Reitz	21	Construction																					
	Container	300m x -15m	Reitz	22	Design (DD)																					
					Tender (TD)																					
					Supervision (CS)																					
					Construction (CO)																					
					Equipment (EQ)																					
	Other General	180m x -10m	Lighter Area	4	DD, TD, CS, CO																					
2021 to 2025	Container	300m x -15m	Reitz	23	Design (DD)																					
					Tender (TD)																					
					Supervision (CS)																					
					Construction (CO)																					
					Equipment (EQ)																					
	Multi-purpose	300m x -14m	Dongo Kundu	D1	Design (DD)																					
					Tender (TD)																					
					Supervision (CS)																					
					Construction (CO)																					
	Multi-purpose	300m x -14 m	Dongo Kundu	D2	Design (DD)																					
					Tender (TD)																					
					Supervision (CS)																					
					Construction (CO)																					
					Equipment (EQ)																					
2026 to 2030	Container	300m x -15m	Reitz	24	Design (DD)																					
					Tender (TD)																					
					Supervision (CS)																					
					Construction (CO)																					
					Equipment (EQ)																					
2031 to 2035	Container	300m x -15m	Reitz	25	Design (DD)																					
					Tender (TD)																					
					Supervision (CS)																					
					Construction (CO)																					
					Equipment (EQ)																					
	Passenger	370m x -11m	Lighter Area	1	DD, TD, CS, CO																					

Source: JICA Team

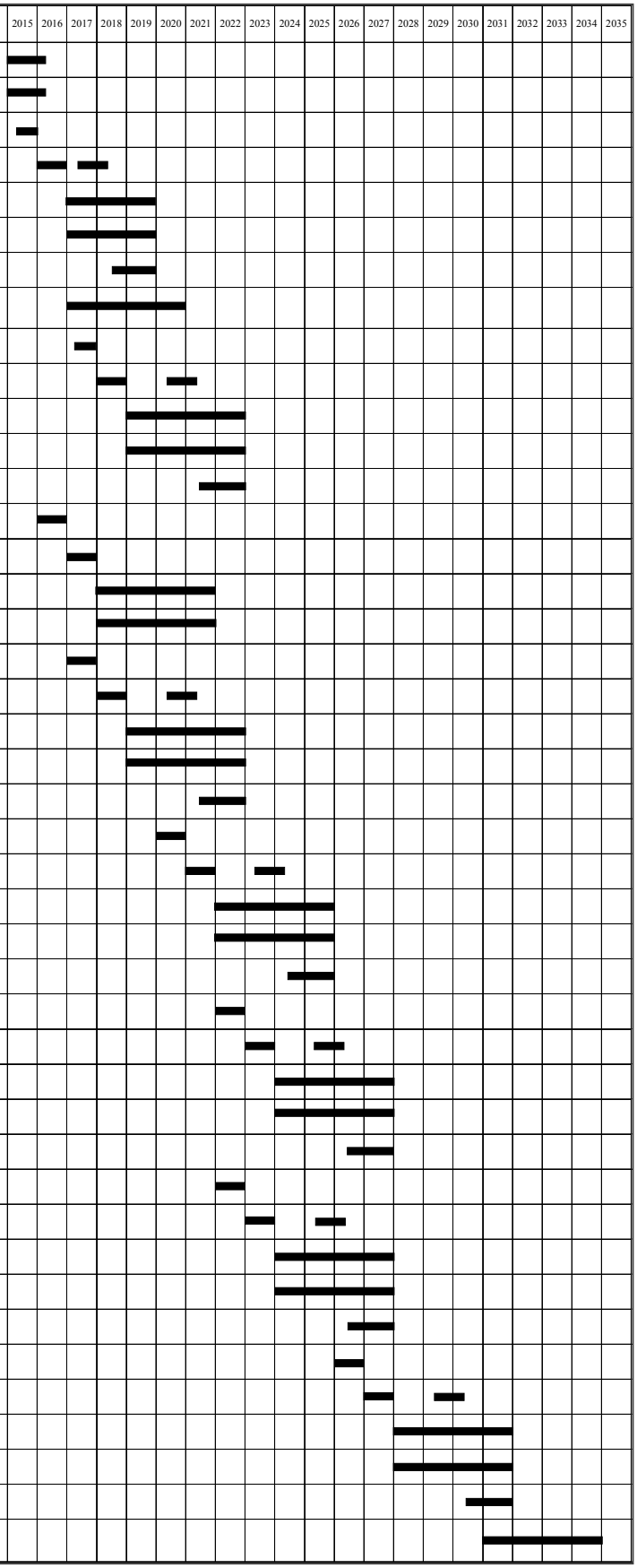
Table 9.2.2 Preliminary Project Implementation Schedule (Base Case) (2/2)

Year	Cargo	Location	Improvement Work	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
to 2020	Bulk	Mbaraki	*Structural Improvement of Jetty to Increase Productivity			■	■	■	■															
			*Introduction of Additional Unloaders				■	■																
	Container	Berth No. 19	*Extension of Quay-wall Length (200m) (Relocation of existing oil jetty should be done at first.)		■	■	■	■	■															
			*Introduction of New STS Gantry Cranes and Other Equipment					■	■															
	Various Cargo	Berth No.11 to 14	*Deepening Quay-wall Depth (-10m to -12m) (4 Berths to 3 berths) *Renewal of Quay-wall and Pavement		■	■	■	■	■															
2021 to 2025	Oil	KOT	Relocation of KOT			■	■	■	■	■														
	Vehicle/Steel/ Other General Cargo	Berth No. 1, 2, 4, 5, 7, 8, 9, 11, 12 and 13	*Introduction of Additional Unloaders to Increase Productivity							■	■	■	■	■										
	Wheat, Clinker, Coal, and	Berth No. 3, 4, 8, 9 and 10	*Introduction of Additional Unloader to Increase Productivity							■	■	■	■	■										
2020 to 2035	Various Cargo	Berth No. 1 to 10	*Renewal of Quay-wall and Pavement (Urgent)						■	■	■	■	■	■										
		Berth No. 16 to 18	*Rehabilitation of Quay-wall and Pavement																				■	■

Source: JICA Team

Table 9.2.3 Preliminary Project Implementation Schedule (Alternative Case) (1/2)

Year	Cargo	Dimension	Location	Berths	Stage
to 2020	Container	210m x -10m	Reitz	20	Construction
	Container	300m x -15m	Reitz	21	Construction
	Container	300m x -15m	Reitz	22	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
					Equipment (EQ)
	Other General	180m x -10m	Lighter Area	4	DD, TD, CS, CO
2021 to 2025	Container	300m x -15m	Reitz	23	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
					Equipment (EQ)
	Multi-purpose	300m x -14m	Dongo Kundu	D1	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
	Multi-purpose	300m x -14 m	Dongo Kundu	D2	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
					Equipment (EQ)
	Multi-purpose	300m x -14 m	Dongo Kundu	D3	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
					Equipment (EQ)
2026 to 2030	Multi-purpose	300m x -14 m	Dongo Kundu	D4	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
					Equipment (EQ)
	Container	300m x -15m	Reitz	24	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
					Equipment (EQ)
2031 to 2035	Container	300m x -15m	Reitz	25	Design (DD)
					Tender (TD)
					Supervision (CS)
					Construction (CO)
					Equipment (EQ)
	Passenger	370m x -11m	Lighter Area	1	DD, TD, CS, CO



Source: JICA Team

Table 9.2.4 Preliminary Project Implementation Schedule (Alternative Case) (2/2)

Year	Cargo	Location	Improvement Work	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
to 2020	Bulk	Mbaraki	*Structural Improvement of Jetty to Increase Productivity			■	■	■	■															
			*Introduction of Additional Unloaders				■	■																
	Container	Berth No. 19	*Extension of Quay-wall Length (200m) (Relocation of existing oil jetty should be done at first.)		■	■	■	■	■															
			*Introduction of New STS Gantry Cranes and Other Equipment					■	■															
	Various Cargo	Berth No.11 to 14	*Deepening Quay-wall Depth (-10m to -12m) (4 Berths to 3 berths) *Renewal of Quay-wall and Pavement		■	■	■	■	■															
2021 to 2025	Oil	KOT	Relocation of KOT			■	■	■	■	■														
	Vehicle/Steel/ Other General Cargo	Berth No. 1, 2, 4, 5, 7, 8, 9, 11, 12 and 13	*Introduction of Additional Unloaders to Increase Productivity							■	■	■	■	■										
	Wheat, Clinker, Coal, and	Berth No. 3, 4, 8, 9 and 10	*Introduction of Additional Unloader to Increase Productivity							■	■	■	■	■										
2020 to 2035	Various Cargo	Berth No. 1 to 10	*Renewal of Quay-wall and Pavement (Urgent)						■	■	■	■	■	■										
		Berth No. 16 to 18	*Rehabilitation of Quay-wall and Pavement																				■	

Source: JICA Team

9.3 Economic analysis

In order to examine whether or not the project is still feasible when any condition changes, a sensitivity analysis is made for the following 3 alternatives.

- Case A: The costs increase by 10%
- Case B: The benefits decrease by 10%
- Case C: Both Case A and B occur simultaneously.

The result of the sensitivity by the base case and the alternative case is shown in Table 9.3.1 with the NPV (Net Present Value), B/C ratio and EIRR.

Table 9.3.1 Sensitivity Analysis

Base Case (New 11 berths and other improvement works on existing facilities)			
Case	NPV (1,000 US$)	B/C Ratio	EIRR
Base Case	851,515	1.55	18.5%
Case A	697,408	1.41	17.0%
Case B	612,257	1.40	16.9%
Case C	458,150	1.27	15.4%
Alternative Case (New 13 berths and other improvement works on existing facilities)			
Case	NPV (1,000 US$)	B/C Ratio	EIRR
Original Case	710,974	1.42	17.3%
Case A	542,813	1.29	15.8%
Case B	471,715	1.28	15.7%
Case C	303,554	1.16	14.2%

Note: 12% (economic opportunity cost of capital) is used for NPV and B/C Ratio analysis

The increase of the construction cost and the decrease of the cargo volume will not give a big impact on the project feasibility. Even though the case A and case B occur simultaneously, the feasibility of the project is quite acceptable.

9.4 Financial analysis

9.4.1 FIRR (One organization will implement whole projects)

There is a possibility that unexpected changes surrounding the project conditions occur in which cost could increase and/or revenue decrease. Accordingly, the FIRRs when cost increases and/or revenue decreases are calculated as follows.

Table 9.4.1 FIRR Variation under Situations

Case	Base	expense 10% plus	revenue 10% minus	expense 10% plus revenue 10% minus
1	9.7%	8.2%	8.1%	6.5%
2	8.9%	7.4%	7.2%	5.7%

The results show that, even in the worst case scenario, the FIRRs exceed the weighted-average interest

rate of assumed loans: 5.1%, and that the both development alternatives are deemed to be financially feasible.

9.4.2 FIRR (PPP)

The FIRRs of the public sector's portion and the private sector's portion for each case are calculated as shown in Table 9.4.2.

Table 9.4.2 FIRRs under PPP Scheme

PPP Scheme Case	Public Sector	Private Sector
A	11.6%	6.9%
B	7.0%	12.6%

For both PPP schemes, Case-A and Case-B, the private sector's portions are not appraised as feasible given the city bank interest rate. Soft loans are needed to ensure feasibility of the development implementation under these schemes.

10. Environmental and Social Considerations

The preliminary scoping study for Environmental and Social Considerations identified the following concerns and challenges for the proposed development plan of expanded port in Port Reitz and Dongo Kundu.

10.1 Necessity of Mangrove reforestation

The coastal line of Dongo Kundu area is almost all covered by the Mangrove forest that serves as a breeding ground preserving the enriched tidal and marine biodiversity and providing a fishing place where the local people earn their livelihood. The proposed plan will directly clear 36 ha of Mangrove at maximum. It will consequently lead to a significant loss of biodiversity and associated ecological services that include the provision of the products for local communities such as fuel wood and construction materials, fishing ground and breeding ground for offshore organisms, as well as acting as a natural barrier/buffer from disaster, tidal waves and providing carbon storage. The subsequent study needs to suggest a sound mitigation program including the Mangrove reforestation plan. In order to compensate for potential loss, the site for Mangrove restoration needs to be selected according to the results of impact assessment to restore the original functions.

10.2 Consideration of cumulative impacts on ecosystems

Port development will involve large scale reclamation, bank protection and dredging works and result in a wide-range of both direct and indirect impacts. The direct impacts include the physical removal and disturbance of aquatic and tidal flora and fauna, while the indirect impacts may result from changes in water quality and flow, sedimentation pattern and discharges of storm water and wastewater. Deterioration of ecology results in loss or secondary damage to fisheries and fragile coastal habitats. In addition, the Dongo Kundu and Port Reitz area will undergo increased development activities from other development of infrastructure services represented by Mombasa Bypass Road and SGR as well as Mombasa SEZ in the near future. It will significantly change the land use of Port Reitz's creek and waterfront area. It is necessary for the subsequent ESIA to consider those induced and cumulative impacts. Furthermore, the mitigation measures and environmental management plan to be derived from ESIA need to suggest a suitable management system that conserves the shoreline ecosystem in the whole creek area. It probably should include habitat evaluation, zoning approach and Mangrove management plan with community involvement.

10.3 Measures for increase in pollution load

The reclamation, dredging and other construction work will also involve the short-term deterioration of water quality in terms of turbidity and transparency as well as deterioration of air quality and noise and vibration. In the long term, the operation of expanded port facilities will increase the burden of pollution and other risks such as an oil spill, air emissions from a ship and port operation, environmental accident, generation of wastes, effluent from water front activities, and so on. While the pollution burden will be dramatically increased in the area surrounding Port Reitz, the self-purification capacity of water and intertidal environment will be deteriorated and it will accelerate the accumulated adverse impact represented by the eutrophication in the creek. Among some impact items, it is suggested that the impact on level of pollution, turbid water and eutrophication be predicted quantitatively as much as possible in the course of ESIA. In addition, KPA, as an environmental leader for the entire area of Mombasa port will need to enhance the monitoring and management system of offshore and onshore environment. Careful attention should also be paid to occupational health and safety especially for port workers. KPA has responsibility to implement proactive measures against potential concerns of pollution control, waste management, global warming prevention, and occupational health and safety coordinating with the relevant authorities. The design of installed facilities and operation of new berths also can be harmonized with the implementation of Green Port Policy that will provide a variety of programs for such mitigation measures.

10.4 Involuntary resettlement

This study confirmed the 19 households of informal settlers locating in the Study Area of Dongo Kundu based on the demographic survey result in 2014 (MOIED, SEA for Master Plan for the development of Mombasa SEZ). As of August 2015, KPA is engaging the consulting team to develop the comprehensive RAP (Resettlement Action Plan) for the entire area of Dongo Kundu whose target includes the affected people in the port development area. In that sense, the subsequent study will monitor the progress, review the output and implement the supplementary study if needed, in order to ensure that the RAP will undertake sufficient compensation and assistance for PAPs (Project Affected Peoples). The RAP should also take into account a livelihood restoration program for the PAPs given their high vulnerability and poverty. Since the progress of resettlement is a critical factor for the implementation of the port development project, KPA, the land owner of Dongo Kundu, needs to ensure that the resettlement as well as the compensation and assistance to be agreed in RAP should be implemented in a timely and appropriate manner.

10.5 Potential damage to fisheries

Considering the abundant fishery resources and existing artisanal fishing activities in the Port Reitz creek area, the development of Port Reitz creek will affect on the livelihood of fisheries and fish traders for long periods. The construction work will keep the fisheries out of the area. The expansion of reclamation and ship navigation route will deprive the fisheries of their fishing grounds including the landing site. The change in hydrological and geological characteristics of area and deterioration of natural resources will result in decrease in fish catch and income. The necessary mitigation measures may include: procurement of equipment such as a vessel and gear, development of a new landing site, technical training and other assistance for their transformation to deep fishing as well as to the aquaculture industry, eco-tourism and any other alternative livelihoods. Those considerations are included in the on-going RAP study for Dongo Kundu and shall be reviewed in the course of ESIA.

10.6 Sacred place with social and cultural values

The sacred forests, Kaya, have biological diversity and the cultural significance to the local communities in coastal Kenya who use it as for traditional religious and spiritual ceremonies. This study found that two Kayas covered by the construction area in Dongo Kundu need to be relocated at least and the access to another Kaya which is close to the planned berths would be interfered with. Consultation with Kaya elders as well as local community and NMK (National Museum of Kenya) need to be made in order to conserve or relocate those Kayas in the ESIA Archeological Impact Assessment that is proposed as one of outputs in ESIA as well as the on-going RAP study for Dongo Kundu.

11. Administrative and Management Issue

11.1 Strengthen port administration and coordination power of MOTI

MOTI ensures regulatory framework, enforces authorities/state corporations who manage and implement their projects, and harmonize their missions under the Ministry. The Transport and Infrastructure Departments ensure development of regulatory framework, which is enforced through the authorities and state corporations under the ministry;

Each Authority has the same power in its administration and operation, resulting to take some time to solve contradiction(s) in projects' interfaces. i.e., Highway Project vs Railway Project and Container Terminal Project vs Railway Project still require further coordination for practical solutions

Planning and project monitoring are handled in the transport department headquarter but there is no planning and coordination department between transport and infrastructure departments.

It is expected that the Ministry takes a strong leadership for the inter-sectorial coordination in the master plans.

Figure 11.1.1 Strengthen port administration and coordination power of MOTI
Source; Study Team

11.2 Establishment of Port Division in MOTI and enactment of a new Port Act

The KPA Act has provided for the continued application of the East African Harbor Regulations of 1970 promulgated under the East African Railways and Harbors Act. However changes in shipping, port development and technology, growth in trade, development of larger and more specialized terminals, the need to comply with international legislation and keep abreast of industry practices. Many of the existing regulations and KPA Act fossilized development and management of coastal area.

For example, port planning and coordination protocol is not clarified in the KPA Act. That is why other authorities does not respect a master plan established by KPA. A new Port Act, which is modern and international, should be prepared. Roles among policy maker, regulator, manager, and operator should be clearly demarcated. At the same time, Port Division in MOTI also should be established.

11.3 Transformation to landlord port

The port authority focuses on broader aspects of port development management such as port planning, and real estate. But the port management and operation of KPA is still in the service port type. Productivity could be increased by changing the port management model. The first step in this direction is the concession of container-terminal. That is, the port authority withdraws as the operator,

allowing a private sector company to take over as the terminal operator and manager. KPA is on the way of selection of concessionaire for a new container terminal.

Changes to the existing roles of some government agencies would likely require changes in the relevant laws which created them. In particular, a new port act that defines the roles of public and private sectors, or roles of regulator, manager and operator of port, is required.

11.4 Realistic PPP model in Mombasa Port

For the development of the new container terminals, PPP initiative will be introduced. If private companies are not interested in investing in infrastructure development due to the huge costs involved, a PPP initiative in which the public sector bears the cost of infrastructure while the private sector covers superstructure will be examined.

11.5 Single window and new gate system

The objective of the Single Window system can be achieved by eliminating existing inefficiencies, for instance the inefficient space utilization at ports, where waiting times lead to congestion. Furthermore there are inefficiencies in the cargo clearance process which involves manually handling paper documents between many stakeholders. These inefficiencies lead to delays in cargo clearance, high trade transaction costs and corruption which together reduce Kenya's competitiveness.

On the other hand, the Simba System needs to be improved to prevent program downtime which suspends the port operation.

The most serious issue is to improve the gate system of KPA. When a container arrives at the KPA gate, a staff inputs container number to the system, and then a slip which shows where a container should be brought to, comes out. Even now, the gate is congested by trailers. The gate system should be updated and upgraded as container cargoes in Mombasa port are rapidly increasing. A container booking system should be introduced as soon as possible. RFID tag for container and GPS yard system for container should also be introduced.

12. Conclusion and Recommendations

12.1 Current Situation and Issues of Mombasa Port

Cargo traffic is dominated by imports which account for 90% of total cargoes handled at Mombasa Port in 2014. This trend has remained steady in the past decade. Out of total import cargoes, about 30% is transit cargoes destined to hinterland countries and shows a gradual steady increase over the past decade. It is noted that overall cargo traffic at Mombasa Port has been increasing due to growth of the Kenyan economy and landlocked countries as well. In particular, the container traffic at Mombasa Port has also increased since 2005 reaching 1,012,002 TEUs in 2014. Annual growth of container traffic in the last 9 years shows a remarkable rate of nearly 10%.

Although the total volume of cargo handled at the port has doubled over the past decade, various issues regarding cargo operation remain as follows;

12.1.1 Excessively high berth occupancy ratio (B.O.R) followed by long waiting time for berthing

Table 12.1.1 shows B.O.R, possibility of waiting by berth occupied (B/O), waiting time and average waiting time of each mooring facility in 2013. As mentioned in Chapter 5.3.1, UNCTAD recommends preferable B.O.R for various occasions. In cases where there are 6-10 berths, preferable B.O.R. is 70 %. Since Mombasa Port has more than 10 berths, the preferable B.O.R could be assumed to be approximately 70-75 % at most. Mooring facilities including Berth No. 4, 5,7,11, 12, 16, 17 and 18 exceed the recommended B.O.R. by UNCTAD. Moreover, B.O.R of Berth No.10 and 13 is close to 75 %. Extremely high B.O.R. means that Mombasa Port is critically deficient in mooring facilities including berths and wharf. Accordingly, long waiting time for berthing caused by berth occupied (B/O) takes place.

Table 12.1.1 B.O.R of Berths and Other Indicator in 2013

Berth/ Wharf	B.O.R.	Waiting Possibility by B/O*	Waiting Time	Av. Waiting Time
	(%)	(%)	(hour)	(hour/ Vessel)
Mbaraki	13.8	0	0	0
No.1	58.7	16	636	25
No.2	1.1	33	61	61
No.3	67.0	35	1,839	77
No.4	77.2	22	1,198	63
No.5	75.7	18	467	29
No.7	80.9	18	582	53
No.8	52.4	15	244	31
No.9	65.6	29	749	47
No.10	74.7	29	1,160	61
No.11	75.5	19	772	39
No.12	76.9	3	462	154
No.13	74.2	9	278	31
No.14	55.4	4	50	17
No.16	79.5	47	2,003	48
No.17	88.9	34	1,778	47
No.18	91.9	35	1,742	40
Total			14,021	

Note*: Percentage of vessels waiting for berthing due to the berth occupied by another ship
Source: KPA and The Project Team

12.1.2 Excessive mixture of various commodities followed by low cargo handling productivity

Table 12.1.2 shows the allocation of major cargo to berths/wharf in 2013. Motorcars were handled at 11berths, steel at 9 berths, containers at 15 berth and etc. Only the bulk wheat was handled in a concentrated manner, because efficient wheat unloaders have been installed at berth No.3.

If a designated berth for a commodity is changed on a case-by-case basis, mobilization of stevedoring laborers and preparation of required cargo handling equipment will take longer than in the case of a fixed berth system for a commodity. Extraordinary mixture of various commodities leads to lower productivity in cargo handling.

Table 12.1.2 Allocation of Major Cargo to Berth/Wharf in 2013

Commodity	Berth/Wharf Handled	Total
Motorcars	**No.1**, No.3, No,4, No.5,No,7,No,8, No.9,No.11, No.12,No.13,No.14	11 Berths
Steel	No.1, No.3, **No.4,** No.5, **No,7**, No.8, No.9, **No.10**, **No.11**	9 Berths
Container	No.1, No.3, No.4, No.5, No.7, No.8, No.9, No.10, No.11, No.12, No.13, No.14, **No.16-19**	15 Berths
Bulk Wheat	**No.3**	1 Berth
Bulk Clinker	Mbaraki, No.7, No.9, **No.10**	4 Berths
Bulk Fertilizer	No.1, No.5, **No.7**, **No.9**, No.10, No.11	6 Berths
Bulk Coal	Mbaraki, No.5, **No.9**, No.11	4 Berths
Other Liquid Bulk	Mbaraki, No.8, No.9, No.10	4 Berths

Note: Bold character means main berths for major commodities.
Note 2: Data on other liquid bulk is in 2014.
Source: KPA and the Project Team

12.1.3 Inadequate berth length for calling vessels

Table 12.1.3 shows the number of vessels of which LOA exceed originally designed LOA of a berth in 2013. At Berth No.1, almost all vessels have longer than designed LOA. Accordingly, Berth No.2 is also used to accommodate the ships. As a result, the number of calling ships is very limited at Berth No.2. Capacity of Berth No. 2 is not fully utilized. The same phenomenon is also observed at Berth No.16 and 17.

There are officially 18 berths/wharfs in Mombasa Port but that number is misleading as the berths cannot be used effectively due to their inadequate length.

Table 12.1.3 Number of Vessels of which LOA Exceed Originally Designed LOA in 2013

Berth/ Wharf	Allowable LOA.	Number of Calling Ships	Ships with Longer LOA than Designed LOA	Ratio
Mbaraki	276 m	9	0	0 %
No.1	156 m	160	138	86 %
No.2	150 m	3	0	0 %
No.3	150 m	69	63	91 %
No.4	171 m	88	33	38 %
No.5	161 m	89	74	83 %
No.7	187 m	61	18	30 %
No.8	154 m	54	4	7 %
No.9	162 m	56	45	80 %
No.10	184 m	65	49	75 %
No.11	166 m	107	53	50 %
No.12	165 m	99	0	0 %
No.13	157 m	97	78	80 %
No.14	163 m	78	70	90 %

Berth/ Wharf	Allowable LOA.	Number of Calling Ships	Ships with Longer LOA than Designed LOA	Ratio
No.16	160 m	90	89	99 %
No.17	165 m	111	105	95 %
No.18	215 m	126	9	7 %
Total		1,364	828	61 %

Source: KPA and The Project Team

12.1.4 Low productivity

Productivities of major cargo in 2013 are summarized in Table 12.1.4. Motorcars are unloaded mainly at Berth No.1. There is no designated large parking area in Mombasa Port; unloaded vehicles park temporarily at various and scattered places in the port. If a large parking area were established for motorcars, productivity would become twice or three times the current level. Steel is handled by ship gear cranes and trucks in a narrow space because vacant transit sheds are located close to the quay-wall. If a wider space were provided for steel handling, productivity could be dramatically improved.

Bulk wheat is unloaded at Berth No.3 where GBHL's unloaders are located in. Long waiting time for berthing takes place at Berth No.3 due to the low capacity of existing equipment.Bulk clinker is unloaded mainly at Berth No.10. Productivity at Mbaraki Wharf is low due to the decrepit structure of the jetty and old cargo handling equipment. Bulk fertilizer is unloaded at Berth No.7 and 9. Additional processing of fertilizer, namely packing, is conducted on the apron. Apron is not a space for processing. If another place for storing and processing were to be acquired, productivity at quay-side could be dramatically improved.

Table 12.1.4 Productivity of Major cargo in 2013

Commodity	Range of Productivity at Each Berth (ton/day)	Average Productivity (ton/day)
Motorcars	2,600-3,800	3,000
Steel	3,500-4,900	4,000
Container	900,000 TEU/year at Existing Container Terminals	
Bulk Wheat	7,600	7,500
Bulk Clinker	5,900-10,300	10,000
Bulk Fertilizer	2,000-2500	2,500
Bulk Coal	5,400-7,500	6,500
Other Liquid Bulk	3,600-14,700	9,000

Source: SAPROF Review Report, KPA and the Project Team

12.1.5 Capacity saturation with cargo demand

Table 12.1.5 shows the number of required berths in 2013, namely 17 berths. There are officially 18 berths/wharfs in Mombasa Port but that number is misleading as the berths cannot be used effectively due to their inadequate length. Cargo volume has been reaching the port capacity.

Table 12.1.5 Number of Mooring Facilities Required in 2013

	Productivity	2013	
	(1,000 ton/berth/year)	Volume (1,000 ton)	Required Berths
Motor Vehicle	740	366	**0.49**
Steel	1,100	1,192	**1.08**
Other General Cargo	210	1,379	**6.57**
Container	1,390	7,777	**5.59**
Total (General)		10,714	**13.74**
Bulk Wheat	2,070	1,401	**0.68**
Bulk Clinker	2,620	2,228	**0.85**
Bulk fertilizer	690	603	**0.87**
Bulk Coal	1,700	296	**0.17**
Other Bulk Cargo	1,310	450	**0.34**
Total (Dry Bulk)		4,978	**2.91**
Other Liquid Bulk	2,480	900	**0.36**
Total		16,592	**17.01**

Note: Productivities except container are for existing ordinary berths with180 m length and -10m depth.
Source: KPA and the Project Team

Table 12.1.6 shows the result of demand forecast. Average growth rates from 2014 to 2035 by cargo type are as follows;

Table 12.1.6 Cargo Volume in Future

(Import) (x 1,000 tons)

	2013	2014	2015	2020	2025	2030	2035
Iron & Steel	1,192	1,367	1,357	2,067	2,853	3,668	4,397
Rice	465	651	331	316	262	145	0
Sugar	207	231	435	558	688	826	973
Chemicals & Insecticides	254	390	260	260	260	260	260
Plastics	398	662	399	399	399	399	399
M/Vehicles & Lorries	366	463	487	742	1,025	1,318	1,580
Paper and Paper Production	300	503	431	645	881	1,127	1,346
Cereal Flour	41	49	75	75	75	75	75
Fertilizer	80	102	81	81	81	81	81
Maize in Bags	16	37	31	31	31	31	31
Wheat in Bags	8	9	9	9	9	9	9
Others	5,319	4,649	6,075	9,152	12,560	16,095	19,256
Total General Cargo	**8,646**	**9,113**	**9,971**	**14,335**	**19,124**	**24,034**	**28,407**
Wheat in Bulk	1,401	1,908	1,981	3,088	4,497	6,203	8,063
Clinker	2,228	2,065	2,690	4,436	6,370	8,375	10,169
Fertilizer in Bulk	603	360	579	579	579	829	829
Coal	296	436	396	582	788	1,001	1,192
Other Cereals in Bulk	156	184	106	106	106	106	106
Maize in Bulk	0	0	485	492	471	466	564
Others	229	278	306	459	629	805	962
Total Dry Bulk	**4,913**	**5,231**	**6,543**	**9,742**	**13,440**	**17,785**	**21,885**
P.O.L.	5,637	6,286	6,757	8,654	10,755	12,933	14,882
Other Liquid Bulk	900	906	995	1,324	1,688	2,065	2,403
Total Liquid Bulk	**6,537**	**7,192**	**7,752**	**9,978**	**12,443**	**14,998**	**17,285**
Grand Total (Import)	**20,096**	**21,536**	**24,266**	**34,055**	**45,007**	**56,817**	**67,577**

(Export) (x 1,000 tons)

	2,013	2,014	2,015	2,020	2,025	2,030	2,035
Tea	541	554	522	605	698	811	912
Soda Ash	423	336	355	465	588	737	870
Coffee	264	256	265	313	368	434	493
Others	840	851	965	1,269	1,608	2,022	2,391
Total General Cargo	**2,068**	**1,997**	**2,107**	**2,652**	**3,262**	**4,004**	**4,666**
Titanium	0	363	450	450	450	450	450
Soda Ash in Bulk	0	0					
Cement in Bulk	0	0					
Fluorspar	65	59					
Other Dry Bulk	0	0	84	84	84	84	84
Total Dry Bulk	**65**	**422**	**534**	**534**	**534**	**534**	**534**
Bulk Oil	62	19					
Bunkers	38	26					
Total Liquid Bulk	**100**	**45**	**112**	**112**	**112**	**112**	**112**
Grand Total (Export)	**2,233**	**2,464**	**2,753**	**3,298**	**3,908**	**4,650**	**5,312**

	2,013	2,014	2,015	2,020	2,025	2,030	2,035
Total (Import, Export)	**22,329**	**24,000**	**27,019**	**37,353**	**48,915**	**61,467**	**72,889**

12.2 Mombasa Port Master Plan

12.2.1 Basic policies and strategies of port development and management

(1) Direction of Kenyan Economic Development

"Kenya Vision 2030" is the country's new development blueprint covering the period 2008 t0 2030. The Vision is based on three "pillars", namely the economic, the social and the political pillars. The economic pillar describes the economic vision and strategy. This economic vision and strategy shows six key sectors for sustainable economic development of Kenya; tourism, agriculture, wholesale and retail trade, manufacturing, business process offshoring (BPO) and financial service.

(2) Roles and Functions of Mombasa Port for accomplishment of the Vision 2030

Since Mombasa Port has been sole international gateway for not only Kenya but also landlocked neighboring countries including Ethiopia, South Sudan, Uganda, Burundi, Rwanda and D.R. Congo, Mombasa port should contribute toward the accomplishment of the Vision. Mombasa Port could support tourism sector by means of providing a safe and comfortable international passenger terminal. Mombasa Port also could support the agriculture sector and the wholesale and retail sector as well as the manufacturing sector. Should more efficient and effective cargo (fertilizer and other commodities) handling be achieved in the port, transport cost of commodity would decrease accordingly.

Mombasa port shall play absolutely necessary roles to sustain people's daily life and economic development of Kenya by means of providing all customers with rational and efficient maritime transport services.

(3) Basic Policies for Port Development

Cargo handling capacity of the port has been saturated with the cargo demand already. Consequently, long waiting time for berthing due to berth occupied by another ship and low productivity in cargo handling take place. Capacity development is an urgent issue to be tackled.

Mombasa Port has various advantages in maritime transport, namely long history as an international port, an international gateway function referred by Kenya and other landlocked countries and plenty of

direct hinterland which could be developed as industrial area. Mombasa Port shall be developed taking these advantages in to consideration.

In this context, basic policies are set as follows;

- To develop cargo handling capacity to meet future cargo demand
- To develop Mombasa Port in comprehensive manner to meet various needs from other projects including Dongo Kundu SEZ, Mombasa Urban Development Project, Mombasa Bypass Highway project and other important projects.

(4) Overall Goals of Master Plan

Overall goals of the Mombasa Port Master Plan are set as follows;

- To strengthen an international gateway function not only for Kenya but also for but also landlocked neighboring countries including Ethiopia, South Sudan, Uganda, Burundi, Rwanda and D.R. Congo,
- To develop the best and largest international maritime gateway port in the east African coast; container terminals will stretch 1,500 m length in Kipeve area.
- To become the central area of free trade, manufacturing and processing in the east coast of Africa
- To support the tourism sector
- To contribute actively to solutions in urban issues including traffic congestion in Mombasa by means of vigorous utilization of railway and bypass highways.

(5) Strategies of the Master Plan

Basic strategies of the Master Plan are set as follows;

- To develop Mombasa Port in the most effective and efficient manner utilizing existing resources and potential of the port.
- To maximize cargo handling capacity of the port. Overflowing cargo will be handled in another international port including Lamu Port.
- To develop required mooring and other facilities in a timely manner. These required facilities include terminals for MPDP, Dongo Kundu SEZ Project and other necessary projects.
- To renew existing berths in Kilindini in series. Passenger facilities including a berth and terminal will be developed.
- To introduce more efficient cargo handling equipment to cope with the critical shortage of berths.
- To ensure the maritime safety and security
- To preserve and improve the natural environment in/out of the port

(6) Spatial Utilization Plan

In order to rationalize spatial utilization in the port, two types of long-term spatial utilization plans are prepared. One is on line with current spatial utilization and the other is modified plan to relocation some kinds of bulk cargo from existing area to Dongo Kundu Area. Figure 12.2.1 shows the former and Figure 12.2.2 shows the latter.

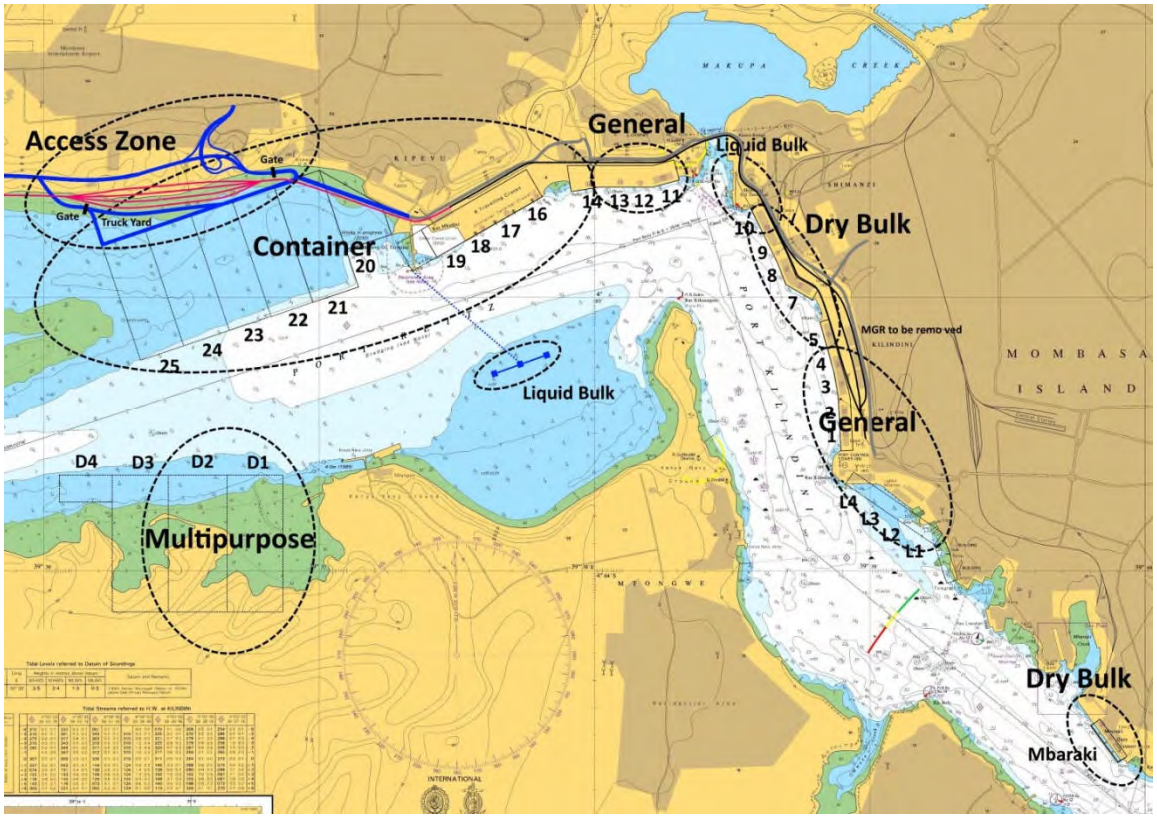


Figure 12.2.1 Spatial Utilization Plan (Base Case (Scenario 1))
Source: The Project Team

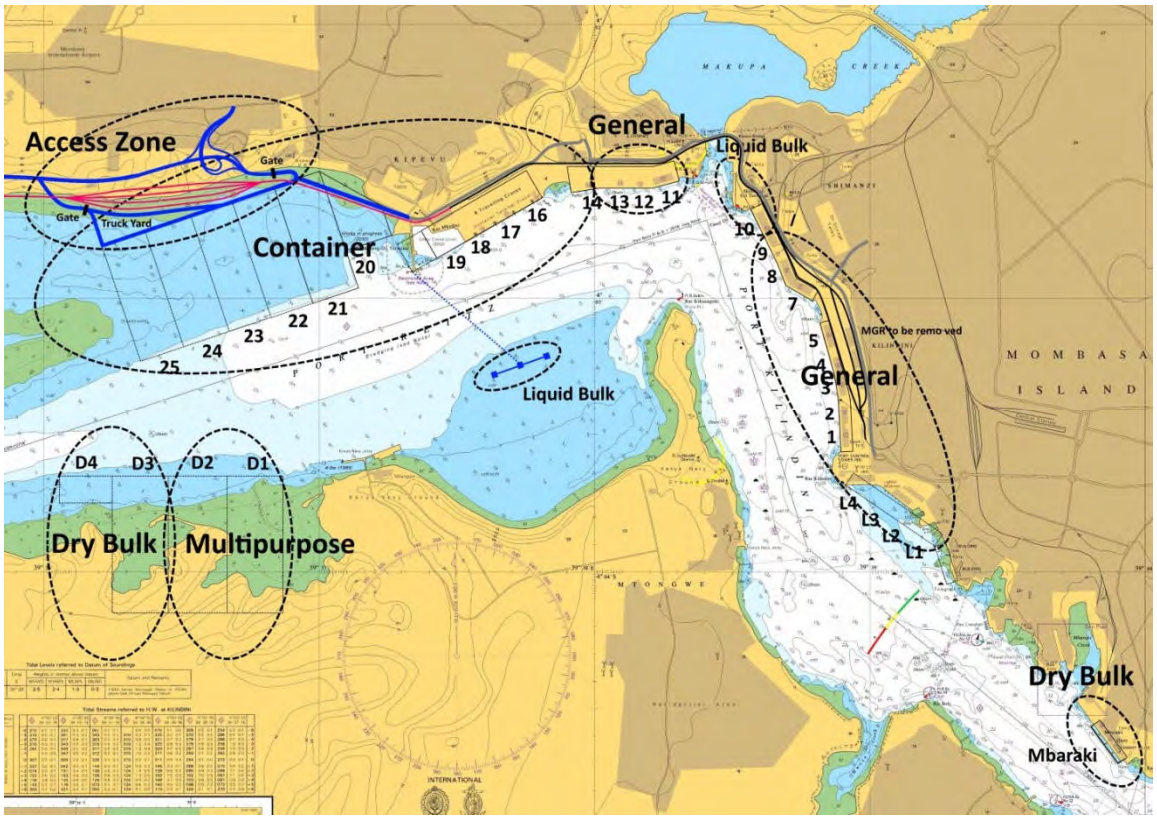


Figure 12.2.2 Spatial Utilization Plan (Alternative (Scenario 2))
Source: The Project Team

(7) Scale of Development

a) Major Facilities to be developed

- Container Terminal: At Kipevu area, international container berths of 1,500m in length (Draft -15m, Length 300m x 5 berths) should be developed targeting for 60,000 DWT (4,300-5,700 TEU) class container vessels.
- Multi-purpose Terminal: At Dongo Kundu area, international multi-purpose berths of 600m in length (Draft -14m, Length 300mx 2 berths) should be developed targeting for 30,000 DWT (8,000 units) class car carriers, 70,000 DWT class dry bulk carriers and other vessels.
- General Cargo Terminal: At Lighter area, international general cargo berths of 720m in length (Draft -10m, Length 180m x 4 berths) should be developed targeting for 20,000DWT class general cargo vessels.
- Cruise Ship Terminal: A cruise vessel terminal (Draft -10.0m, Air draft 63m, Length 350m), targeting for 130,000GT class cruse vessel should be developed. (Transformation of existing Berth No.1 and No.2 from general cargo terminal to cruise terminal at Klindini area or new development near Lighter area)
- Petroleum Jetty: At the area in front of Navy Grand, a new oil jetty platforms consisting of 4 berths should be developed. These 4 berths are targeting for 5,000 – 200,000DWT oil tankers (with tidal advantage).

b) Economic Aspect

Total investment including public and private sector are between US$ 20.2 billion to US$ 23.4 billion.

12.2.2 Facility development and improvement plan

(1) Up to 2020

Figure 12.2.3 shows the development plan up to 2020.

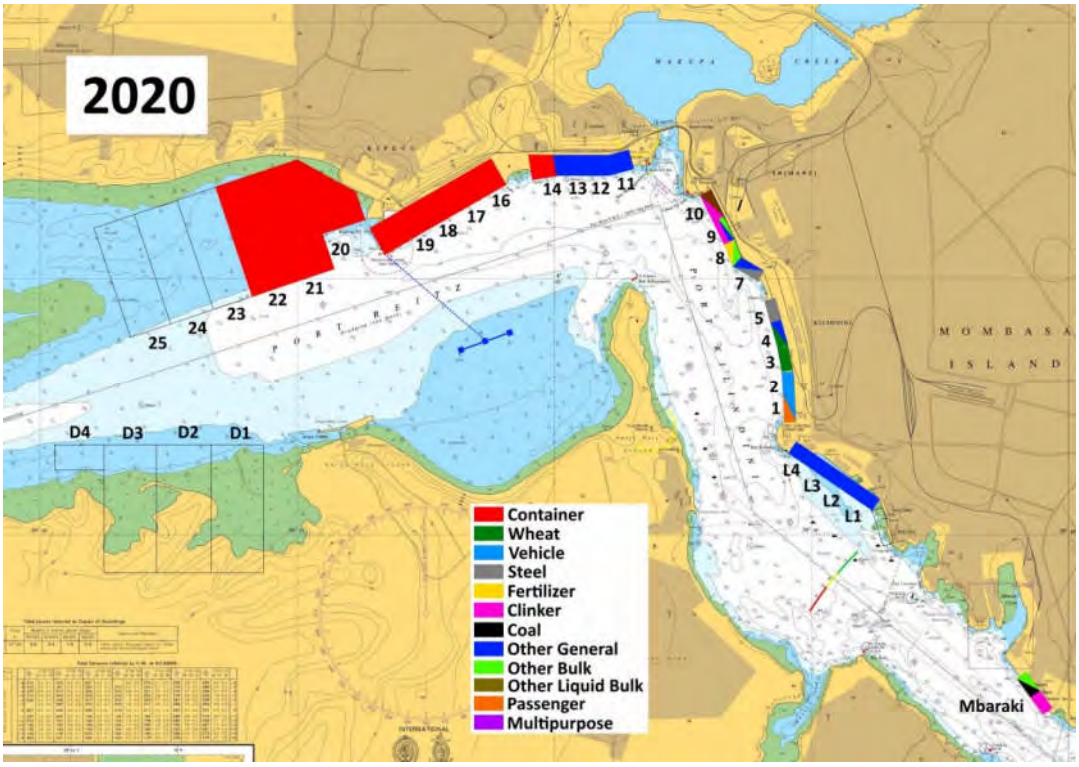


Figure 12.2.3 Development Plan up to 2020
Source: The Project Team

(2) 2021 - 2025

Figure 12.2.4 and Figure 12.2.5 show the development plan in 2021 to 2025.

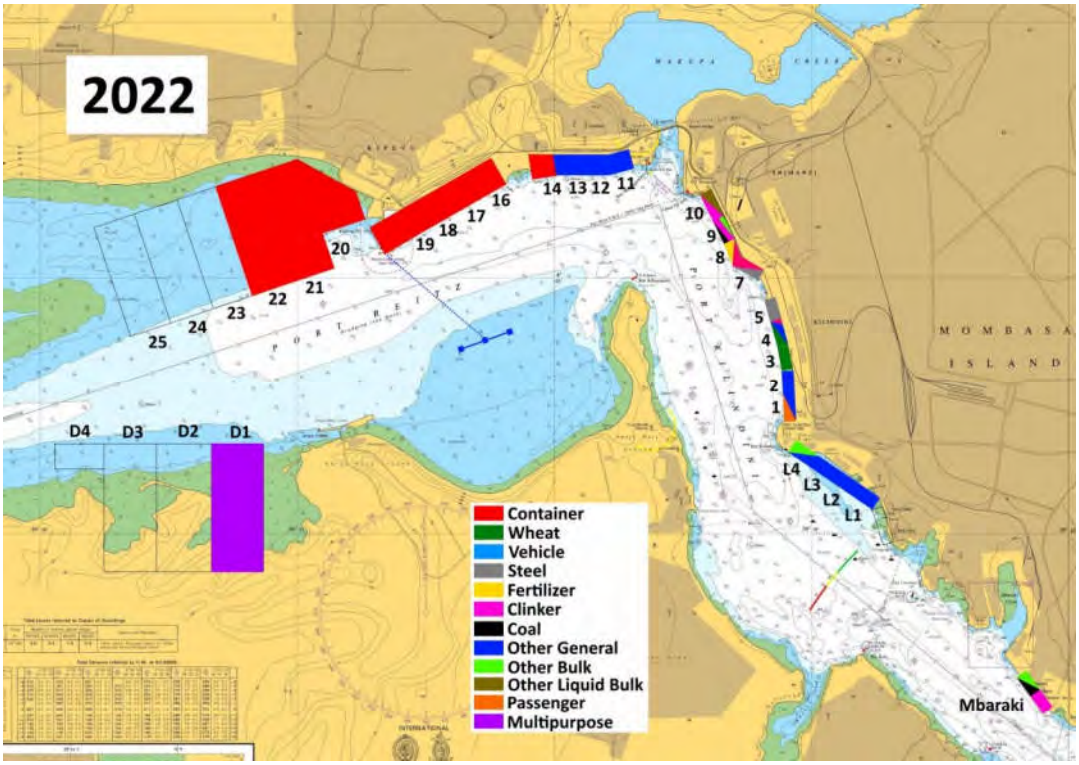


Figure 12.2.4 Development Plan in 2021 to 2025 (1)
Source: The Project Team

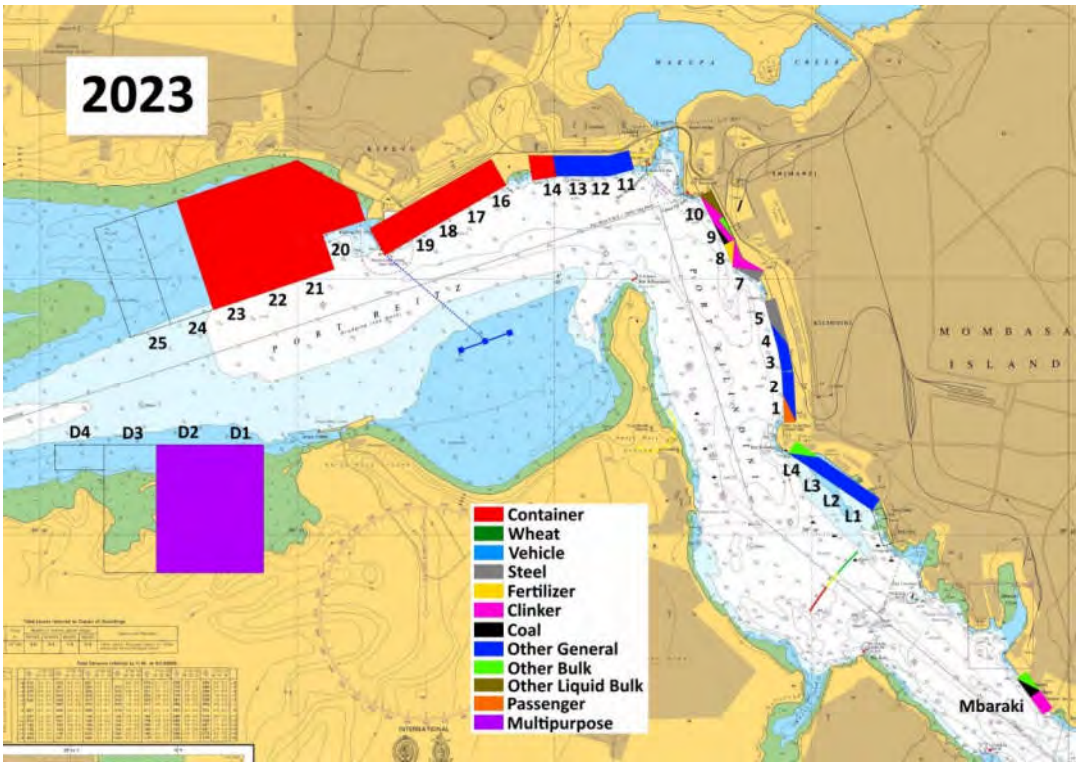


Figure 12.2.5 Development Plan in 2021 to 2025 (2)
Source: The Project Team

(3) 2026 - 2030

a) Base Case (Scenario 1)

Figure 12.2.6 shows the development plan in 2026 to 2030.

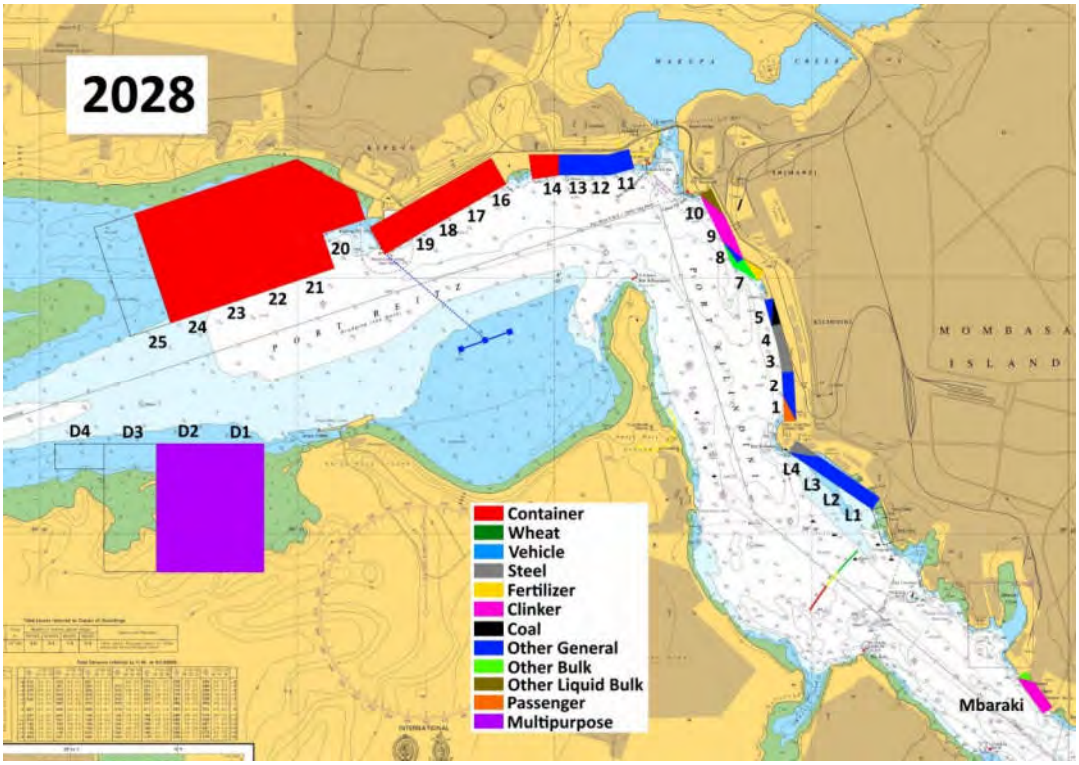


Figure 12.2.6 Development Plan in 2028 (Base Case (Scenario 1)
Source: The Project Team

b) Alternative (Scenario 2)

Figure 12.2.7 and Figure 12.2.8 show the development plan in 2026 to 2030.

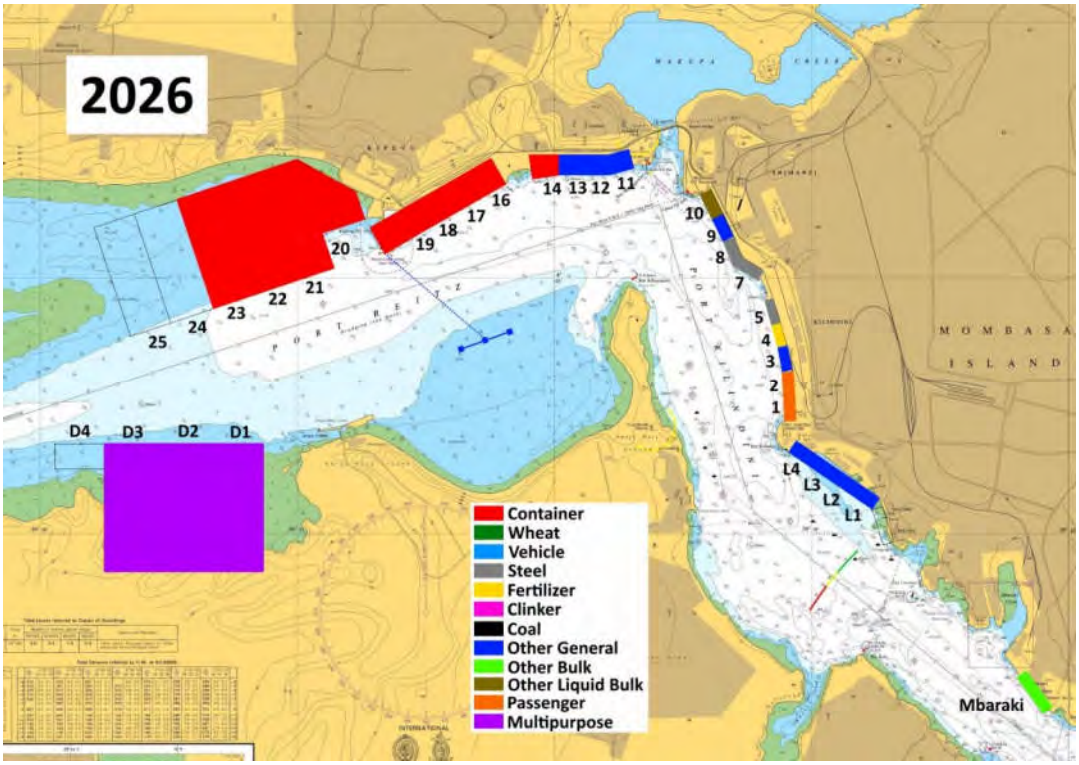


Figure 12.2.7 Development Plan in 2026 and 2028 (Alternative (Scenario 2) (1)
Source: The Project Team

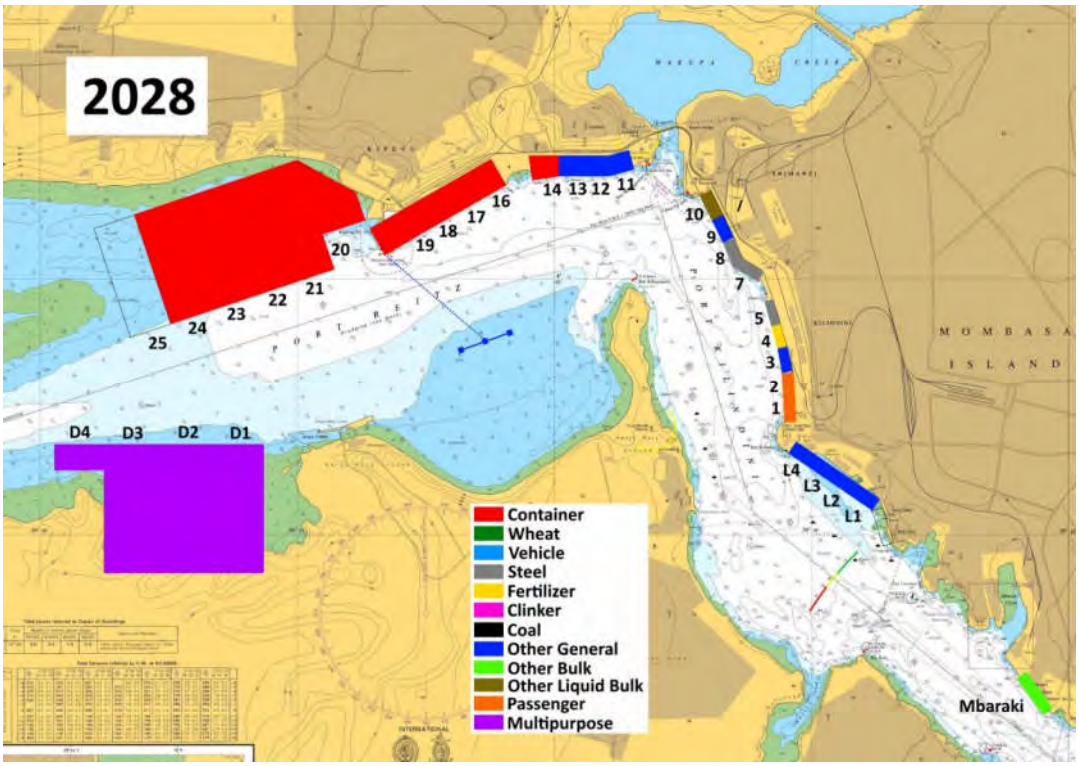


Figure 12.2.8 Development Plan in 2026 and 2028 (Alternative (Scenario 2) (2)
Source: The Project Team

(4) 2031- 2035

a) Base Case (Scenario 1)

Figure 12.2.9 shows the development plan in 2026 to 2030.

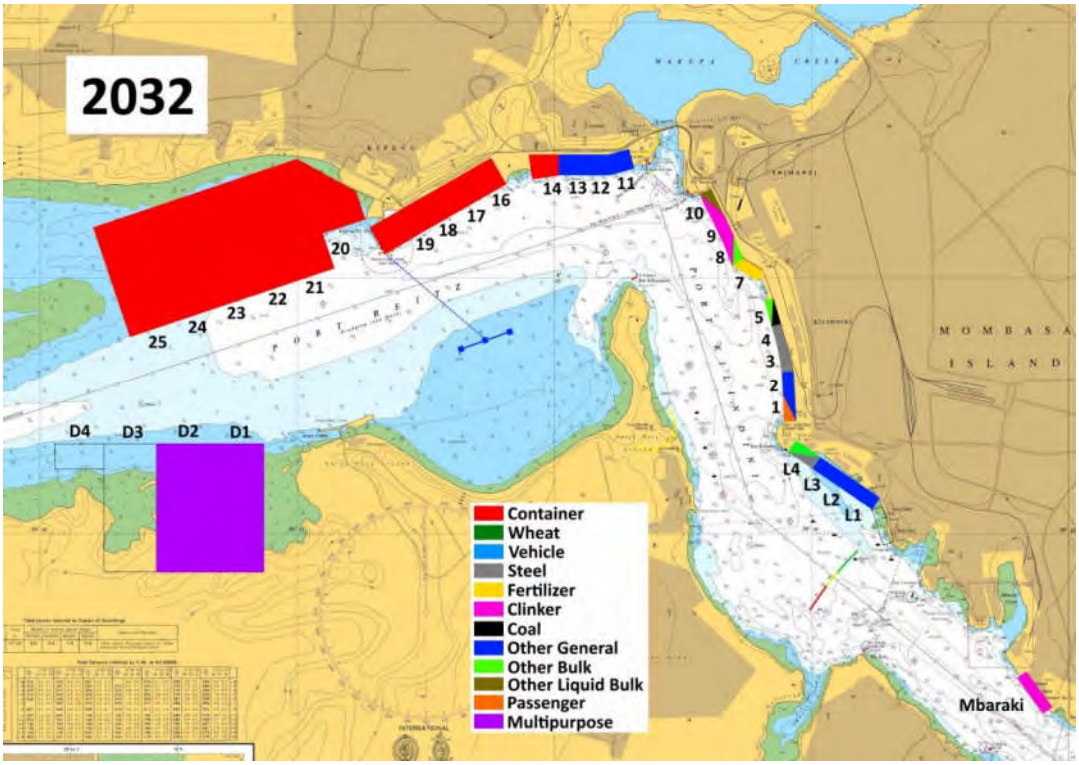


Figure 12.2.9 Development Plan in 2032 (Base Case (Scenario 1)
Source: The Project Team

b) b. Alternative (Scenario 2)

Figure 12.2.10 shows the development plan in 2026 to 2030.

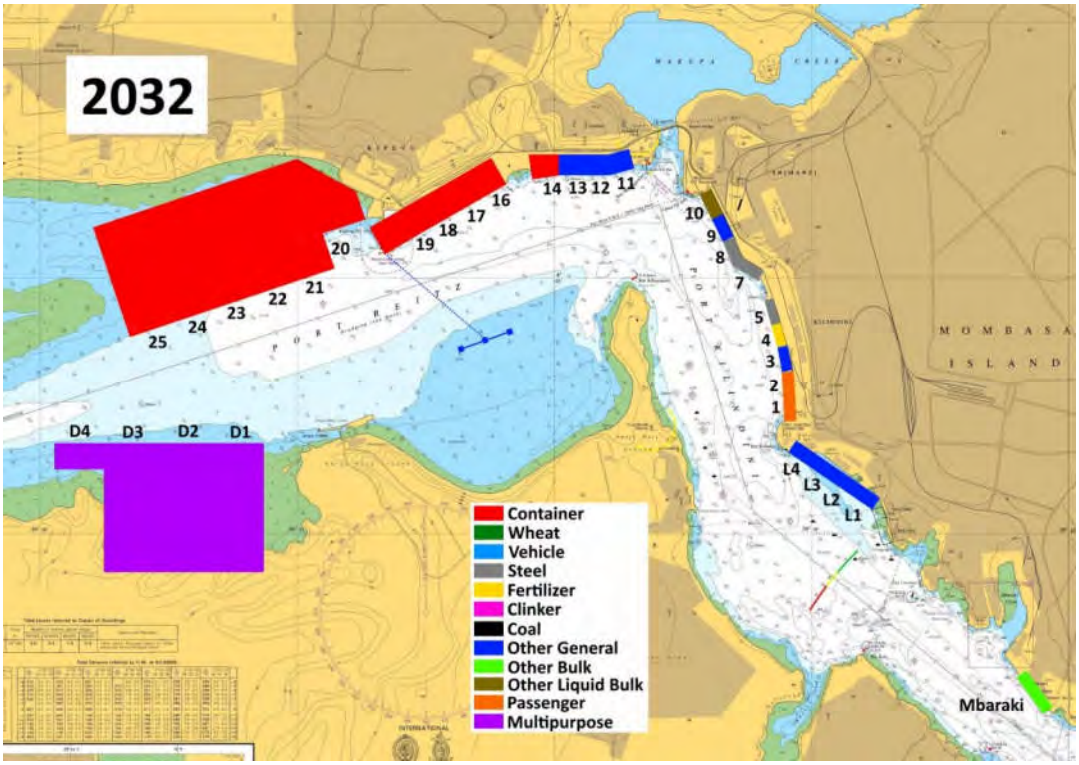


Figure 12.2.10 Development Plan in 2032 (Alternative (Scenario 2)
Source: The Project Team

12.2.3 Administrative development

(1) Structural Reform

KPA shall accelerate institutional reform from "Service Port" to "Landlord Port". KPA currently owns most of the port infrastructure and undertakes the majority of port operations. The shift in the role of KPA from **port service provider** to l**andlord and regulator** is a difficult change management exercise. The Government of Kenya committed to transforming Mombasa to a landlord port in 2002, but there has been little progress on implementation. There can be no strategic port management until the roles of the public and private sectors are clearly defined in a low. It will require new skills, institutional capabilities, and practices including regulating **unfair and anti-competitive practices**, designing and negotiating contracts with private providers of port services, performance monitoring and **ensuring compliance with standards.**

12.3 Recommendations

12.3.1 Efficient port operation

(1) PPP scheme at new container terminals in Kipevu area

To realize the efficient and global operation of port, PPP scheme and concessioned terminal operation should be introduced in development and operation of new container terminals in Kipevu area, and multi-purpose terminals in Dongo Kundu area.

(2) Improvement of existing cargo handling equipment/systems

Chapter 6 of this master plan, "Mombasa Port Development Plan including Dongo Kundu Area", introduced the following assumption on future improvement of cargo handling productivity.

- Productivities except container and other liquid bulk will increase 10 % in 2020 and 2025.
- Productivities except container and other liquid bulk will increase 20 % in 2030 and 2035.
- Productivity of container will be stable. Since current productivity at the existing berths seems to have almost reached the maximum and that of the second container terminal (MPDP) is expected to be very high, it is not realistic to expect productivities to increase in future.
- Productivity of other liquid bulk will increase 20 % in 2020 and 2025.
- Productivity of other liquid bulk will increase 40 % in 2030 and 2035.

These improvements by means of introduction of new and larger cargo handling equipment/systems are inevitable to implement the master plan.

Specified issues of current cargo handling are as follows;

Motorcars are unloaded mainly at Berth No.1. There is no designated large parking area in Mombasa Port; unloaded vehicles park temporarily at various and scattered places in the port. If a large parking area were established for motorcars, productivity would become twice or three times the current level.

Steel is handled by ship gear cranes and trucks in a narrow space because vacant transit sheds are located close to the quay-wall. If a wider space were provided for steel handling, productivity could be dramatically improved.

Container handling productivity has already been surveyed in the "SAPROF Review Report."

Bulk wheat is unloaded at Berth No.3 where GBHL's unloaders are located in. Long waiting time for berthing takes place at Berth No.3 due to the low capacity of existing equipment.

Bulk clinker is unloaded mainly at Berth No.10. Productivity at Mbaraki Wharf is low due to the decrepit structure of the jetty and old cargo handling equipment.

Bulk fertilizer is unloaded at Berth No.7 and 9. Additional processing of fertilizer, namely packing, is conducted on the apron. Apron is not a space for processing. If another place for storing and processing were to be acquired, productivity at quay-side could be dramatically improved.

12.3.2 Improvement of gate system

Container positioning document system in the port gate and terminal gate should be reviewed, and automated and advanced gate system and container transport booking system should be introduced to cope with the increase of container cargo. Container trailers should pass through gates more smoothly and rapidly.

12.3.3 Harmonization of road and railway

China will supply the initial rolling stock comprising 56 diesel locomotives, 1,620 wagons and 40 coaches. If the availability ratio of wagons is assumed to be 50%, and one wagon carries 4 TEUs containers, annual transport volume by train becomes 1183,000 TEUs. Container demand in 2035 will

be 3789,000 TEUs. Therefore, transport ratio by rail will be 31%. In the case of 2 TEU in one wagon, its ratio will decrease to 16%. In addition, container cargo volume which is transit to landlocked countries is 104,500 TEUs (3% in total) in 2035. Container logistics is always carried out based on the concept of just in time. Cargo owners who prefer to use railway are in the minority. This means that road transportation is main player for container while rail transportation is a side player. Road access development to the port should be prioritized.

12.3.4 Channel dredging, reclamation and environmental mitigation

Implementation of this port master plan involves a huge amount of channel dredging and reclamation works. Site selection in an offshore of Mombasa to dispose dredged material and collect sea sand material for the reclamation, should be carefully examined. In addition, impacts to mangrove forests should be mitigated, and the relocation of local port inhabitant should be minimized when possible.

12.3.5 Master plan adjustment in every 5 years

To realize this master plan, a huge amount of financial resource and investment are required. This master plan should be implemented step by step examining the economic situation in Kenya and should be adjusted every 5 years. In addition, financial sources should be carefully examined.

12.3.6 Strengthen port administration and coordination power of MOTI

MOTI ensures regulatory framework, enforces authorities/state corporations who manage and implement their projects, and harmonize their missions under the Ministry. The Transport and Infrastructure Departments are responsible for the development of the regulatory framework, which is enforced through the authorities and state corporations under the ministry;

Each Authority has the same power in its administration and operation, which means resolving contradiction(s) in projects' interfaces is often time-consuming. For example, the Highway Project vs Railway Project and Container Terminal Project vs Railway Project still require further coordination for practical solutions

Planning and project monitoring are handled in the transport department headquarter but there is no planning and coordination department between transport and infrastructure departments. In other words, establish a port and harbor division within MOTI having administrative functions such as to approve port development plans and to establish port and harbor related laws. Moreover, a development coordination division under direct control of each ministry is proposed to coordinate projects among ministries.

It is expected that the Ministry will pay the leading role in inter-sectorial coordination in the master plans.

12.3.7 Establishment of Port Division in MOTI and enactment of a new Port Act

KPA Act has provided for the continued application of the East African Harbor Regulations of 1970 promulgated under the East African Railways and Harbors Act. However changes in shipping, port development and technology, growth in trade, development of larger and more specialized terminals, the need to comply with international legislation and keep abreast of industry practices. Many of the existing regulations and KPA Act fossilized development and management of coastal area. For example, port planning and coordination protocol is not clarified in the KPA Act. That is why other authorities does not respect a master plan established by KPA. A new Port Act, in line with modern international trends, should be prepared. Roles among policy maker, regulator, manager, and operator should be clearly demarcated. At the same time, Port Division in MOTI also should be established.

12.3.8 Study on new international port development plan in Kenya

Mombasa port is the port for 5 countries' economy, not only for Kenya's. KPA should challenge not only to renew the rules and regulations for port management, but also to develop a new international

port. A total cargo demand including import and export in 2035 will be 72.9 million tons in Mombasa Port. On the other hand, the future capacity in the new development master plan of Mombasa port including Dongo Kundu area is 52.4 million tons, which means 20.5 million tons of cargo will not be able to absorb in Mombasa port. Lamu port in the north part of Kenya is on the way to be developed but the start of Lamu port operation is not clear now. In addition, the friction between port and urban activities in Mombasa will increase even if development of bye pass highways, standard gage railway and Dongo Kundu area terminals are developed. Therefore a study of new international port development should be start earlier. Malindi area might be considered as one of proposed sites for a new international port.

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1. Outline of the Project

Mombasa Port, located in Mombasa City, is the largest port in the East Africa region. Mombasa port is used not only for the trade of Kenya, but also for inland countries such as Uganda and Rwanda. Due to the rapid economic development in the region and the increasing container handling volume, the Japan International Cooperation Agency (hereinafter referred to as "JICA") is supporting Kenya Ports Authority (hereinafter referred to as "KPA") in expanding the container terminal on the northern side of the port under the "Mombasa Port Development Project" (hereinafter referred to as "MPDP") of which a loan agreement was signed in November 2007 for the amount of 26.7 billion Japanese Yen. In addition, at the request of the Government of Kenya (hereinafter referred to as "GOK"), JICA commenced "The Project on Master plan for Development of Dongo Kundu, Mombasa Special Economic Zone" which is expected to contribute to the acceleration of economic growth in Kenya and the East African region.

In recent years, the cargo handling volume of Mombasa port has been increasing much more than forecast. Taking the current situation into consideration, it is required to formulate the Master Plan for the Development of Mombasa Port which contains the vision and concept of Mombasa Port development after completion of the above mentioned Yen loan project. A Detailed Planning Survey Team was dispatched to Kenya in November 2013 and held a series of discussions with Kenyan authorities on formulation of the Project. Based on the discussions, a consensus was reached on the objectives and methodology of the Project.

(1) Purpose of the project

The project shall be implemented based on the Record of Discussions (hereinafter referred to as "RD") signed by the Ministry of Transport and Infrastructure (hereinafter referred to as "MOTI"), KPA and JICA on May 29, 2014 including the Project Design Matrix (hereinafter referred to as "PDM") and Plan of Operation (hereinafter referred to as "PO").

(2) Overall Goal

For the purpose of developing Mombasa Port, projects are to be implemented in accordance with the Mombasa Port Master Plan including Dongo Kundu.

(3) Project Purpose

Capacity of KPA staff regarding port development is enhanced.

(4) Outputs

Outputs based on the PDM are as follows;

- Mombasa Port Master Plan (revised in 2009 by KPA) is reviewed and revised.
- Strategic planning and management system in KPA is improved.
- Future capacity and forecast method in KPA is improved.
- Comprehensive Mombasa Port development implementation/investment plan is prepared.

(5) Project area

The project area shall be Mombasa Port including Dongo Kundu as well as other areas related to the project.

2. Basic Information Relevant to Logistics in Kenya

2.1 Socioeconomic conditions

2.1.1 Socioeconomic forecast by World Bank, IMF etc.

(1) World Bank

Reference is made to "African Overview" and "Kenya Overview" in 2015 by the World Bank.

Sub-Saharan Africa's macroeconomic prospects remain promising. Despite headwinds, medium-term growth for Africa remains favorable. Regional GDP growth is projected to strengthen to an average annual pace of 5.2 percent in 2015-2016 from 4.6 percent in 2014, and rise to 5.3 percent in 2017. GDP per capita is set to rise steadily from an estimated 2.1 percent in 2014 to 2.6 percent in 2015, reaching 2.8 percent in 2017.

Public investment in infrastructure, increased agricultural production, and buoyant services sector are expected to continue to support growth in the region. The growth pick-up is expected to occur in a context of reduced support from commodity prices and net FDI flows as global demand remains subdued. Overall, Sub-Saharan Africa is forecast to remain one of the fastest growing regions. Net exports are again projected to make a marginal contribution to GDP growth in the region over the forecast horizon. On the import side, the demand for capital goods is projected to remain strong, as governments continue to frontload infrastructure investments and private consumptions remains strong. Reflecting these trends and the weakening of commodity prices, the current account deficit in the region is projected to widen from an estimated 2.4 percent of GDP in 2013 to an average of 3.1 percent of GDP in 2014 and 2015.

Table 2.1.1 shows four-year forecasts for annual GDP growth in Kenya by the World Bank. Kenya's economy is estimated to have grown by 5.4 % in 2014 and is projected to grow by 6 % in 2015. The resilience is likely to continue with the economy expanding at 6.6 % in 2016 and 6.5 % in 2017, according to the latest World Bank Group's economic analysis. "The Kenya Economic Update for March 2015" says Kenya is emerging as one of Africa's key growth centers and is also poised to become one of the fastest growing economies in East Africa, supported by lower energy costs, investment infrastructure, agriculture, manufacturing and other industries.

The momentum for growth is expected to be sustained by a stable macroeconomic environment, continued investment in infrastructure, improved business environment, exports and regional integration. While the overall medium term outlook remains favorable, risks exist from the continued downturn of the tourism sector arising from security concerns. External demand for exports is also sluggish and low growth of production for exports is widening the current account deficit. Also, the share of the manufacturing sector to GDP has remained stagnant in recent years, with low overall productivity and large productivity differences in firms across subsectors due to lack of competition. Increased competitiveness of the manufacturing sector will be a key driver of growth, exports, and job creation.

Table 2.1.1 Four-Year Forecasts for Annual Growth in Kenya

Year	2014	2015	2016	2017
Kenya	5.4 %	6.0 %	6.6 %	6.5 %

Source: World Bank

(2) IMF (International Monetary Fund)

Reference is made to the "IMF Executive Board Concludes 2014 Article IV Consultation with Kenya" in the following section.

Kenya's economy has continued to expand in a stable economic environment. Credit to the manufacturing sector has picked up and foreign investor interest is growing, notably in the extractive industries. The economy's growth rate rose to 5 percent in 2013/2014 and is expected to gain further momentum in 2014/2015, driven by higher domestic and external investment. Kenya's medium-term growth prospects are favorable, supported by rising infrastructure investment in energy and transportation; the expansion of the East African Community market; deepening financial inclusion, which fosters a more dynamic small and medium-sized enterprise sector; and the positive impact of large-size irrigation projects on agricultural productivity.

The IMF staff report projected higher growth in the Kenyan economy for a third straight year, at 5.8 percent in 2014/2015 after an estimated 5 percent in 2013/2014. Inflation remains moderate, but rising food prices and rapid credit growth may fuel inflation expectations. The staff report noted, however, that manufacturing, transport, and communications were the main supports of growth in early 2014, while the agricultural sector was relatively subdued due mainly to poor rains. In addition, security concerns following terrorist attacks and threats hit the tourism industry.

Promising commercial prospects of oil discoveries could potentially provide significant foreign exchange and fiscal resources. Kenya's relatively high current account deficit, at 7.7 percent of GDP in 2013/2014, reflects strong capital goods imports, in particular of equipment for oil exploration.

The report said there are five principal drivers of growth in Kenya that support positive projections of economic expansion.

- Improved business conditions arising from the removal of bottlenecks by increased infrastructure investment in energy and transportation;
- Expansion of the East African Community market thanks to decisive steps toward regional integration with neighboring Burundi, Rwanda, Tanzania, and Uganda;
- Reduced social strife as a result of devolution and central government transfers to 47 newly formed countries under the 2010 constitution;
- A more dynamic small and medium-sized enterprises sector arising from strong financial inclusion and small business access to credit;
- Higher agricultural productivity and reduced medium-term vulnerability of agricultural production to weather shocks, reflecting implementation of large irrigation projects.

A boost in investor confidence following the successful Eurobond issuance could further improve Kenya's outlook. Accelerated regional integration, improved security conditions, and possible new discoveries of oil, gas, and other minerals could have a large impact on investor sentiment. Nevertheless, the report added, the Kenyan economy is vulnerable to risks affecting the external and fiscal positions. Near-term risks include the potential for security conditions to deteriorate further, for poor rains followed by other weather-related shocks, and additional difficulties in implementing devolution that could complicate public finance management.

Table 2.1.2 shows forecasts for annual growth in Kenya up to Year 2019 by IMF.

Table 2.1.2 Forecasts for Annual Growth in Kenya

Year	2014	2015	2016	2017	2018	2019
GDP(Billion)*	3,841	4,078	4,338	4,619	4,922	5,248
GDP Growth(%)	5.344	6.159	6.381	6.487	6.552	6.617

Source: IMF
Note: *Kenya Shillings(Constant Price/Base Year 2009)

2.1.2 Population

According to "World Population Prospects, The 2012 Revisions by United Nations", the total population in 2014 in Kenya is expected to be 45.581 million and the growth rate is 2.71 % for the last

decade. The change of the population in Kenya for the last decade is shown in Table 2.1.3.

Table 2.1.3 Change of the Population in Kenya for the Last Decade

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Population	34,886	35,786	36,811	37,835	38,860	39,884	40,909	42,077	43,245	44,413	45,581

Source: World Population Prospects; The 2012 Revision by United Nations

The population distribution and density by provinces is shown in Table 2.1.4.

Table 2.1.4 Population Distribution and Density by Provinces (Year 2009)

Province*1	Area (sq. km)	No. of Districts	Population	Density (per km^2)
Nairobi	695.1	4	3,138,369	4,515
Central	13,163.7	17	4,383,743	333
Coast	82,892.8	13	3,325,307	40
Eastern	153,403.9	28	5,663,123	37
North Eastern	126,852.3	11	2,310,757	18
Nyanza	12,612.9	21	5,442,711	432
Rift Valley	183,383.2	44	10,005,805	55
Western	8,309.3	20	4,334,282	522
Total	**581,313.2**	**158**	**38,604,097**	**66**

Note *1: In accordance to the new constitution on 2010, "Province" cease to exist and "County" became as a unit of devolution.
Source: Kenya National Bureau of Statistics; 2009 Population and Housing Census

Out of Kenya's total population of 38.6 million in 2009, Rift Valley (10 million) has the highest population among the provinces followed by Eastern (5.7 million), Nyanza (5.4 million) and Central (4.4 million) Provinces. Nairobi Province has the highest population density with 4,515 persons/km^2 followed by Western (522 persons/ km^2), Nyanza (432 persons/ km^2) and Central (333 persons/ km^2) Provinces.

2.1.3 Gross domestic product (GDP)

Table 2.1.5 shows GDP in Kenya and Uganda surveyed by International Monetary Fund (IMF). According to the data, GDP in 2014 in Kenya was Kenya shillings 3,841,300 billion (Constant prices/Base year 2009) and the average annual growth rates for the last decade and for the last five years were 5.17 %/year and 6.13 %/year, respectively. While, GDP in 2014 in Uganda was Uganda shillings 25,580,200 billion (Constant prices/Base year 2002) and the average annual growth rates for the last decade and for the last five years were 6.63 %/year and 5.36 %/year, respectively.

Table 2.1.5 GDP and Growth Rate in Kenya and Uganda

Year	Kenya		Uganda	
	GDP, Constant Price /Base Year 2009 (Billion Shillings)	GDP Growth Rate (annual %)	GDP, Constant Price /Base Year 2002 (Billion Shillings)	GDP Growth Rate (annual %)
2004	2,320,065	4.229	13,466,727	5.803
2005	2,447,412	5.489	14,814,398	10.007
2006	2,584,950	5.620	15,858,718	7.049
2007	2,790,629	7.957	17,137,543	8.064
2008	2,780,400	-0.367	18,924,645	10.428
2009	2,853,321	2.623	19,706,991	4.134
2010	3,099,405	8.624	20,928,032	6.196
2011	3,334,048	7.571	22,221,554	6.181
2012	3,487,557	4.604	22,838,447	2.776
2013	3,646,409	4.555	24,151,821	5.751
2014	3,841,300	5.345	25,580,200	5.914

Source: IMF Data & Statistics

2.1.4 Population and GDP Forecast in East African Countries

Table 2.1.6 shows the population and GDP in East African Countries, based on the data by International Monetary Fund (IMF). Ethiopia is the biggest population in East African Countries and the second ranking of high GDP growth rate.

Table 2.1.6 Population and GDP Forecast in East African Countries around Kenya

Country	Population Forecast (million)		GDP Forecast Upper: National Currency (Billion) Lower: GDP Growth Rate (%)	
	2014	2020	2014	2020
Burundi	9.2	10.6	1,787.3	2,422.9
			(4.7)	(5.5)
Comoros	0.8	0.9	148.6	186.8
			(3.3)	(4.0)
Eritrea	6.5	7.9	8.9	10.5
			(1.7)	(3.8)
Ethiopia	91.0	103.1	626.6	995.5
			(10.3)	(7.5)
Madagascar	23.6	27.8	7,467.8	9,999.8
			(3.0)	(5.0)
Malawi	17.6	20.9	759.5	1066.9
			(5.7)	(5.9)
Mauritius	1.3	1.3	292.3	359
			(3.2)	(3.5)
Mozambique	26.5	30.6	419.6	692.5
			(7.4)	(14.5)
Rwanda	11.1	12.9	4,688.0	7,167.8
			(7.0)	(7.5)
Seychelles	0.1	0.1	8.0	9.9
			(2.9)	(3.5)
South Sudan	11.4	13.1	23.6	32.5
			(5.5)	(3.1)
Tanzania	47.7	56.9	41361.6	62093.3
			(7.2)	(6.9)
Uganda	38.0	45.5	51473.8	72539.4
			(4.9)	(6.3)
Zambia	15.0	18.3	124.2	182.5
			(5.4)	(6.4)
Zimbabwe	13.3	14.2	12.1	14.7
			(3.2)	(3.7)
Djibouti	0.9	1.1	120	177.9
			(6.0)	(6.0)

Source: International Monetary Fund, World Economic Outlook Database, April 2015

2.2 Maritime transport in East Africa

Container handling volumes in major African countries for 2013 are shown in Figure 2.2.1. Egypt (Port Said) handled the largest volume (over 4.1 million TEUs) followed by South Africa (Durban) of 2.63 million TEUs. The location of major ports in East Africa is shown in Figure 2.2.2.

Figure 2.2.1 Container Throughput in Africa
Source: Containerisation International Lloyd's List 2013

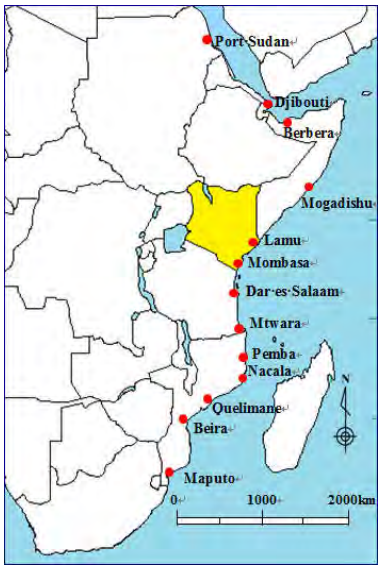


Figure 2.2.2 Location of Major Ports in East Africa
Source: Study Team

2.2.1 Category and type of vessels calling at East African ports

(1) Djibouti Port

Djibouti is a main gateway port for Ethiopia connected through the Addis Ababa corridor (which has been operating since 1998).

a) Table 2.2.1 below shows all types of vessels that called Djibouti from 2010 to 2014. General cargo vessels increased by 48% from 2010 to 2014 while container vessels increased by about 36% during the same period. A total of 1,406 commercial vessels called in 2014.

Table 2.2.1 Calling Record in Djibouti

Type of Vessels	2010	2011	2012	2013	2014
Container vessels	531	684	594	643	720
General Cargo	158	171	205	217	235
Car Carrier/RoRo	105	81	84	66	65
Bulk Carrier	61	79	86	76	61
Tankers	109	97	91	99	86
Livestock	115	117	90	46	80
Navy Vessels	411	382	327	367	288
Others	60	119	100	130	159
Total	1550	1730	1577	1644	1694

Source; Djibouti Harbour Control Office

Vessels which called Mombasa in 2014 are shown below for comparison. While 720 container vessels called Djibouti in 2014, only 557 container vessels called Mombasa.

Car carrier/Ro-Ro made over 200 calls to Mombasa in 2014 whilst Djibouti only had 65 calls in 2014 (Car carrier and Ro-Ro figure combined). This is due differences in the commercial characteristics of each country's trade.

Table 2.2.2 Calling Record in Mombasa (2014)

Type of Vessels	Nos. of calls
Container Ship	557
General Cargo	285
Ro-Ro vessel	49
Car Carrier	156
Bulk Carrier	210
Tankers	194
Total	1,451

Source: KPA Statistics

a) Length Overall (LOA), Dead weight tons (DWT), draft & TEU particulars of all vessels which called Djibouti in April 2015 are shown in Table 4.5.3.

Table 2.2.3 Actual Vessel Size & Type at Djibouti

Type of Vessels	Vessel Name	DWT	LOA(m)	Draft(m)	TEU
General Cargo	LE CONG	29,108	182	9.6	
	MEKELE	28,066	166	9.1	
	GAMBELLA	28,119	166	7.4	
	ADMAS	13,593	137	8.7	
	SHEBELLE	27,391	178	9.0	
Car Carrier	MORNING CHANT	20,190	200	8.2	
Bulk Carrier	TALENT	47,574	190	11.5	
	MAINE DREAM	58,105	189	11.7	
	SEA QUEEN II	57,000	183	10.1	
Full Container	MSC NOA	44,552	241	10.5	3,044
(Djibouti Container Terminal)	KOTA CARUM	**83,963**	**299**	**10.3**	**6,600**
	STADT KOLN	44,234	222	9.2	3,398
	KOTA KASTURI	39,916	233	10.3	3,091
	MAERSK UTAH	61,454	292	11.0	4,400
	KOTAMAIM	39,763	233	8.8	3,080
	MAESRK DETROIT	**84,688**	**299**	**10.4**	**6,200**
	APL GERMANY	67,009	280	12.0	5,888
	BARBADOS	52,325	258	10.2	4,308
	SAFMARINE CHAMBAL	65,458	249	9.0	4,496
Tankers	ETC NEFERTARI	49,749	189	11	
(Djibouti Oil Terminal)	UACC HARMONY	45,913	179	12	
	CHANG HNG KAI TUO	45790	185	12	

Source: Dibouti Port Authority

General cargo vessels and bulk carriers are of similar size as those currently calling Mombasa but container vessels are larger than those calling Mombasa because of differences in berth depths (3 berths with depths of 17~18m are available in Djibouti which were built in April 2008 to accommodate 6,600TEU type vessels which have a DWT of 84,000 tons and LOA of nearly 300 meters).

b) Comparison between berth capacity at Djibouti and Mombasa ports

Djibouti is already able to accommodate 6,000-6,600 TEU sized container vessels. The differences between the container berths in Djibouti and Mombasa ports are indicated in Table 4.5.4.

Table 2.2.4 Djibouti and Mombasa Berths

Djibouti Berth	Ro-Ro	General	Container	Container	Oil	Total
Numbers	1	10	3	3	5	22
Depth (m)	11	7.8-11.3	9.5-12	17-18	12-19	
Mombasa Berth	Ro-Ro	General	Container		Oil	Total
Numbers	2	9	6		2	19
Depth (m)	10.5	10.5-11.5	10.5-13.5		9.76-13.4	

Source: JICA Study Team

c) Main regular Services

There are scheduled services by main carriers such as Maersk, MSC, PIL and ad-hoc by Evergreen

and COSCO for which the route maps are shown below.

Maersk Line

Maersk Line employs a 6200TEU (LOA 299m) type on the Suez Canal-Djibouti-Salalah-Jebel-Ali- Port Qasim - Pipavav-Jawaharlal Nehru- Salalah route, the details of which are listed below.

Table 2.2.5 Maersk Schedule

Port	Terminal	Arrival	Departure
Suez Canal	Canal Zone Terminal	2015/4/27 19:00	2015/4/28 17:00
Djibouti	Djibouti Dorale Container Terminal	2015/5/2 20:00	2015/5/3 9:00
Salalah	Salalah Terminal	2015/5/6 1:00	2015/5/6 11:00
Jebel Ali Dubai	Jebel Ali Terminal 2	2015/5/10 9:00	2015/5/10 21:00
Port Qasim	Port Qasim Terminal	2015/5/13 18:00	2015/5/14 14:00
Pipavav	Pipavav Terminal	2015/5/15 22:00	2015/5/16 13:30
Jawaharlal Nehru	Jawaharlal Nehru NSICT	2015/5/17 6:00	2015/5/18 18:00
Salalah	Salalah Terminal	2015/5/21 8:00	2015/5/21 20:00

Source: Maersk Line Web Site

PIL

PIL has three services 1) PIL employs a 6600TEU vessel for China direct service and a 3,000 TEU vessel for Indian Sea service, which regularly calls at Singapore – Nansha – Shanghai – Ninbo – Chiwan – Singapore – Djibouti – Aden – Jeddah – Sokhna - Aqaba. 2) Indian Sea calls at Mundra – Karachi - Jebel Ali – Aden – Jeddah - Port Sudan - Djibouti. 3) PIL also operates gulf feeders between Djibouti – Hodeidah port.

Those three services are mapped below.

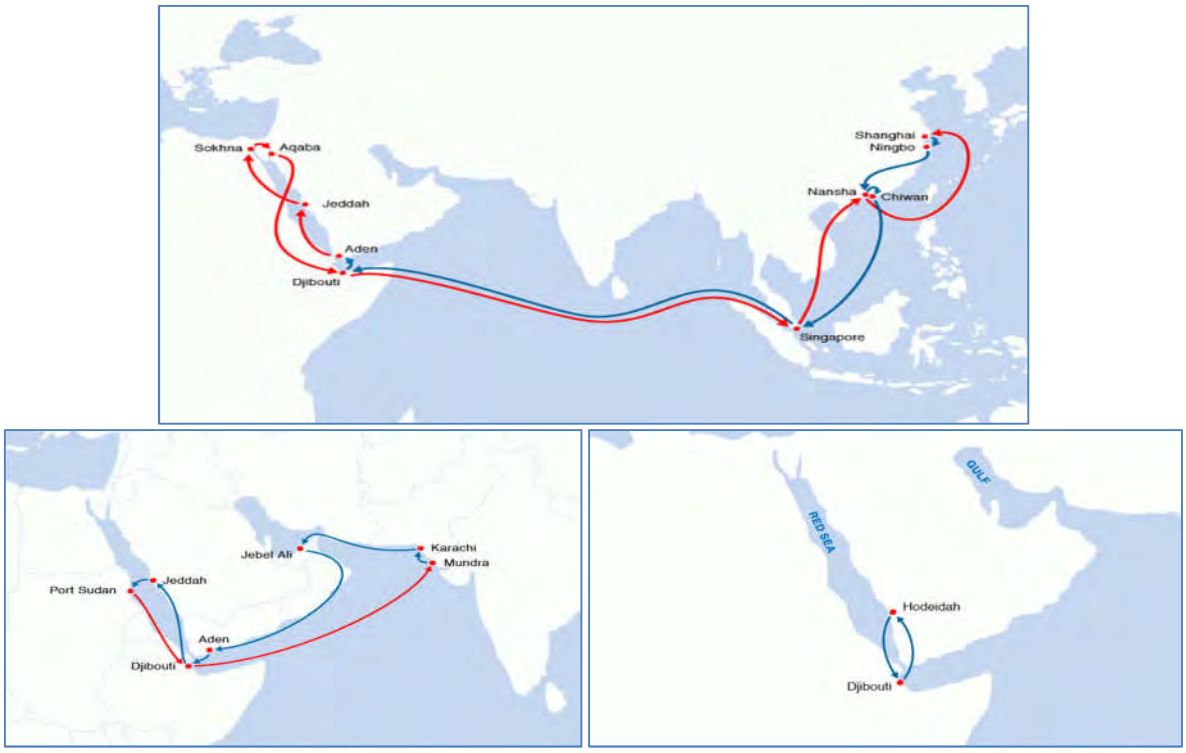


Figure 2.2.3 PIL Services at Djibouti
Source: PIL Web Site

(2) Port Sudan

Port Sudan has two areas, a North port and South port which faces the Red Sea as its main trading port. Container service is concentrated on the South port by Sea Ports Corporation.

a) Berths 13 and 14 and 16, 17 and 18 are operated 24 hours a day as container terminals. No.15 is a grain/bulk terminal, which is operated by Sea Ports Corporation. The largest container berth is No.13 with a depth of 16m and LOA of 400m which is suitable for larger sized vessels such as MSC (14,000TEU) as shown below.

Table 2.2.6 Port Sudan (South)

Berth No.	Depth/m	Length/ m	Usage
13	16.0	400	Containers
14	16.0	381	Containers
15	10.7	192	Grain/Bulk/G.C
16	10.7	143	Containers
17	12.6	210	Containers
18	12.6	210	Containers

Source: Port Sudan Port Report

b) Calling liner services

Shipping lines calling at Port Sudan are: Maersk, MSC, COSCO, CMACGM, Evergreen, PIL and UASC as follows.

1) Maersk Line

Is operating 3,500 ~ 4,330 TEU vessels weekly on the Jebel Ali – Djibouti – Jeddah - Port Sudan - Djibouti route.

2) MSC - Operating between Yantian - Chiwan / Singapore - Port Sudan with DWT 162,000 sized full container vessel (LOA 366m, width 51m=21 rows, draft 16m, 14,000TEU sized) every week.

3) CMACGM & Evergreen– Jointly Operating between Port Sudan with 4,400 TEU sized vessel between China and Malaysia (Port Kelang) weekly as shown in the following Figure 2.2.4.

Figure 2.2.4 CAM CGM China/ Port Kelang service

Source: CMACGM Web Site

4) PIL – By following the Indian Service available at Port Sudan
Calling rotation is Port Sudan – Djibouti –Mundra –Karachi –Jebel Ali – Aden-Jeddah.

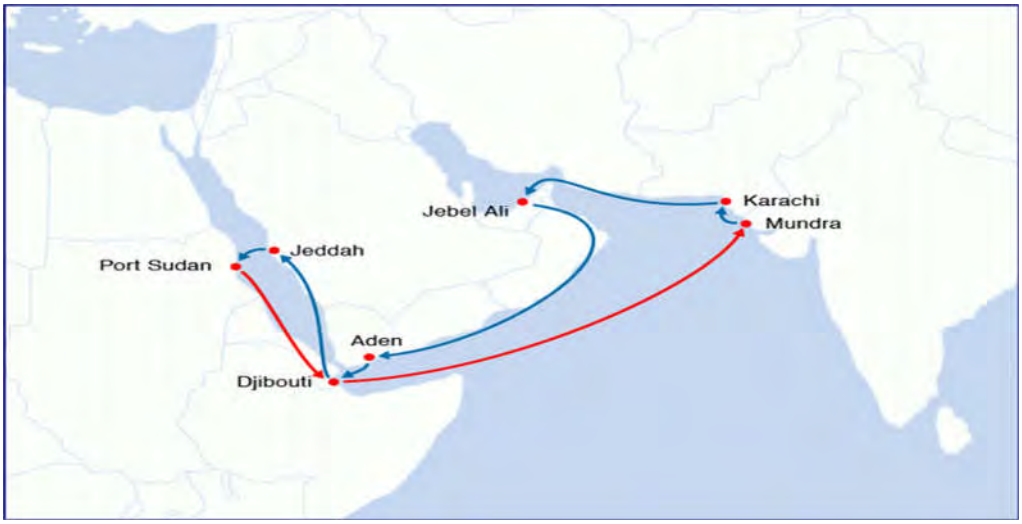


Figure 2.2.5 PIL Port Sudan Service
Source: PIL Web Site

(3) South Sudan

a) Via Kenya

South Sudan does not have its own Sea Port as the country is landlocked. It relies on transit cargo, mainly containers, from Mombasa, Kenya and Somaliland.

Cargo via Mombasa was approximately 10% of total Mombasa transit cargo.

Table 2.2.7 South Sudan via Mombasa

(unit:1,000 tons)

	Year	2007	2008	2009	2010	2011	2012	2013	2014
S.Sudan	Export	145	220	155	190	376	736	717	697
	Import	0	3	12	33	41	30	59	64
	Total	145	223	167	223	417	766	776	761
Mombasa	Export	4,043	4,471	4,611	5,003	5,166	6,201	6,196	6,691
	Import	380	403	369	378	430	424	513	508
	Total	4,423	4,874	4,980	5,381	5,596	6,625	6,709	7,199

b) LAPSSET Corridor

The following map shows the ideal corridor under LAPSSET, which is a major cargo route to the Capital, Juba, but cargo is currently moving via Mombasa. To make shipping cargo to South Sudan more efficient, Lamu can play an important role in Kenya, and would be competitive against the Berbera corridor via Somalia (see Figure 2.2.6).

Figure 2.2.6 LAPSSET Corridor
Source: LAPSSET Corridor Development Authority

c) Berbera - Juba Corridor

There is another corridor that runs from Berbera to Juba (capital of South Sudan) which connects directly to Sudan from discharge at the Port (see Figure 2.2.7).

Figure 2.2.7 Berbera to Juba Corridor
Source: Berbera Port Authority

(4) Somalian Ports

Somalia has two major ports of call, Berbera port (facing the Red Sea) and Mogadishu port under the control of the Somaliland Authority.

The Republic of Somaliland is situated in the Horn of Africa. Its boundaries are defined by the Gulf of Aden in the north, Somalia in the east, the Federal Republic of Ethiopia in the south-west, and the Republic of Djibouti in the north-west. It lies between Latitudes 8° and 11°27″ North and Longitudes 42°35′ and 49° East; it has mountain ranges rising up to six and seven thousand feet in the center and

in the east of the country respectively. The total area of the Republic of Somaliland is 137,600sqkms, and it has a coastline which is 850kms long.

a) Berbera has been operating as a port for more than a 1000 years; the present facilities were developed initially by the Soviet Union in 1968 (300 meter berth) and expanded by the USA in 1984 to 350 meters.

In 2011, the volume of import containers reached nearly 15,000TEU, however there is no breakdown by individual commodity in the container statistics.

Information on berth dimensions is limited but shown below in Table 2.2.8.

Table 2.2.8 Berbera Berth

	General Cago Berth					Ro-Ro Berth
Berth	No.1	No.2	No.3	No.4	No.5	No.6
Length (m)	125	125	125	125	125	25
Depth (m)	-9	-9	-9	-9	-11	-9

Source: Berbera Port Authority

b) The number of vessels calling at Berbera increased rapidly from 2007-2011 but the figures for 2012/2013 have not yet been reported by the port authority.

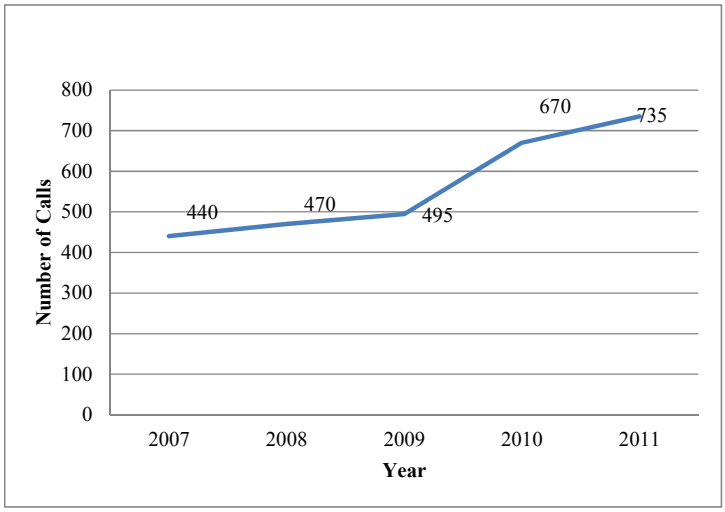


Figure 2.2.8 Berbera Port Traffic
Source: Berbera Port Authority

c) Regular Service –Berbera calling

PIL is provides service for Djibouti- Berbera- Massawa on the feeder service shown below.

Figure 2.2.9 PIL Somalia Berbera Feeder Service
Source: PIL Web Site

d) Regular Service-Mogadishu after Mombasa is called on.

Regular service is operated by CMACGM as shown in the following calling route between Khor Al Fakkan, Jebel Ali.

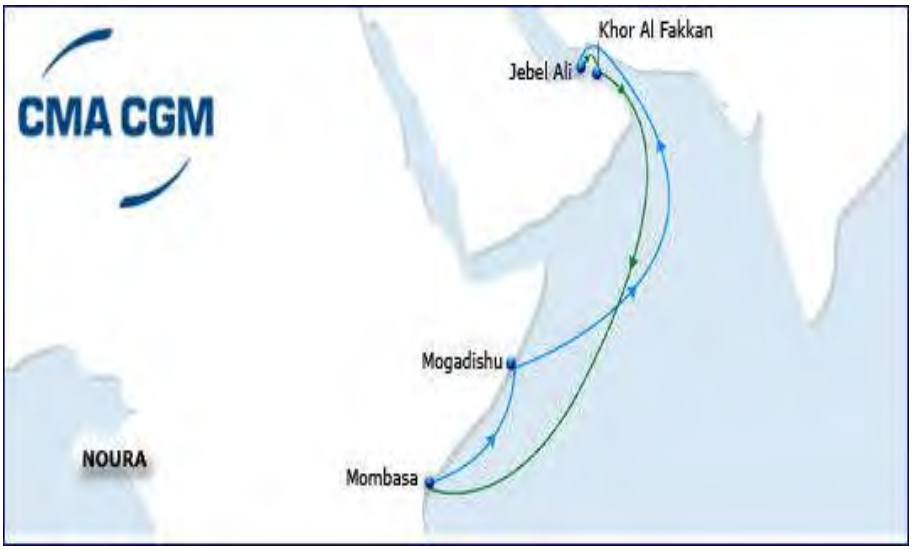


Figure 2.2.10 Mombasa-Mogadishu-Khor Fakkan Service
Source: CMACGM Web Site

However, vessel size, at present, is limited because of the size and depth of the berths in both ports.

Vessels ranging from 1,600~2,200TEU typically call the ports. This service was not found in 2013 when the first survey of vessels calling Mombasa was conducted.

Table 2.2.9 Vessels Employed (2015) by CMACGM

Vessel Name	Ships geared	TEU Size
CMACGM KAILAS	Y	1,854
CMACGMLA TOUR	Y	2,272
MARIE DELMAS	Y	2,207
OSAKA TRADER	N	1,613

Source: CMACGM Web Site

Of the 4 container vessels deployed on this route, three have ship's gear and one is a gearless vessel.

e) Mogadishu Port

Mogadishu is located in Somalia north of Kenya as per the following map.

Figure 2.2.11 Mogadishu Port
Source: Google Map

Mogadishu port is not fully containerized but accepts most general cargo vessels at its current 6 berths.

No.6 berth, with a depth of 10 m, is the only berth in Mogadishu capable of accommodating a 200m sized vessel.

Table 2.2.10 Mogadishu Berths

	General Cargo Berth					Container Berth
Berth	No.1	No.2	No.3	No.4	No.5	No.6
Length (m)	160	160	160	160	140	200
Depth (m)	-10	-10	-10	-8	-8	-10

Source: Somaliland Port Authority

(5) Tanzania

a) Dar es Salaam, Tanga and Mtwara ports

Table 2.2.11 shows ships calling at major ports in Tanzania in 2012/2013 and 2011/2012. In 2012/2013, 347 vessels for dry bulk/general cargo, 477 container ships and 138 tankers called at the three ports, namely Dar es Salaam, Tanga and Mtwara in Tanzania.

Table 2.2.11 Ship Calling at Major Ports in Tanzania

Tanzanian Major Ports	DAR ES SALAAM		TANGA		MTWARA		TOTAL	
	2012/13	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13	2011/12
(a) Dry General Cargo Vessels								
Number of Calls	329	342	7	2	11	34	347	378
GRT ('000)	12,772	12,201	200	29	91	256	13,063	12,486
(b) Container Vessels								
Number of Calls	370	419	78	93	29	28	477	540
GRT ('000)	8,166	8,610	1,228	1,445	446	398	9,840	10,453
(c) Tankers								
Number of Calls	136	120	1	2	1	-	138	122
GRT ('000)	3,541	3,015	28	59	3	-	3,572	3,074
Total -ship call	**835**	**881**	**86**	**97**	**41**	**62**	**962**	**1,040**
Total GRT('000)	**24,479**	**23,826**	**1,456**	**1,533**	**540**	**654**	**26,475**	**26,013**

Source: TPA Statistics

Based on the report of "Port of Dar es Salaam, due partly to the modernizing of Berths 1-7 in 2013" by Tanzania Port Authority (TPA), a total of 781 vessels called at Berths 1 to 11 in Dar es Salaam Port from July 2010 to June 2011 (Year 2010/2011); 467 were container vessels, 54 dry cargo vessels, 81 general cargo vessels and 178 Ro-Ro vessels. Table 2.2.12 shows average and maximum size for various types of vessels calling at Dar es Salaam Port

Table 2.2.12 Average and Maximum Vessel Calling at Dar es Salaam Port in 2010/2011

Vessel Type		DWT	LOA (m)	Beam (m)	Draft (m)	Parcel Size
Container (Berth 1-7)	Average	24,907	181	27.1	8.8	1,200TEU
	Maximum	34,682	212	32.0	11.4	
Container (Berth 8-11)	Average	24,041	176	26.3	8.9	1,200TEU
	Maximum	55,321	234	32.3	11.9	
Dry Cargo	Average	32,269	171	26.7	9.2	23,000t
	Maximum	58,020	190	32.3	11.4	
General Cargo	Average	21,377	155	24.5	7.6	11,000t
	Maximum	53,565	199	32.3	10.5	
RoRo	Average	29,217	201	31.1	9.7	
	Maximum	41,373	217	32.3	10.8	
Car Carrier	Average	17,868	191	31.3	8.3	490nos.
	Maximum	36,837	232	33.0	9.7	

Source: "Port of Dar es Salaam Modernizing of Berth 1-7 in 2013" by Tanzania Port Authority

A 58,020 DWT bulk carrier was the maximum size in Dar es Salaam Port, followed by a container ship (55,321 DWT), a general cargo ship (53,565 DWT), a RoRo ship (41,373 DWT), and a car carrier (36,837 DWT).

Current TPA regulations allow a maximum length over all of only 234 m, whereas vessels with a draft of more than 9.4 m or a length over 200 m are restricted to high tides adding approximately 2 m water depth for the passage through the entrance channel. However the deepest draft ship at a TPA berth during the reporting period ending June 2011 had a draft of 11.9 m.

For reference, vessels calling in January 2015 in Tanzanian ports are shown in Table 2.2.13.

Table 2.2.13 Calling Vessels in Tanzanian Ports in January 2015

Port	Vessel Type	DWT	LOA (m)	Beam (m)	Draft (m)
Dar es Salaam	Car Carrier	14,868	182.8	32.2	8.5
	Car Carrier	19,670	199.3	32.0	9.2
	Tanker	45,987	180.0	32.0	9.9
	Container	35,976	208.0	33.0	11.0
	Container	33,807	207.3	29.8	11.0
	Container	35,980	201.5	32.3	10.8
	Container	33,751	207.4	29.8	10.5
	Bulk	55,628	190.0	32.2	6.8
	Bulk	31,754	177.4	28.2	6.6
	General Cargo	23,440	164.4	22.9	6.5
Tanga	LNG Tanker	84,980	285.4	43.4	9.3
	Container	22,967	184.2	25.3	9.8
	Bulk	50,271	189.8	32.3	12.3
Mtwara	Container	18,871	160.0	28.0	6.1
	Bulk	28,200	169.3	27.2	5.8

Source: World's Port Database Internet Service

According to the above table, a 55,628 DWT bulk carrier was the maximum size in Dar es Salaam Port, followed by a tanker (45,987DWT), a container ship (35,980 DWT), a general cargo ship (23,440 DWT) and a car carrier (19,670 DWT). It is noted that the maximum size vessels are similar in both Table 4.5.12 and Table 4.5.13 even though the recorded period is one year for the prior and only one month for the latter.

Size of a bulk carrier calling into Tanzania is limited and a Handy-Bulker or Handy-Max type is the maximum size under the present port condition. A bulk carrier such as over 55,000 DWT needs to reduce its cargo to half loaded condition (or call at multiple ports in advance) to reduce its draft. Dry/liquid bulk trade business has totally different characteristics compared to the container trade business. Bulk commodities are often traded on spot market basis and carriers do not follow a schedule. Further, bulk trade business is served using dedicated carrier lines between sources and destinations. Tankers move on a regular basis to supply their own land side storage tanks without missing the supply chain under a contract basis or their own internal supply systems.

TPA has already started port development under a Master Plan in 2009 in Dar es Salaam Port with main funds being supplied through the World Bank (EATTFP). The main development is the container terminal refurbishment aiming at container handling over 650,000 TEUs. Mtwara Port also has a development plan for gas, coal and iron ore. It is expected that the above development will require more ship calls and the deployment of larger size vessels.

b) New Bagamoyo Port

It is proposed by Hamburg Port Consulting GmbH (HPC) on feasibility Study to develop a state-of-the-art port for containers and imported vehicles at Mbegani-Bagamoyo. The design is based on PostPanamax vessels, and a compact and reliable RTG (Rubber Tyred Gantry Crane) Yard System

and high capacity road and rail connectivity. According to DFR report with volumes and pattern the recommended specification of main port components is as follows:

- Access Channel:
  Length: 4,460 meters, Width: 230 meters, Depth:-15.5 m CD alternatively-13.5 m CD
- Outer Turning Basin:
  Diameter: 560 meters
- Container Berths:
  Depth Alongside: -14.5m CD, Length of one berth: 300 meters
- Vehicle Carrier Berths:
  Depth Alongside: -12.0 m CD, Length of one berth: 220 meters
- Service Berth:
  Depth Alongside: -4.0 m CD, Length: 200 meters
- Tug Boats:
  Bollard Pull: 45 to 55 tons
- Ship-Shore Container Crane:
  Type: Post-Panamax
- Full Container Stacking:
  Rubber Tyred Gantry Cranes: 16 wheels
- Stacking Height:
  One over five
- Rows within portal:
  Seven plus one
- Empty Container Handler:
  Stacking Height: Five

Based on the assessment of

- the competitive situation of Tanzanian ports in the regional context,
- the economic perspectives of Tanzania and its landlocked transit countries, and
- possible transshipment activities,

container throughput of the proposed port at Mbegani-Bagamoyo are forecasted below.

Table 2.2.14 Container Throughput Forecast 2020 ~ 2030 (Base Forecast)

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	PHASE I					PHASE II				PHASE III	
Throughput (quayside)											
1,000 TEU p.a.	200	300	400	500	613	786	975	1.183	1.411	1.663	1.939
1,000 Containers p.a.	136	203	270	335	409	522	644	778	924	1.083	1.256
TEU-Factor	1,47	1,48	1,48	1,49	1,50	1,51	1,51	1,52	1,53	1,54	1,54

Source: TPA Bagamayo Port Feasibility Study DFR

According to the Terms of Reference, the forecasting horizon is 2025. However, as Mbegani-Bagamoyo port is expected to start operations by 2018 at the earliest, the resulting time span of eight years for operational planning and economic and financial feasibility analysis would be too short to arrive at realistic results. Thus, the forecasting period is extended to 2030. As requested by the ToR, three alternative developments are projected.

Phased port development schedules for each three development alternatives (high forecast/base forecast/low forecast) are shown in Table 2.2.15. The comparatively large increase in the forecast traffic volumes requires a rather tight phasing of port construction and extension. The determining element for this phasing is the quay wall that represents the most expensive single construction item apart from dredging. A three-phase development approach is proposed.

Table 2.2.15 Phased Development Schedule for Each Case

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
High Forecast	Phase I						Phase II				Phase III		
Base Forecast			Phase I					Phase II				Phase III	
Low Forecast					Phase I								Phase II

Source: TPA Bagamayo Port Feasibility Study DFR

It is also reported that the proposed initial quay length of approximately one kilometer shall ensure successful entry into the market and shall provide sufficient capacity to sustain in the competition with neighboring ports. The following phasing might appear very tight at first site. It should, however, be kept in mind that this schedule is based on a long-term traffic projection with all its uncertainties. The timing of the proposed 2nd and 3rd phase can and will be adapted to actual traffic growth.

In order to minimize dredging, and to make best use of Luale Bay and to secure sufficient shore-line reserve for long-term port extension, it is recommended to locate the new port at the western end of the bay partly covering the site of Mbegani Fisheries Development Centre. This location is almost in line with the port position proposed in the TPMP 2009. The total area required for the development of the new port until 2030 will have a size of approximately 2 km x 0.9 km or 180 ha. The expected port development until 2030 will not require terrain presently occupied by Mlingotini Village.

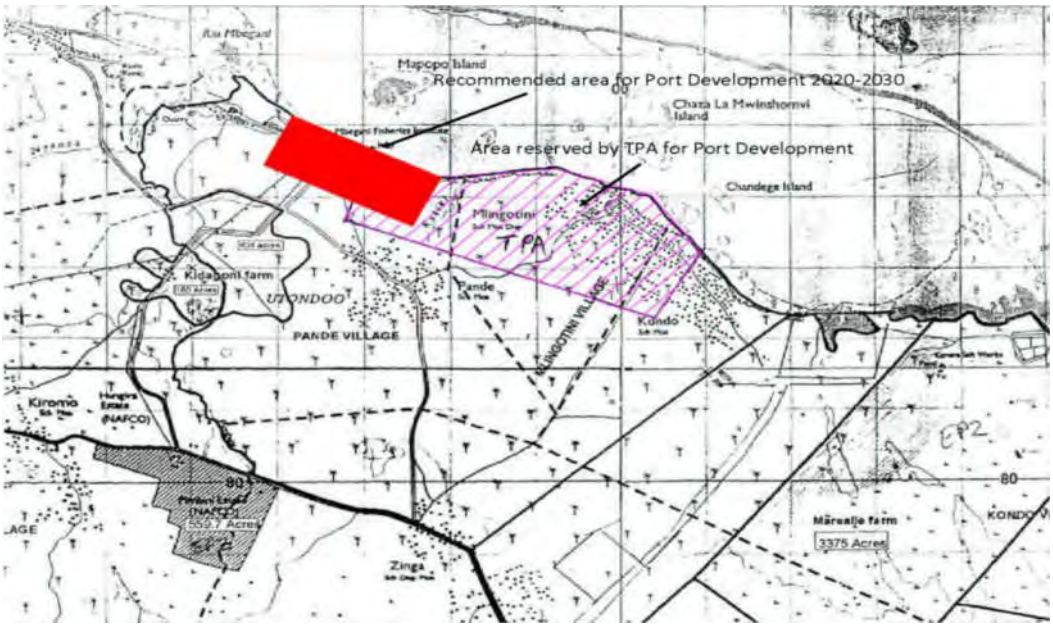


Figure 2.2.12 Position of the Proposed Port at Mbegani-Bagamoyo
Source: TPA Bagamayo Port Feasibility Study DFR

(6) Mozambique

Table 2.2.16 shows ship calls at major ports in Mozambique in 2008 and 2009.

Table 2.2.16 Ship Calling at Major Ports in Mozambique in 2008 and 2009

Vessel Type	Nacala		Beira		Maputo	
	2008	2009	2008	2009	2008	2009
Container	97	108	114	144	N/A	N/A
General Cargo	41	37	118	139	N/A	N/A
Bulk Cargo	3	10	-	-	N/A	N/A
Tanker	58	71	98	103	N/A	N/A
Others	64	73	66	152	N/A	N/A
Total	263	299	396	538	761	613

Source: The Preparatory Survey on Nacala Port Development Project in the Republic of Mozambique in 2011 by JICA

Nacala Port received 299 vessels including 108 container vessels in 2009 and the average cargo handling volume per vessel call is around 4,000 tons or 480 TEUs inbound and outbound. The total number of cargo vessels calling in Beira Port in 2009 was 386 of which 27 % were container vessels. The number of container vessels increased by 26 % compared to the previous year. The number of vessels calling at Maputo Port was 761 in 2008 and 613 in 2009. Thirteen container lines called at the port in 2009, whereas only 5 lines called in 2007.

Dimensions of maximum sized vessels calling at Nacala Port are shown in Table 2.2.16. As shown in Table 4.5.15, 50,000 DWT class vessels call at the port almost every month and occasionally even larger vessels enter the port. Though all these large vessels are conventional vessels such as grain bulkers, they berth at container quays due to the shortage of water depth at general cargo quays. This mixed operation makes port traffic very complicated and hampers container operation.

Table 2.2.17 Dimensions of Maximum-Sized Vessels Calling at Nacala Port

	Year 2008	Year 2009											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LOA	228	185	190	197	200	186	189	187	193	190	196	190	190
Draft	12.0	10.2	10.4	10.5	11.2	11.6	8.9	11.0	10.5	10.9	10.1	10.8	12.5
GT	43,793	30,06	30,963	29,828	24,679	29,733	30,751	30,081	29,998	29,130	30751	28,097	31,236
DWT	76,520	43,245	55,541	50,242	47,512	51,603	47,463	49,999	23,076	74,141	41,035	47,401	56,057

Source: The Preparatory Survey on Nacala Port Development Project in the Republic of Mozambique in 2011 by JICA

For reference, vessels calling in January 2015 into Mozambican ports are shown in Table 2.2.18.

Table 2.2.18 Calling Vessels in Mozambican Ports in January 2015

Port	Vessel Type	DWT	LOA (m)	Beam (m)	Draft (m)
Nacala	RoRo	45,200	240.0	37.5	8.9
	Tanker	31,975	177.0	30.0	7.2
	Tanker	32,127	177.2	30.0	7.0
	Container	33,995	208.0	29.8	8.5
	Container	25,985	179.7	27.6	8.1
	Container	34,333	208.9	29.9	8.6
	Container	35,926	199.9	29.8	9.7
	Bulk	58,780	189.9	32.3	12.6
	General Cargo	14,386	127.6	20.0	6.4
Beira	Tanker	50,386	189.0	32.0	7.8
	Tanker	47,128	183.2	32.2	10.0
	Tanker	47,465	182.4	32.2	9.6
	Tanker	50,013	182.5	32.2	9.5
	Tanker	49,749	189.0	32.2	10.4
	LPG Tanker	26,361	174.0	28.2	10.5
	Container	27,500	181.5	31.5	8.1
	Container	14,148	163.4	22.3	8.1
	Container	13,464	146.7	23.3	6.8
	Container	24,924	193.0	28.0	8.2
	Bulk	53,776	194.0	32.0	7.8
	Bulk	55,783	187.8	32.3	9.6
	General Cargo	12,684	138.0	21.4	8.0
Maputo	Car Carrier	13,363	184.1	30.6	8.4
	LPG Tanker	5,261	106.0	17.6	5.4
	Container	33,796	187.4	30.0	9.7
	Container	41,815	199.0	32.3	12.0
	Bulk	57,552	190.0	32.0	6.7
	Bulk	32,768	179.8	28.0	6.7
	Bulk	28,343	169.3	28.0	9.2
	Bulk	57,800	185.0	32.0	6.5
	Bulk	57,079	189.0	32.3	10.6
	Bulk	28,200	169.3	27.2	5.8
	Bulk	44,062	190.0	30.5	6.6
	Bulk	55,649	190.0	32.3	9.1
	Bulk	58,923	196.0	32.3	6.7
	Bulk	58,686	197.0	32.3	12.1

Source: World's Port Database Internet Service

According to Table 2.2.18, maximum size of vessels in each port is a 58,780 DWT bulk carrier, a 55,783 DWT bulk carrier and a 58,923 bulk carrier in Nacala, Beira and Maputo, respectively. It is expected that maximum size of vessels is a 50,000~60,000 DWT class for bulk carriers, a 40,000~50,000 DWT class for tankers and a 35,000~40,000 DWT class for container ships.

Nacala Port is a natural deep sea port with 15m depth and a new container terminal is planned by modification of the conventional berth. It is expected in the near future that larger size vessels, especially container ships, will call at the port after development of the terminals including Beira and Maputo.

(7) Category and type of vessels calling at major East African ports

Table 2.2.19 shows the category and type of vessels calling at major East African ports. The biggest container vessel (84,688DWT, LOA 299m, Draft 10.4m) in East African Ports can be accommodated in Djibouti Container terminal in Djibouti.

Table 2.2.19 Category and Type of Vessels Calling at Major East African Ports

Country	Port	Vessel Type		DWT	LOA (m)	Beam (m)	Draft (m)	Parcel Size
Djibouti	Djibouti Port	General Cargo		13,593~ 29,108	137~200	-	7.4~9.6	
		Car Carrier		20,190	200	-	8.2	
		Bulk Carrier		47,574~ 58,105	183~190	-	10.1~11.7	
		Full Container (Djibouti Container Terminal)		39,763~ **84,688**	222~**299**	-	8.8~**10.4**	3,080TEU~ **6,600TEU**
		Tankers (Djibouti Oil Terminal)		45,913~ 49.749	183~192	-	11~12	
Tanzania	Dar es Salaam Port	Container (Berth 1-7)	Average	24,907	181.0	27.1	8.8	1,200TEU
			Maximum	34,682	212.0	32.0	11.4	
		Container (Berth 8-11)	Average	24,041	176.0	26.3	8.9	1,200TEU
			Maximum	55,321	234.0	32.3	11.9	
		Dry Cargo	Average	32,269	171.0	26.7	9.2	23,000t
			Maximum	58,020	190.0	32.3	11.4	
		General Cargo	Average	21,377	155.0	24.5	7.6	11,000t
			Maximum	53,565	199.0	32.3	10.5	
		RoRo	Average	29,217	201.0	31.1	9.7	
			Maximum	41,373	217.0	32.3	10.8	
		Car Carrier	Average	17,868	191.0	31.3	8.3	490nos.
			Maximum	36,837	232.0	33.0	9.7	
	Tanga Port	LNG Tanker		84,980	285.4	43.4	9.3	
		Container		22,967	184.2	25.3	9.8	
		Bulk		50,271	189.8	32.3	12.3	
	Mtwara Port	Container		18,871	160.0	28.0	6.1	
		Bulk		28,200	169.3	27.2	5.8	
Mozambique	Nacala	RoRo		45,200	240	37.5	8.9	
		Tanker		31,975~ 32,127	177~ 177.2	30.0	7.0~ 7.2	
		Container		25,985~ 35,926	179.7~ 208.9	27.6~ 29.9	8.1~ 9.7	
		Bulk		58,780	189.9	32.3	12.6	
		General Cargo		14,386	127.6	20.0	6.4	
	Beira	Tanker		47,128~ 50,386	182.4~ 189	32.0~ 32.2	7.8~ 10.0	
		LNG Tanker		26,361	174.0	28.2	10.5	
		Container		13,464~ 27,500	146.7~ 193.0	22.3~ 31.5	6.8~ 8.2	
		Bulk		53,776~ 55,732	187.8~ 194.0	32.0~ 32.3	7.8~ 9.6	
		General Cargo		12,684	138.0	21.4	8.0	
	Maputo	Car Carrier		13,363	184.1	30.6	8.4	
		LNG Tanker		5,261	106.0	17.6	5.4	
		Container		33,796~ 41,815	187.4~ 199.0	22.3~ 31.5	6.8~ 8.2	
		Bulk		28,200~ 58,923	169.3~ 197.0	27.2~ 32.3	5.8~ 12.1	

Source: Summarized by the Project Team

Moreover, Table 2.2.20 shows container ships and their shipping routes through Mombasa Port by each operator.

Table 2.2.20 Summary of Container Vessels and Shipping Routes by Operator

Operator	Service	Vesel TEU	LOA(m)	DWT	Calling Ports	Remarks
CMA-CGM S/A & Emirates Shipping (CMACGM)	ASEA	2,556~ 2,794 (6 vessels)	208~212 (Width 32.2)	34,248~ 41,411	**Mombasa**~Tanga~Dar Es Salaam~Port Kelang~ Singapore~Colombo~Port Victoria~**Mombasa**	Weekly
	SWAX2	2,600~ 2,650 (5 vessels)	207.9~210.0 (Width 31.3)	34,667~ 35,924	**Mombasa**~Khor Al Fakkan~Jebel Ali~**Mombasa**~ Dar Es Salaam~Zanzibar~Nacala~**Mombasa**	Weekly
Ever Green (EMC)	AEF	2,474~ 2,733 (5 vessels)	199.85~ 212.5 (W 30.1~33)	34,167~ 41,636	**Mombasa**~Dar Es Salaam~Singapore~Tanjung Pelepas~Columbo~**Mombasa**	Weekly by 5 vessels
IGNAZIO MESSINA (MESSINA) Shipping (MSC)	RoRo+ Containers	3,000 (4 vessels)	199.5~239.0 (W 30.1~33)	27,720~ 45,200	**Mombasa**~Dar Es Salaam~Maputo~Durban~ Nakala~Dar Es Salaam~ ~**Mombasa**~Jeddah~Leghorn~Barcellona~Marseille~ Castellon~~Maputo~**Mombasa**	Weekly by 4 vessels
	SALALA Express	2,200~ 2,300 (5 vessels)	195.71 (W 32.23)	34,907~ 41,771	**Mombasa**~Salalah-Dubai~Mundra~Quasim~**Mombasa**	Weekly
MEARSK Line	Mashariki Express	2,496 (7 vessels)	207.3~207.4	33,807~ 33,976	**Mombasa**~Dar es Salaam~Laem Chabang~ Tanjung Pelepas~**Mombasa**	Weekly
	Masika	2,510 (5 vessels)	207.4 (W29.8)	33,501~ 33,976	**Mombasa**~Salalah~Sharjah~Jebel Ali ~Salalah~ ~Dar Es Salaam~**Mombasa**	Weekly
	Mawingu Express	3,500 (5 vessels)	239.5 (W 32.19)	46,925~ 47,027	**Mombasa**~Victoria~Jawaharlal Nehru~Port Qasim~Salalah~**Mombasa**	Weekly
Pacific International (PIL)	AM2	1512 (4 vessels)	182 (Width 27)	23,665	**Mombasa**~Dar Es Salaam~Zanzibar-Mtwra-**Mombasa**~~Pemba~Mombasa	Weekly
	AM1	1,454~ 1,810 (8 vessels)	179.7~182.8 (Width 25)	23,840~ 25,989	**Mombasa**~Durban~Cape Town~Lagos~Lome~Tema~ ~Durban~Colombo~Hazira~Nhava Sheva~Jebel Ali~ Khor Fakkan~Karachi~**Mombasa**	Weekly
	EAS	2,546~ 2,754 (10 vessels)	211.9~226.5 (Width 32)	34,000~ 39,524	**Mombasa**~Singapore~Davao~Shanghai~Dalian~ ~Xingang~Qindao~Ninbo~Singapore~Colombo~ **Mombasa**	Weekly

Source: Summarized by the Project Team

2.2.2 Correlation between calling port and commodities handled

(1) Djibouti Port

Most of the inbound/outbound cargoes are destined/originated to or from Ethiopia, however, as stated in Chapter 2.2.1 there are no cargo statistics available to the public at present.

Most of the cargo to be consumed in Addis Ababa is regularly transported from the Djibouti-Addis corridor.

Livestock export is Somaliland's second most important export as 80 vessels entered for loading livestock headed for Arabian Gulf countries.

There is no exact country wise breakdown for transit containers via Djibouti but total handling volumes at Djibouti are shown in the table below.

Table 2.2.21 Djibouti Containers Handled (2011~2014)

(unit: TEU)

	DPWT(Dorale)				PDSA			
Status	2011	2012	2013	2014	2011	2012	2013	2014
Import & Import Transit	157,167	181,788	199,411	216,456	20,822	24,992	27,417	35,987
Export & export Transit	147,260	178,849	186,179	217,162	18,917	22,176	22,751	34,032
Transhipment	384,065	367,904	351,626	351,736	0	594	483	515
Shifting	15,125	14,732	6,577	7,963	622	428	287	176
Total Handlings	703,617	743,273	743,793	793,317	40,361	48,190	50,938	70,710

Source;Djibouti Harbour Control Office

The total handling volume in Djibouti in 2014 was 864,027 TEU which is a little smaller than the Mombasa figure (including transit to Uganda, Rwanda, DR Congo and South Sudan) but is very close to the 2013 result. Mombasa achieved over 1 million TEUs in 2014 as growth has been more rapid than in Djibouti. There are no statistics which list cargo to/from Ethiopia,

It is noteworthy that the 50,000 tons of bagged fertilizer imported into Ethiopia annually are transported via the Somaliland port of 'Berbera' under a new contract signed by the Ethiopian government in 2015.

(2) Port Sudan

Most of the service trades are between China (direct service) and Middle Eastern countries, however, there are no available cargo statistics or transit cargo breakdown at present. A visit to the Sudan port authority may be useful for acquiring such data.

However there are, as stated formerly, 5 full container berths in operation which serve mostly 4,400TEU ~ 14,000TEU (Max) vessels which suggests that a large volume of the containers are handled. The website for the Port of Sudan does not work properly.

(3) Somalian Ports

As stated in section 2.2.1. Livestock exports is an important source of revenue for Somalia and they exported 3.5 million heads in 2012.

Imports are mostly food (Rice, Wheat, Vegetables) for human consumption, clothing, cigarettes, and beverages, which are mostly consumed in Hargesia, the capital of Somaliland.

a) Export -Somaliland Ministry of National Planning and Development reported the following

export figures for livestock, which is the backbone of the Somaliland economy and provides subsistence to a considerable proportion of the local population. Livestock export contributes to more than 60% of the national GDP and earnings. Livestock is now regarded as a source of cash income to Somalia.

The largest market for Somaliland livestock exists in Middle Eastern countries, especially Saudi Arabia as the largest country. On average, sheep/goats make up about 85% of the total in average and the rest are cattle and camels.

Table 2.2.22 Somaliland Export Livestock

(unit: Heads)

Live Stock	2007	2008	2009	2010	2011	2012
Goat/Sheep	1,354,246	1,380,566	1,836,970	2,827,909	3,104,684	3,219,584
Cattle	87,476	84,541	133,670	207,195	150,934	190,354
Camel	14,149	30,468	48,608	124,154	107,281	102,664
Total	1,455,871	1,495,575	2,019,248	3,159,258	3,362,899	3,512,602

Source: Somaliland Statistical Buletin

Imports – Figures are steady and continue to be made up of products similar to those in 2013 but the figures for 2013 are still estimates as no figures have been published yet. Cigarettes and soap imports are increasing remarkably. Food imports consist of mainly Sugar, Rice, Wheat, Wheat Flour, Pasta and cooking oil.

Table 2.2.23 Somaliland Import Products

(unit: tons)

Commodity	2010	2011	2012	2013 (Q1)	2013 (Prosp.)
Foods	399,966	430,577	417,978	105,579	422,316
Track Spare Parts	16,942	17,646	15,722	7,713	30,852
Construction Mtrl.	202,722	252,179	205,728	55,887	223,548
Cloths	20,514	13,792	10,861	288	1,152
Cigarettes	6,872	9,225	9,011	3,812	15,248
Soap	9,993	11,592	9,148	4,520	18,080
Others	128,988	176,598	197,715	49,579	198,316
Total	785,997	911,609	866,163	227,378	909,512

Source: Somaliland Statistical Buletin

Note: Right hand column is the estimate for 2013, which was 4 times that of the Q1 figure.

Most of the import products are containerized but below container data has no breakdown by commodity at present.

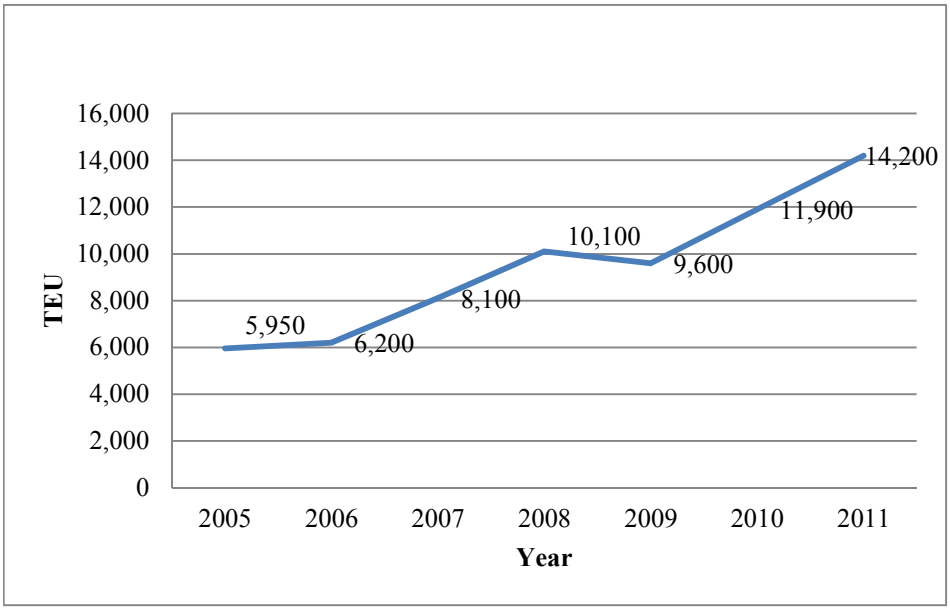


Figure 2.2.13 Berbera Imported Containers
Source: Berbera Port Authority

b) The Ethiopia government entered into an agreement in January 2015 with Berbera port to handle 50,000 tons of fertilizer at Somalia for transport to Ethiopia by the Berbera-Addis Ababa corridor instead of Djibouti port, which is shown below.-

Figure 2.2.14 Berbera- Addis Ababa corridors
Source: Berbera Port Authority

(4) Tanzania

Table 2.2.24 shows cargo handling volumes at ports in Tanzania.

Table 2.2.24 Cargo Handling Volume in Tanzanian Ports in 2012/2013
Unit: 1,000 tons

Port	Import Bulk				Export Bulk			Total
	Dry	Break	Liquid	Total	Break	Liquid	Total	
Dar es Salaam	1,743	4,440	4,261	10,443	1,926	75	2,001	12,444
Tanga	250	89	6	345	113	0	113	458
Mtwara	0	65	0	65	139	0	139	204
Others	0	75	16	92	30	0	30	122
Total	1,993	4,669	4,283	10,945	2,208	75	2,283	13,228

Source: Tanzania Port Authority

Dar es Salaam Port is the largest port and handled 94 % of the total bulk cargoes in Tanzania in 2012/2013. According to data from the "International Trade Center", the share of imported oil products accounted for nearly 40 % of the total import amount in 2013, followed by vehicles (9%), Iron & steel (4%) and cereals (3%). The share of the exported ores, slag and ash accounted for 9 % of the total export amount in 2013, followed by oil products (2 %) and sugar (2 %).

Table 2.2.25 shows transit cargo volumes to landlocked countries from Tanzanian ports.

Table 2.2.25 Transit Cargo Volumes to Landlocked Countries from Tanzanian Ports in 2012/2013

Unit: 1,000 tons

Country	Import				Export			Total
	Break/Dry	Liquid	Container	Total	Break	Liquid	Container	
Zambia	118	1,148	313	1,580	0	0	279	1,859
DR Congo	19	312	370	702	0	0	264	965
Burundi	26	137	125	287	0	0	21	308
Rwanda	93	235	281	610	0	0	28	637
Malawi	11	27	36	75	0	0	19	93
Uganda	116	42	32	189	0	0	1	191
Others	23	27	4	53	0	0	17	70
Total	406	1,929	1,161	3,496	0	0	628	4,123

Source: Tanzania Port Authority

According to the above table, the share of the transit cargo is 33 % of the total handled volume in Tanzanian ports. This means that Dar es Salaam Port has an important role as a gateway port for landlocked countries. Zambia (45 %) is the major origin and destination of the transit traffic, followed by DR Congo (23 %) and Rwanda (15 %). Liquid bulk and containers are major transit cargoes and the share of liquid bulk in transit is nearly 45 % of the total import volume in Tanzania. A pipeline having 1,710 km in length is installed from Dar es Salaam to Indeni Refinery in Ndola (Zambia), which is operated by TAZAMA Pipeline Limited, jointly owned by the government of Zambia (66.7 %) and Tanzania (33.3 %).

The maximum size of the vessels calling at Dar es Salaam in 2010/2011 was 58,000 DWT for a bulk carrier, 53,000 DWT for a general cargo ship and 37,000 DWT for a car carrier based on the ship calling data in Dar es Salaam Port recorded by the Tanzania Port Authority (TPA). It is expected that

future vessel size will reach 50,000~70,000 DWT due to increased cargo demand and provision of the deep-water berth in Dar es Salaam Port.

(5) Mozambique

Table 2.2.26 shows international trade in Mozambique. Total import and export amounts reached about 10 billion and 4 billion US Dollars in 2013, respectively.

Table 2.2.26 International Trade in Mozambique

Unit: US Dollar Thousand

Commodity/Year	2011	2012	2013
Import	**6,305,647**	**6,177,210**	**10,099,147**
Oil Products	1,487,753	1,472,895	2,969,535
Optical, Photo, Medical etc.	39,904	48,672	1,074,934
Machinery	882,213	879,845	902,605
Vehicle	643,152	488,851	835,497
Electronic Equipment	230,529	285,187	538,045
Aluminum and Articles	694,864	576,044	517,166
Iron & Steel	337,854	502,230	433,604
Cereals	308,267	208,892	405,696
Export	**3,604,118**	**3,469,852**	**4,023,719**
Oil Product	586,682	964,860	1,346,469
Aluminum and Articles	1,625,727	1,089,352	1,064,303
Tabacco	179,511	227,897	257,334
Ship and Other Floating Structures	63,988	81,272	224,308
Sugar	92,641	148,104	190,470
Ores, Slag and Ash	175,914	238,734	157,885
Cotton	39,247	47,574	102,450

Source: "International Trade Center" data

According to Table 2.2.26, it is estimated that oil products, vehicles, aluminium, iron & steel and cereals for import and oil products, aluminium, ship and other floating structures, sugar and ores for export are dry/break/liquid bulk cargoes and most probably are transported over a sea route. The share of oil products (29%) to the total import amount is the largest, followed by vehicles (8%), Aluminium (5%) and Iron & Steel (4%) and cereals (4%). The share of oil products (33%) to the total export amount is the largest, followed by aluminium (26%), ships (6%), sugar (5%) and ores (4%).

Table 2.2.27 shows OD (origin and destination) of major bulk cargoes handled in Mozambican ports in 2008.

Table 2.2.27 Origin and Destination of Major Bulk Cargoes in Mozambican Ports in 2008

Commodity	Transit from/to	Exported to/from
Maputo		
(Export)		
Aluminum		Europe (100%)
Magnetite	South Africa (100%)	Eastern Asia (67%), Europe (33%)
Citrus	South Africa (31%), Swaziland (23%)	Europe (62%),
Sugar	South Africa (45%), Swaziland (24%)	Europe (74%), Eastern Africa (12%)
Coal	South Africa (100%)	Europe (74%), Western Asia (11%)
Ferro-Chrome	South Africa (65%), Zimbabwe (35%)	Eastern Asia (67%), Europe (22%)
Chrome Ore	South Africa (97%), Zimbabwe (3%)	Eastern Asia (66%), Europe (20%)
(Import)		
Clinker		South East Asia (57%), Southern Asia (21%)
Wheat		Europe (60%), Americas (40-%)
Alumina		Oceania (100%)
Pet Coke		Southern Asia (52%), Americas (48%)
Sulphur		Southern Africa (100%)
Fuel Oil		Western Asia (55%), Southern Asia (12%)
Beira		
(Export)		
Granite	Zimbabwe (100%)	
(Import)		
Clinker	Malawi (19%)	South East Asia (57%), Southern Asia (22%)
Wheat	Malawi (38%), Zimbabwe (19%)	Europe (62%), Americas (38%)
Fertilizer	Malawi (63%), Zimbabwe (16%)	Western Asia (63%), Southern Asia (21%)
Fuel Oil		Western Asia (55%), Southern Asia (12%)
Nacala		
(Import)		
Clinker		South East Asia (54%), Southern Asia (23%)
Fuel Oil	Malawi (25%)	Western Asia (58%), Southern Asia (8%)

Source: The Preparatory Survey on Nacala Port Development Project in the Republic of Mozambique in 2011 by JICA

According to the above table, Europe and Eastern Asia are the dominant export partners for Mozambique. As for Europe, coal and magnetite exported from South Africa via Maputo Port and aluminium produced by Mozal in Maputo are the main contributors. The main exported commodities to Eastern Asia are mineral products such as magnetite, ferro-chrome and chrome ore which are exported from South Africa or Zimbabwe via Maputo Port.

Import partners are diversified more than those of export destinations. The import volume from Western Asia is the largest followed by Oceania. Imported commodities from Western Asia are mainly oil products, while Australian alumina from Oceania which is the raw material for the Mozal aluminium smelter. Substantial amounts of wheat and clinker are imported from Europe and South East Asia respectively. Major commodities imported from Southern Africa are sulphur and oil products. It is assumed that some amount of oil products are imported by land transport. The dominant import origin for fertilizer and oil products in Beira Port is Western Asia and the port handles a substantial amount of oil products which are transported to Zimbabwe via a pipeline. The major trade partners for Nacala Port are Western Asia from which oil products are imported and South East Asia which exports clinker to Mozambique.

It is noted that cargoes are shipped from a deep-sea port adjacent to a cargo source such as a mine, an oil field and a breadbasket community to a hub port by a Cape Size or a Panamax vessel, and then transshipped to smaller feeder vessels bound for minor ports close to their final destinations. However a hub and feeder system is not adopted for bulk transport in Mozambique. For example tankers calling at Nacala Port also call at several ports in the region including Maputo and Beira, and then go back to the Middle East or South Asia. Routes of dry bulk carriers are similar to tankers. They call at several ports in the region to discharge cargoes, and then go to Durban or Richards Bay, probably to load

cargoes in a different contract. There are two reasons for this. One reason is an absence of the appropriate hub port in the country, Maputo and Beira are shallow ports and Nacala has no deep-water bulk terminal. Richard's Bay and Durban are not major hub ports in the region because Richard's Bay, which has deep-water quays is focused on providing an efficient transport route for the huge amount of bulk cargoes generated in its hinterland, and Durban, which has no quay with enough water depth is a very busy port. Another reason is the limited volume of bulk cargo demands in the country.

A large quantity of coal export which will reach 5 million tons/year after 2020 is planned in Mozambique. Based on the above plan, handling volumes in Beira and Nacala Port will be 28.5 million tons/year and 18 million tons/year respectively. Four bulk berths with 300 m length in the long-term plan in Nacala Port and an extension of the multipurpose berth in the master plan in Beira Port are planned in order to cope with the increase in cargo such as coal. Further, both ports should have a deep water berth to achieve efficient transportation. As a result, large-scale bulk carriers, at least 50,000 DWT-class vessels or even larger, are also expected to be deployed in the near future. A plan for new bulk berths in Nacala Port should be given attention because it is a natural deep-sea port and has a potential to become a hub port for bulk cargoes in the region.

2.2.3 Piracy situation and its security measures adopted by concerned countries

Piracy off the coast of Somalia has been a threat to international shipping since the second phase of the Somali Civil War in the early 21st century. Since 2005, many international organizations, including the International Maritime Organization (IMO) and the World Food Programme (WFP), have expressed concern over the rise in acts of piracy. Piracy has impeded the delivery of shipments and increased shipping expenses, costing an estimated $6.6 to $6.9 billion a year in global trade according to Oceans Beyond Piracy (OBP). According to the German Institute for Economic Research (DIW), a veritable industry of profiteers has also risen around the piracy. Insurance companies, in particular, have profited from the pirate attacks, as insurance premiums have increased significantly.

According to another source, there were 151 attacks on ships in 2011, compared with 127 in 2010 but only 25 successful hijacks compared to 47 in 2010. Pirates were holding 10 vessels and 159 hostages in February 2012.

In 2011, pirates took in a total of $146 million, an average of $4.87 million per ship. An estimated 3,000 to 5,000 pirates operated; by February 2012, 1,000 had been captured and were going through legal processes in 21 countries. According to the European Union Naval Force (EU NAVFOR), intensified naval operations had by February 2012 led to a further drop in successful pirate attacks in the Indian Ocean, with the pirates' movements in the region at large also significantly constrained. About 25 military vessels from the EU and NATO countries, the United States, China, Russia, India and Japan, patrolled approximately 8.3M km^2 (3.2 million square miles) of ocean, an area about the size of Western Europe. On 16 July 2012, the European Union launched a new operation, EUCAP Nestor. An analysis by the Brussels-based Global Governance Institute urged the EU to commit onshore to prevent piracy.

By September 2012, the heyday of piracy in the Indian Ocean was reportedly over. Backers were now reportedly reluctant to finance pirate expeditions due to the low rate of success, and pirates were no longer able to reimburse their creditors. According to the International Maritime Bureau, pirate attacks had by October 2012 dropped to a six-year low, with only one ship attacked in the third quarter compared to thirty-six during the same period in 2011.

Control Risks attributed this 90% decline in pirate activity from the corresponding period in 2012 to the adoption of best management practices by vessel owners and crews, armed private security onboard ships, a significant naval presence, and the development of onshore security forces.

Below is a map showing the location of acts of Somalian piracy based on various attacks in the Indian Sea up to Seychelles near the Maldives area.

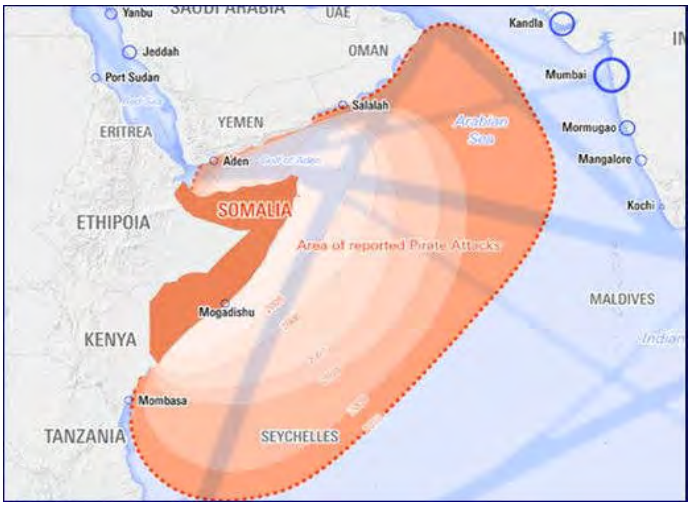


Figure 2.2.15 Piracy Threat Map
Source: Piracy information via Internet

(1) Latest Pirates Profile:

Most of the pirates are young. An official list issued in 2010 by the Somali government of 40 apprehended pirate suspects noted that 80% (32/40) were born in Somalia's southern conflict zones, while only 20% (8/40) came from the more stable northern regions. As of 2012, the pirates primarily operated from the Galmudug region in the central section of the country. In previous years, they largely ventured to sea from ports in the northeastern Puntland province, until the regional administration launched a major anti-piracy campaign and established a maritime police force (PMPF).

According to a 2008 BBC report, the pirates can be divided into three main categories:

- Local fishermen, considered the brains of the pirates' operations due to their skill and knowledge of the sea.
- Ex-militiamen, who previously fought for the local clan warlords, or ex-military from the former Barre government used as the muscle.
- Technical experts, who operate equipment such as GPS devices.

(2) Methodology

The methods used in a typical pirate attack have been analyzed. They show that while attacks can be expected at any time, most occur during the day; often in the early hours. They may involve two or more skiffs that can reach speeds up to 25 knots. With the help of mother ships that include captured fishing and merchant vessels, the operating range of the skiffs has been increased far into the Indian Ocean. An attacked vessel is approached from quarter or stern; RPGs and small arms are used to intimidate the operator to slow down and allow boarding. Light ladders are brought along to climb aboard. Pirates then will try and get control of the bridge to take operational control of the vessel.

According to the news, pirates often jettison their equipment in the sea before arrest, as this lowers the likelihood of a successful prosecution. Piracy opportunity is decreasing but still there were 72 occurrences in 2014.

The chart below shows the number of ships that were attacked.

Although success in Pricy dramatically decreased to 202 boardings, the amount paid to the pirates was still very high at US$135 million in 2011 from January to December.

The success rate has been decreasing year to year but 16% is still an intolerably high rate.

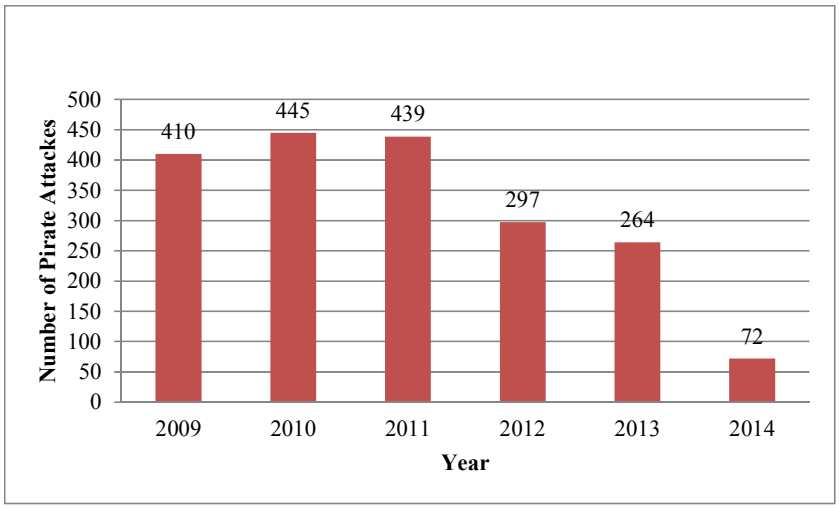


Figure 2.2.16 Number of Ship Attacks (2009 to 2014)
Sources: Somalia Piracy Statistics

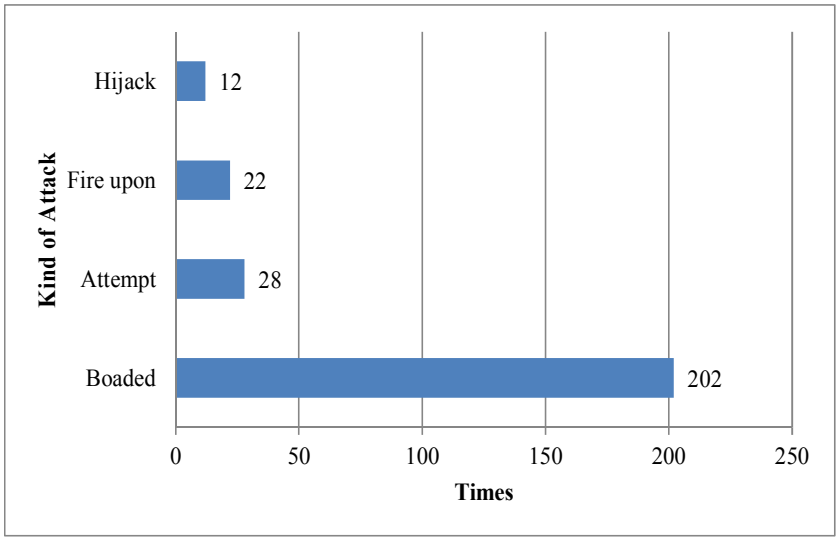


Figure 2.2.17 Number of Acts of Piracy in 2013 by Category
Sources: Somalia Piracy Statistics

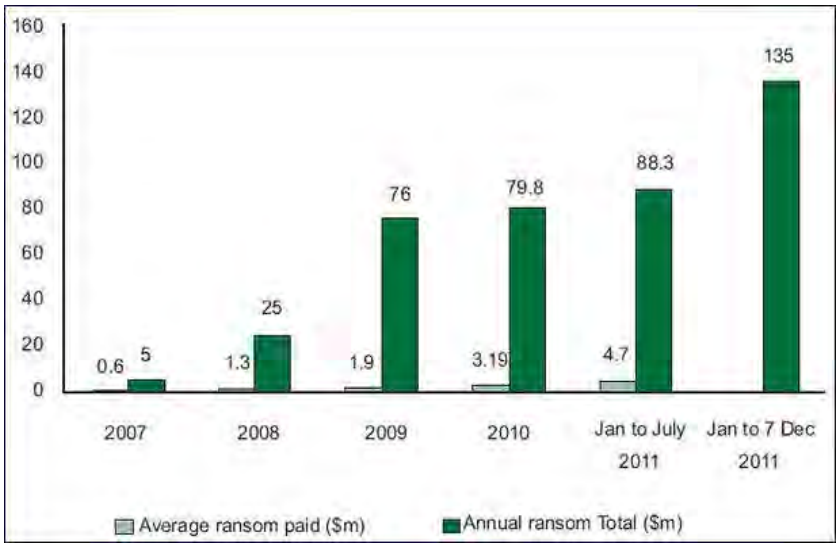


Figure 2.2.18 Amounts Paid to Pirates in 2013 (Million US Dollars)
Source: Somalia Piracy Statistics-Amount

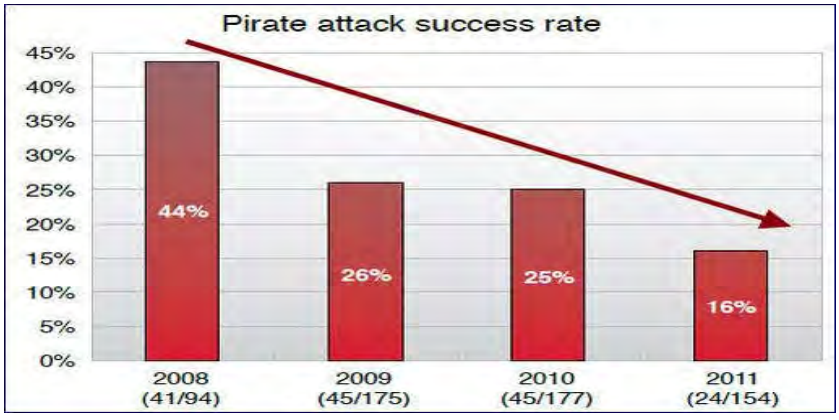


Figure 2.2.19 Piracy Success Rate
Source: Somalia Piracy Statistics-Amount

(3) Mombasa Security Case

In Mombasa, KPA employs a GMDS (Global Marine Safety System) to monitor the seas from Somalia to Mozambique 24 hours a day.

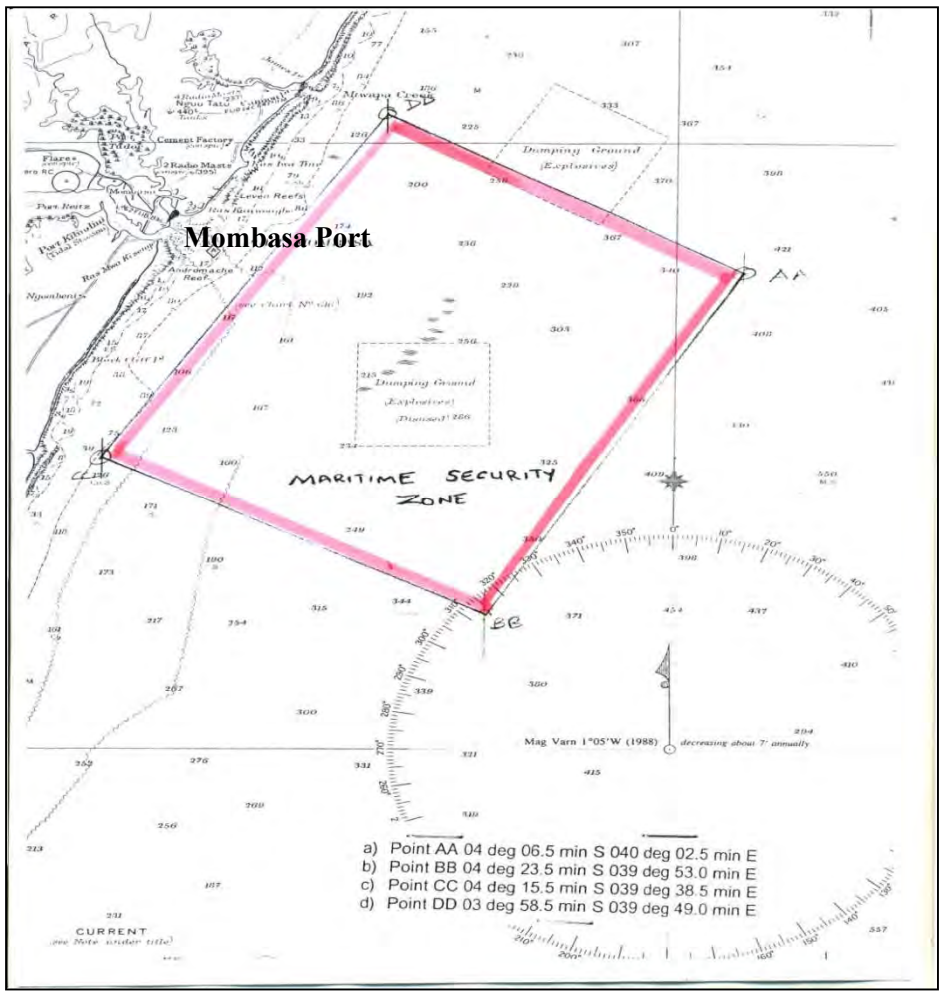


Figure 2.2.20 Mombasa Security Zone
Source: KPA home page -Mombasa Security Zone

To thwart the pirates, KPA adopted an IMO standard (Electric Chart Information System) and continually monitors a 15 mile square zone (Security Safety Zone) to provide security around Kenya/Mombasa port.

Therefore, all vessels wanting to enter into Mombasa port must wait in this security zone until clearance for berthing is obtained because the navy is patrolling 24 hours a day in this safety zone as shown in the above sketch with the AA-BB-CC-DD squares to provide full security.

2.3 Current situation of trade and international transport

2.3.1 Trends in East African Trade Flows

It is noted that as in other ports of Africa, East African trade is mostly oriented to non-African countries. According to "Corridor Diagnostic Study of the Northern and Central Corridors of East Africa" in 2011 by Nathan Associates Inc. under USAID Contract, total East African trade was 34.5 million tons in 2008, consisting of 27 million of imports (78.4 %) and 7.5 million of exports (21.6 %). Most of its imports and exports are with non-African partners (78 % and 62 % respectively), while the rest stay within the East Africa region (30 % and 8 %) and with other African countries (8 % and 14 %). This is shown graphically in Figure 2.3.1.

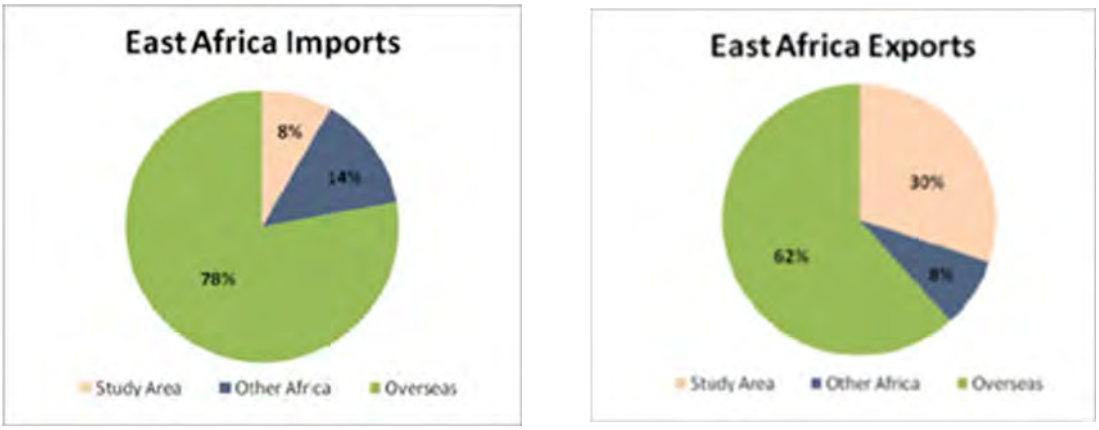


Figure 2.3.1 Distribution of East African Imports and Exports in 2008
Source: "Corridor Diagnostic Study of the Northern and Central Corridors of East Africa" in 2011 by Nathan Associates Inc.

From 2005 through 2009, there was rapid growth in transit traffic for countries using the Northern and Central Corridors. Total transit imports increased from 3.4 million tons in 2005 to 5.6 million tons in 2009, corresponding to an average annual growth rate of 13.3 %. Import growth exceeded export growth in all countries except Sudan. The highest growth in imports was Rwanda (32 %), followed by Uganda (24 %) and Tanzania (19 %). Uganda (23 %) had the highest growth in exports, followed by Sudan (16 %) and Ethiopia (15 %). During this period, Kenya's imports increased at an average annual rate of 15 % whereas exports grew by only 7 %. Tanzania imports and exports increased at an annual rate of 19 % and 16 %, respectively.

Further observations on common characteristics and trends regarding East African trade flows include:

- Countries with a recent history of conflict and economic crises had very low or negative trade growth in the last decade, such as DR Congo and Burundi,
- Export growth rates tend to be faster for overseas trade than those for imports,
- Overseas trade is higher in unit value than trade within Africa,
- Europe used to be a major trading partners but its share in total trade seems to be gradually decreasing for most East African countries,
- East Asia is an emerging trading partner for East Africa and its imports from East Africa are projected to increase continuously.

2.3.2 Transportation routes to/from Kenya

(1) Transportation routes to/from Kenya

Figure 2.3.2 and Figure 2.3.3 show origin of imports and destination of exports of Kenya in 2014 using sea routes. Cargo volumes are also illustrated in the figures.

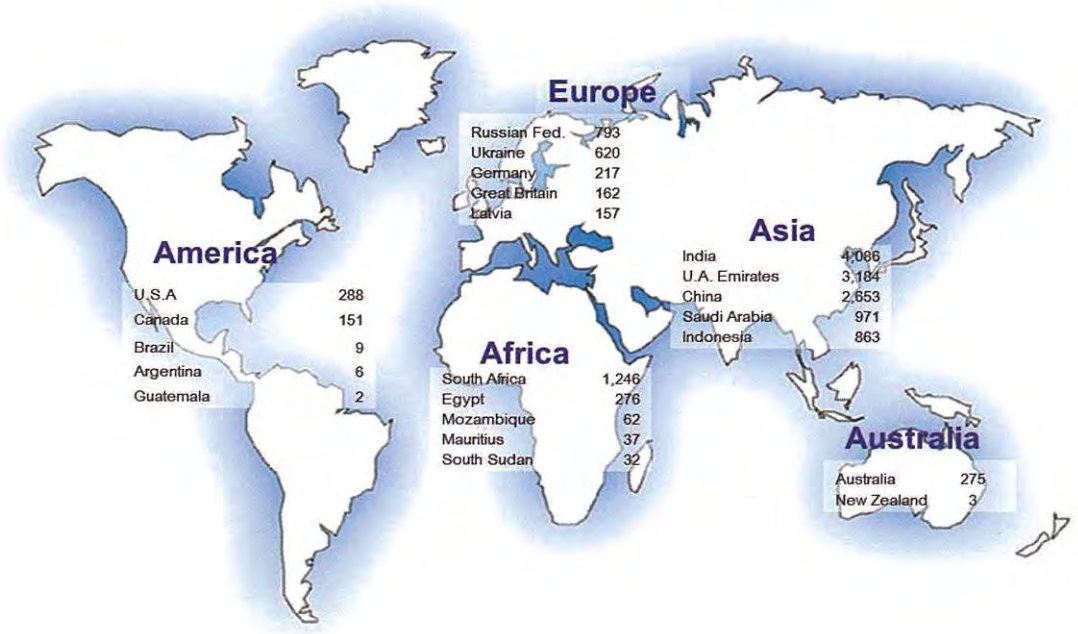


Figure 2.3.2 Import Origins and Cargo Volumes of Kenya in 2014
Source: Annual Review and Bulletin of Statistics 2014 by KPA

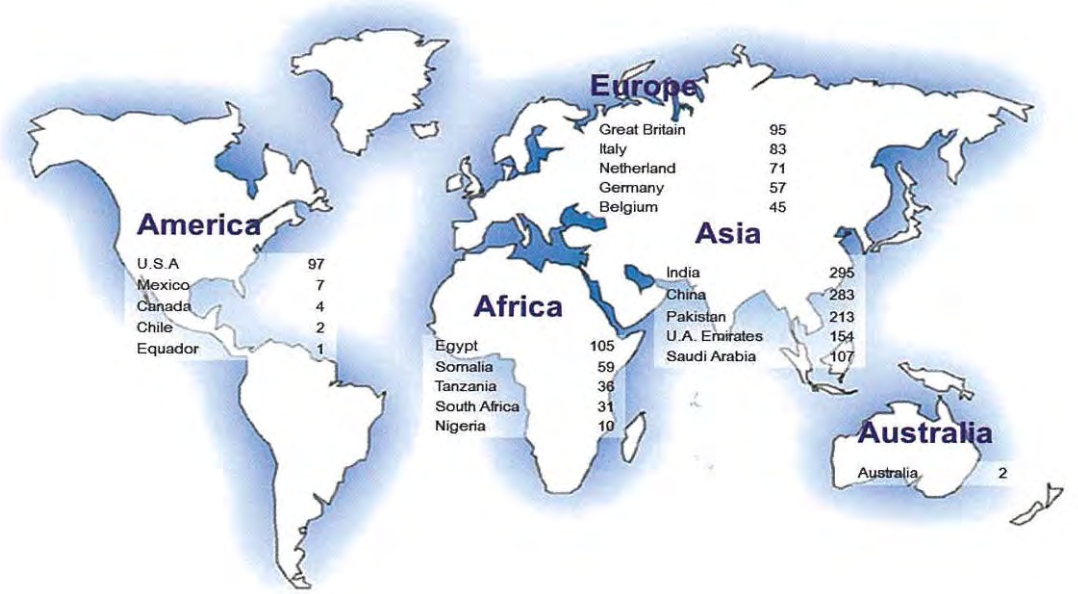


Figure 2.3.3 Export Destinations and Cargo Volumes of Kenya in 2014
Source: Annual Review and Bulletin of Statistics 2014 by KPA

According to the figures, major import trading partners are India (21.3 %), UAE (16.6 %), China

(13.9 %), South Africa (6.5 %) and Saudi Arabia (5.0 %), while major export partners are India (14.8 %), China (14.2 %), Pakistan (10.7 %), UAE (7.7 %) and Saudi Arabia (5.4 %). The area of the import origin having the highest share is Asia with nearly half (49.1 %), followed by Middle East (36.0 %) and Africa (6.5 %). The import share from Europe is only 5.2 %. The area of the export destination having the highest share is also Asia with a share of 46.7 %, followed by Europe (21.0 %) and Middle East (13.1%). The export share to Africa is only 6.3 %.

Table 2.3.1 shows major import and export commodities in 2013 using sea routes.

Table 2.3.1 Major Import Origin and Export Destination by Commodity in 2013

Import			Export		
Commodities	Volume (ton)	Origin	Commodities	Volume (ton)	Destination
POL	5,637,000	UAE, India	Tea	541,000	Pakistan, UK
Clinker	2,228,000	Asia, Middle East	Soda Ash	423,000	South East Asia, India
Wheat	1,409,000	Pakistan, Russia	Coffee	264,000	Switzerland, UK
Iron and Steel	1,192,000	Saudi Arabia, Japan	Tinned fruits, Vegetable etc.	93,000	Europe
Fertilizer	683,000	Russia, Rumania	Flourspar	65,000	Somalia, Uganda

Source: Annual Review and Bulletin of Statistics 2013 by KPA and Data on "International Trade Center"

Major import origins for POL (Petroleum, oil & lubricants) are UAE and India and nearly a half of the products are imported from UAE. More than 40 % of iron and steel is imported from South Africa. More than 50 % of tea is exported to Pakistan, UK and Egypt. Major destinations of Soda ash are South East Asia and India. In addition, nearly 80 % of coffee is exported to Europe.

On the other hand, air freight handled in Kenya is 295,000 tons and 262,000 tons in 2012 and 2013 respectively, based on data from "Kenya Facts and Figures 2014" by Kenya National Bureau of Statistics. This volume is only 1~1.5 % of the seaborne goods and negligible. It is noted that the great part of trade in Kenya has been done through sea routes.

(2) Transit Cargo to/from Landlocked Countries

Table 2.3.2 shows cargo movement to/from surrounding countries including landlocked from/to Mombasa Port in 2012.

The total transit cargo volume was about 6,626 thousand tons in 2012 and equivalent to nearly 34 % of the total cargo volume handled in Mombasa Port. Most of the important policy on transit cargo through Mombasa Port in Kenya is to concentrate on regulated traffics into Uganda, Rwanda, Burundi, DR Congo and South Sudan reciprocally and the maintenance of the traffic route into those countries, solving bottle neck of customs clearance under existing rules and regulations. The transit cargo movement during 2007 to 2013 had involved such to/from Uganda, Rwanda, Burundi, DR Congo and South Sudan and the greater part was consisted of Uganda cargoes in import and export in total (more than 70% out of the transit cargo). Figure 2.3.4 shows transit cargo flows in 2012 from/to Kenya to from surrounding countries including landlocked graphically.

Table 2.3.2 Transit Cargo to/from Surrounding Countries from/to Mombasa Port in 2012

(To Surrounding Countries)

(Unit: ton)

Country	Dry General		Dry Bulk	POL	Palm/Veg. & Tallow	Total
	Container	Non container				
Rwanda	103,427	26,971	46,703	70,629	-	247,730
Burundi	1,433	147	36,136	930	270	38,916
South Sudan	433,286	28,547	28,808	245,625	-	736,266
DR. Congo	173,925	18,502	-	272,562	-	464,989
Somalia	5,595	740	10,023	-	-	16,358
Tanzania	88,382	19,509	15,462	36,732	7,920	168,006
Uganda	1,676,712	257,557	1,117,688	1,228,734	218,612	4,499,302
Others	1,401	82	21,625	-	6,000	29,117
Total	2,484,161	352,064	1,276,446	1,855,211	232,802	6,200,683

(From Surrounding Countries)

(Unit: ton)

Country	Dry General		Dry Bulk	POL	Bunkers	Total
	Container	Non container				
Rwanda	12,508	-	-	-	-	12,508
Burundi	197	46	-	-	-	243
South Sudan	29,100	1,290	-	-	-	30,390
DR. Congo	17,119	250	-	-	-	17,368
Somalia	53	-	-	-	-	-53
Tanzania	17,332	831	-	-	-	18,163
Uganda	344,232	1,962	-	-	-	346,193
Others	-	3	-	-	-	41
Total	420,578	4,382	-	-	-	424,960

Source: KPA Statistics 2013

East African Community (EAC) is composed of 5 countries (Kenya, Tanzania, Uganda, Rwanda, and Burundi). According to “Logistics Study in Southern and Eastern Africa” in 2014 by JETRO in Japan, EAC has little food import because of the major grain production area. Major imported goods in the area are oil products and capital goods. Kenya and Tanzania imported almost all the oil products (US$ 7,800 million in total) used in the area in 2011 and exported mostly to landlocked countries. A lot of capital goods were also imported by EAC including machinery and vehicle imports valued at US$ 6,200 million in 2011. This means that the manufacturing field in the area remains underdeveloped. The value of imported grains in the EAC was US$ 1,400 million in 2011 and the greater part was wheat and rice. Recently a flow of trade is moving into Asia and a commercial relationship with Asian countries has grown stronger. India and China are the main import origins for oil products and medicinal supplies and for machinery and electric products, respectively. In addition UAE as a free port is a transshipment hub on consumable imports for EAC. The scale of the commercial export in Kenya is quite large and its trade amount in the area is equivalent to 19.1 % of the total amount of trade in Kenya. This is equivalent to 8.1 % of the total amount of EAC and the largest in Africa. This is the reason why Kenya is a transshipment hub for logistics to/from landlocked and surrounding countries and a production base for consumable goods.

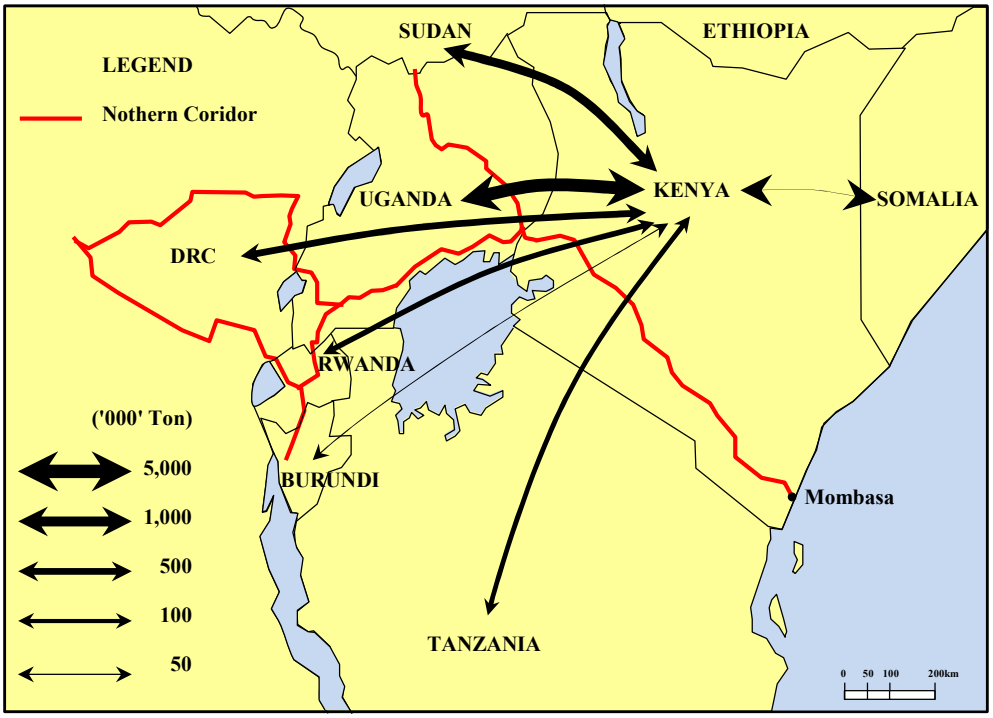


Figure 2.3.4 Transit Cargo Flows in 2012 from/to Kenya to/from Surrounding Countries
Source: KPA Statistics 2013

2.3.3 Liner services to/from Kenya

The liner services are summarized in Table 2.3.3.

The liner service to Kenya is concentrated at Mombasa Port for all the trade. There are two types of services among the shipping industry. One is long distance trade between Far East to Kenya/Mediterranean to Kenya and the other is feeder service along the East African coast by smaller sized vessels. 6 carriers, namely, Maersk, CMACGM, Evergreen, MSC, PIL and Messina Line, are providing fixed ay container services into Mombasa as ocean carrier. Liner services to/from Kenya are shown in Figure 2.3.5.

MSC is only carrier who operates at the East Africa coast looping Durban of South Africa, Nacala, Beira, Maputo of Mozambique from Mombasa Port in Kenya. PIL operates with different patterns such as covering the West and East Africa pendulum service. There are 70 vessels in the regular calling service within those 6 carriers at present but it is expected that some changes will be seen in 2015 in accordance with expansion of the cargo volumes and port enhancement by respective ports.

The size of the oceangoing ship is various, for example 1,900~2,700 TEU sized full container vessels (except feeder services at 1,500 TEU) or conventional general cargo services with own gears equipped including heavy lifts discharges are operating. Bulk carriers are mainly discharging wheat and clinker at the conventional berth.

Mombasa Port currently has restrictions on ship length and required water depth. At present a 3,500 TEU container ship is the largest size, Although a 4,500 TEU container ship may enter the service in the near future. Table 2.3.4 shows liner services by shipping companies.

Maersk Line is the largest shipping line as seen in the above table, having made 156 calls (or 29.4% of total calls) and handled 322,158 TEUs (or 36% of the total, which indicates they are using larger container ships).

Table 2.3.3 Summary of the Mombasa Calling Liner Services

Main Service	Lines	No. of Vessels	TEU Range	Service Ports (Non African)
Far East Service	Maersk	7	2,496	Laem Chabang (Thailand), Tanjung Pelapas (Malaysia)
	CMACGM	6	2,556 – 2,794	Port Kelang (Malaysia), Singapore, Colombo (Sri Lanka)
	Evergreen	5	2,474 – 2,733	Singapore, Tanjung Pelapas (Malaysia), Colombo (Sri Lanka)
China Service	PIL	10	2,546 – 2,754	Shanghai (China), Singapore, Davao (Philippines), Colombo (Sri Lanka), Dalian (China), Xingang (China), Qingdao (China), Ninbo (China)
Middle East Service	Maersk	5	2,510	Salalah (Oman), Sharjah (UAE), Jebel Ali (UAE)
	CMACGM	5	2,600 – 2,650	Jebel Ali (UAE), Khor Fakkan (UAE)
India / Pakistan Service	Maersk	5	3,500	Jawaharlal (India), Port Qasim (Pakistan), Salalah (Oman)
	MSC	5	2,200 – 2,300	Salalah (Oman), Dubai (UAE), Port Qasim (Pakistan), Mundra (India)
Pendulum Service	PIL	8	1,454 – 1,810 (Also serves West Africa: Durban, Cape Town, Lapas, Lome, Tema)	Colombo (Sri Lanka), Hazira (India), Nhave Sheve (India), Jebel Ali (UAE), Khor Fakkan (UAE), Karachi (Pakistan)
	Messina	6	3,000	Jeddah (Saudi Arabia), Leghorn (Italy), Barcelona (Spain), Marseille (France),

Main Service	Lines	No. of Vessels	TEU Range	Service Ports (Non African)
				Castellon (Spain) Salerno (Italy)
African Coast Service	MSC	4	1,928 – 2,394	Nacala (Mozambique), Durban (South Africa), Beira (Mozambique), Maputo (Mozambique)
	PIL	4	1,512	Pemba (Mozambique)
		70		

Source: Web-site of each shipping line

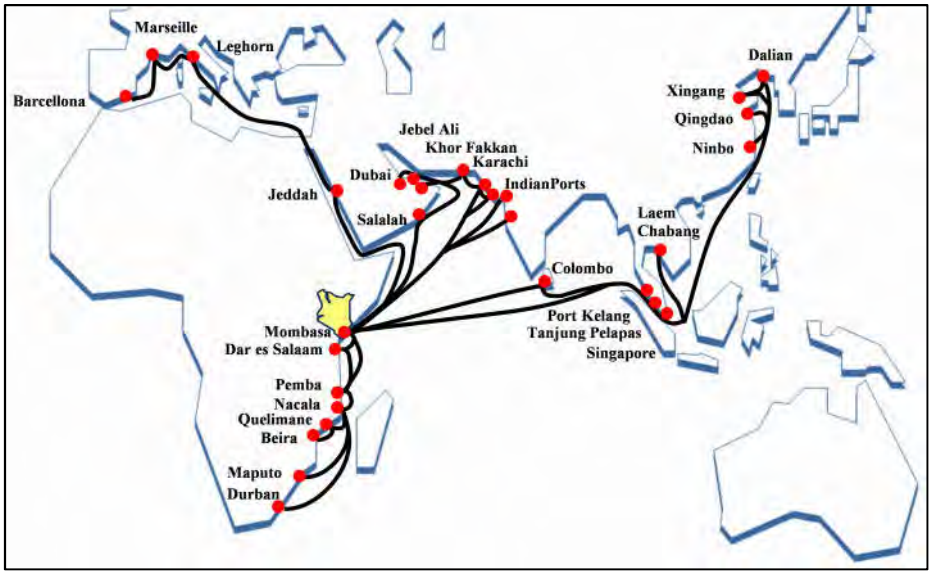


Figure 2.3.5 Liner Services to/from Kenya
Source: Shipping lines

Table 2.3.4 Container Shipping Services to Mombasa Port by Shipping Company

(unit: TEU)

Shipping Company	Calls	(%)	Import full	Import empty	Total imports	Export full	Export empty	Total export	Totals imp/exp	(%)
CMACGM	64	12.08	57,721	550	58,271	11,265	45,278	56,543	114,814	12.84
Emirates	27	5.09	19,270	76	19,346	4,498	16,518	21,016	40,362	4.51
Evergreen	33	6.23	27,302	84	27,386	5,003	19,372	24,375	51,761	5.79
Maersk Line	156	29.43	162,540	3,445	165,985	49,717	106,456	156,173	322,158	36.04
Messina (RoRo)	37	6.98	15,165	302	15,467	5,036	10,038	15,074	30,541	3.42
MSC	71	13.40	71,774	1,033	72,807	32,601	36,545	69,146	141,953	15.88
PIL	75	14.15	52,255	4,585	56,840	12,140	36,027	48,167	105,007	11.75
Other Carriers	67	12.64	45,002	2,461	47,463	11,355	28,586	39,941	87,404	9.78
Grand Total	530	100.00	451,029	12,536	463,565	131,615	298,820	430,435	894,000	100.00

Note: Figures are including number of shifting (quay to quay) in import (full/empty) figures.

Source: Shipping lines

2.3.4 Liner services to major East African ports

Major ports from the northern part of the East African coast (Mombasa, Dar es Salaam, Pemba, Nacala, Quelimane, Beira, Maputo and Durban of South Africa) are shown in Figure 2.3.6.

It depends on the carrier's policy where main import cargoes from Far East are transshipped, such as Port Kelang, Singapore or Tanjung Pelepas. It is noted that those Asian hub ports are also key ports for Japan, Korea, Taiwan and Philippines for transshipment purpose.

There are other shipping sources from the main land China which calls directly to Mombasa Port and other ports in the African East Coast as well.

Cargo handling volumes at the three major East/South African ports are shown in Table 2.3.5.

Mombasa Port handled 21.85% of the total imports among the three ports in 2013 and 21.05% of total exports. Mombasa Port has kept the No.1 trade share in East African ports for a long term. No other large port is available at East Coast of Africa at present except Mombasa and Dar es Salaam for the ocean trade service, therefore carriers need to have feeder services either in-house or slot purchase bases.

The other East African ports are smaller or await expansion and thus are still unable to accept direct calling of larger sized vessels and cannot cope with regular container services as effectively as Mombasa Port.

Figure 2.3.6 Map of East Coast in Africa

Table 2.3.5 Cargo Volumes in Major East/South African Ports

(Unit: TEU)

(Import) Year	2011	2012	2013	2013 Ratio
Mombasa	392,647	444,772	449,389	21.85%
Dar Es Salaam	221,728	266,345	282,139	13.72%
Durban	1,377,138	1,312,679	1,324,936	64.43%
Three Ports Total	1,991,513	2,023,796	2,056,464	100%
(Export) Year	2011	2012	2013	
Mombasa	358,230	446,624	428,342	21.05%
Dar Es Salaam	221,728	240,840	270,913	13.32%
Durban	1,335,837	1,274,207	1,335,210	65.63%
Three Ports Total	1,915,795	1,961,671	2,034,465	100%
(G/Total TEUs)	3,907,308	3,985,467	4,090,929	

Source: Each Port Authority

There is another problem which must be addressed by Mombasa Port. At present, KPA needs to inspect the container contents for the transshipment from A port to B port in accordance with internal security regulations, which results in delays in moving out containers. Consequently, laden containers stay a long time at the transshipment terminal and miss the first transshipment opportunity.

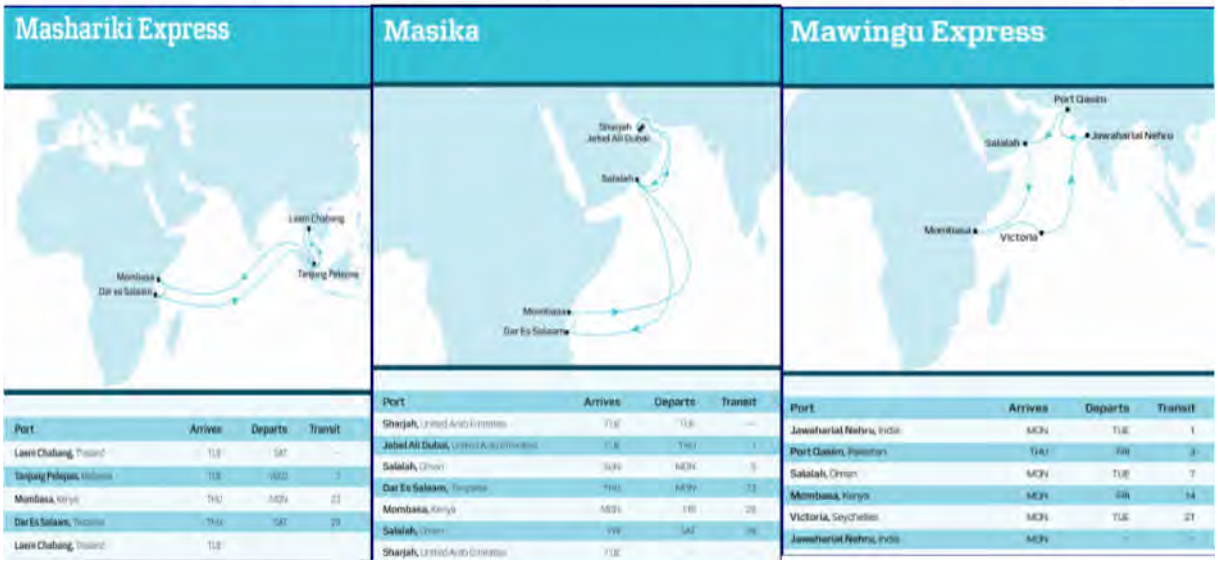
For Mombasa Port to retain its Hub-Port status in East Africa, KPA needs to change its regulations on mandatory inspection of container contents (a practice not seen at most ports) to facilitate transshipment operations and also consider the introduction of modern and larger berths to accommodate larger vessels. Interviews with shipping companies revealed that delays in reaching their final destination are a major concern.

Container liner services to East African ports are shown in the following tables.

(1) Maersk Line

Table 2.3.6 Liner Services Provided by Maersk Line

Operator	Service	Vesel TEU	LOA(m)	DW Tons	Calling Ports	Remarks
MEARSK Line	Mashariki Express	2,496 (7 vessels)	207.3~207.4	33,807~33,976	Mombasa~Dar es Salaam~Laem Chabang~ Tanjung Pelepas~Mombasa	Weekly
	Masika	2,510 (5 vessels)	207.4 (W29.8)	33,501~33,976	Mombasa~Salalah~Sharjah~Jebel Ali ~Salalah~ ~Dar Es Salaam~Mombasa	Weekly
	Mawingu Express	3,500 (5 vessels)	239.5 (W 32.19)	46,925~47,027	Mombasa~Victoria~Jawaharlal Nehru~ Port Qasim~Salalah~Mombasa	Weekly



Source: Maersk Line

(2) CMACGM Line

Table 2.3.7 Liner Services Provided by CMACGA

Operator	Service	Vesel TEU	LOA(m)	DW Tons	Calling Ports	Remarks
CMA-CGM S/A & Emirates Shipping (CMACGM)	ASEA	2,556~2,794 (6 vessels)	208~212 (Width 32.2)	34,248~41,411	Mombasa~Tanga~Dar Es Salaam~Port Kelang~ Singapore~Colombo~Port Victoria~Mombasa	Weekly
	SWAX2	2,600~2,650 (5 vessels)	207.9~210.0 (Width 31.3)	34,667~35,924	Mombasa~Khor Al Fakkan~Jebel Ali~Mombasa~ Dar Es Salaam~Zanzibar~Nacala~Mombasa	Weekly

Source: CMACGM Line

(3) MSC Line

Table 2.3.8 Liner Services Provided by MSC Line

Operator	Service	Vesel TEU	LOA(m)	DW Tons	Calling Ports	Remarks
Mediterranean Shipping (MSC)	ZN	1,928~2,394 (4 vessels)	198.25 (W 32.23)	41,787~41,815	Mombasa~Dar Es Salaam~Nacala-Durban~ Beira~Maputo~Mombasa	Weekly
	SALALA Express	2,200~2,300 (5 vessels)	195.71 (W 32.23)	34,907~41,771	Mombasa~Salalah-Dubai~ Mundra~Quasim~Mombasa	Weekly

msc MEDITERRANEAN SHIPPING COMPANY MSC Schedules

Vessel Name	Voyage Number	Lloyd's Number	Departure Day	Departure Date	Departure Port	Transit Time	Arrival Day	Arrival Date
MSC POSITANO	ZN429R	9154191	Fri	12 Sep 2014	MOMBASA, KENYA	6 days	Thu	18 Sep 2014
MSC JASMINE	ZN430R	8420907	Fri	19 Sep 2014	MOMBASA, KENYA	6 days	Thu	25 Sep 2014
MSC NICOLE	ZN431R	8509387	Fri	26 Sep 2014	MOMBASA, KENYA	6 days	Thu	02 Oct 2014
MSC CHIARA	ZN432R	8420892	Fri	03 Oct 2014	MOMBASA, KENYA	6 days	Thu	09 Oct 2014

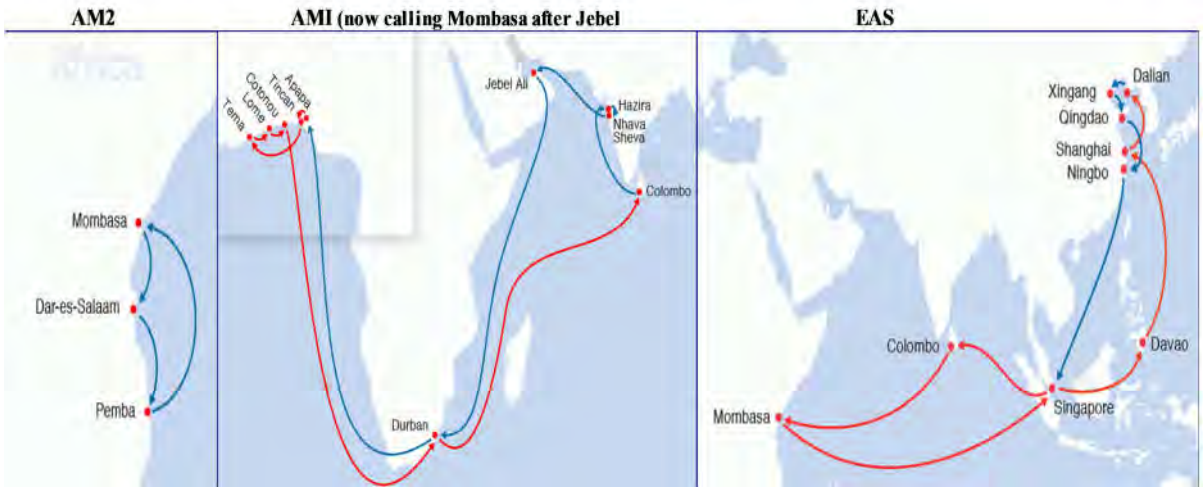
Vessel Name	Voyage Number	Lloyd's Number	Departure Day	Departure Date	Departure Port	Departure Port UNCODE	Transit Time	Arrival Day	Arrival Date	Arrival Port
CAPE MARIN	JX437R	9571325	Wed	24 Sep 2014	SALALAH, OMAN	OMSLL	15 days	Thu	09 Oct 2014	MOMBASA, KENYA
MSC NILGUN	JX438R	9051492	Wed	01 Oct 2014	SALALAH, OMAN	OMSLL	15 days	Thu	16 Oct 2014	MOMBASA, KENYA
MSC IMMA	JX439R	9124366	Thu	09 Oct 2014	SALALAH, OMAN	OMSLL	14 days	Thu	23 Oct 2014	MOMBASA, KENYA
MSC ANAHITA	JX440R	9148025	Thu	16 Oct 2014	SALALAH, OMAN	OMSLL	14 days	Thu	30 Oct 2014	MOMBASA, KENYA
MSC TASMANIA	JX441R	9008574	Thu	23 Oct 2014	SALALAH, OMAN	OMSLL	14 days	Thu	06 Nov 2014	MOMBASA, KENYA

Source: MSC Line

(4) Pacific International (PIL)

Table 2.3.9 Liner Services Provided by Pacific International

Operator	Service	Vesel TEU	LOA(m)	DW Tons	Calling Ports	Remarks
Pacific International (PIL)	AM2	1512 (4 vessels)	182 (Width 27)	23,665	Mombasa~Dar Es Salaam~Zanzibar-Mtwra-Mombasa~ ~Pemba~Mombasa	Weekly
	AM1	1,454~1,810 (8 vessels)	179.7~182.8 (Width 25)	23,840~25,989	Mombasa~Durban~Cape Town~Lagos~Lome~Tema~ ~Durban~Colombo~Hazira~Nhava Sheva~Jebel Ali~ Khor Fakkan~Karachi~Mombasa	Weekly
	EAS	2,546~2,754 (10 vessels)	211.85~226.5 (Width 32)	34,000~39,524	Mombasa~Singapore~Davao~Shanghai~Dalian~ ~Xingang~Qindao~Ninbo~Singapore~Colombo~Mombasa	Weekly



Source: PIL Line

(5) Ever Green Line

Table 2.3.10 Liner Services Provided by Ever Green Line

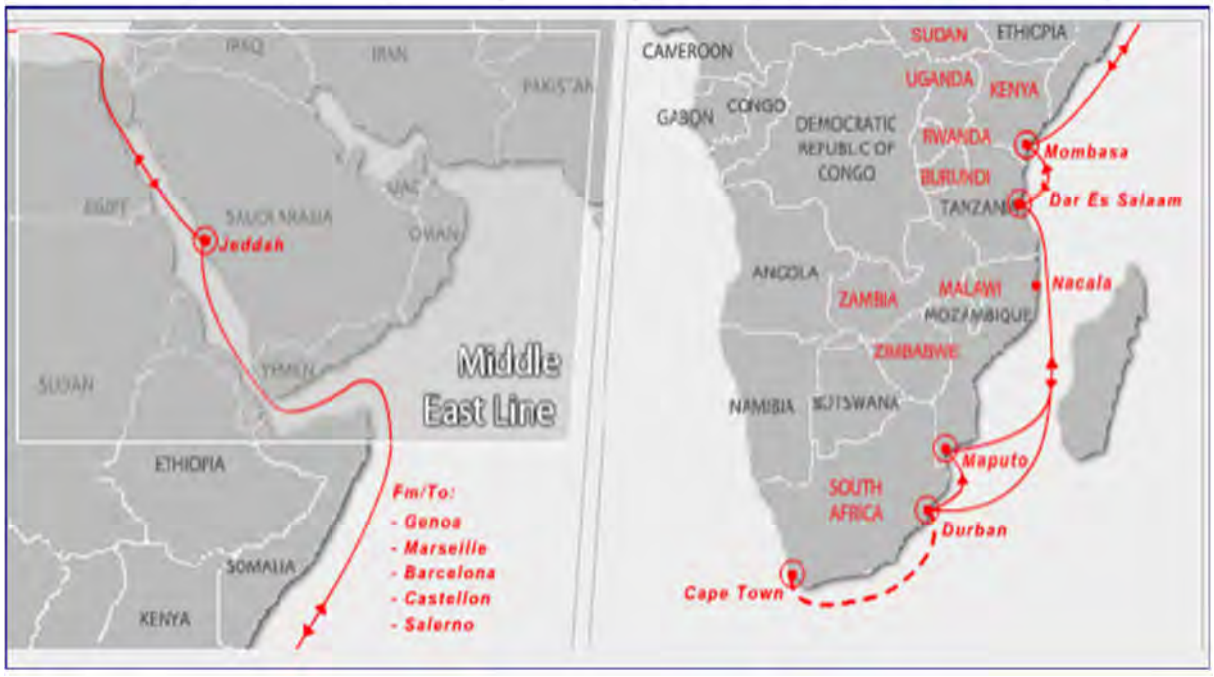
Operator	Service	Vesel TEU	LOA(m)	DW Tons	Calling Ports	Remarks
Ever Green (EMC)	AEF	2,474~2,733 (5 vessels)	199.85~212.5 (W 30.1~33)	34,167~41,636	Mombasa~Dar Es Salaam~Singapore~ Tanjung Pelepas~Columbo~Mombasa	Weekly by 5 vessels

Source: Ever Green Line

(6) Messina Line (RoRo & Container)

Table 2.3.11 Liner Services Provided by Messina Line

Operator	Service	Vesel TEU	LOA(m)	DW Tons	Calling Ports	Remarks
IGNAZIO MESSINA (MESSINA)	RoRo+ Containers	3,000	199.5~239.0 (W 30.1~33)	27,720~45,200	Mombasa~Dar Es Salaam~Maputo~Durban~Nakala~ Dar Es Salaam~~Mombasa~Jeddah~Leghorn~Barcellona~ Marseille~~Castellon~~Salerno~Mombasa	Weekly by 4 vessels



Source: Messina Line

2.4 Current situation of domestic transport system in Kenya

2.4.1 Road

(1) Kenya road network

The Following is a citation from the web site of Kenya Roads Board;

The road network in Kenya at independence was 45,000km out of which only approximately 2000km were paved while the rest was mainly earth. In order to support the country's development objectives the country embarked on a program of upgrading roads to bitumen standards and improvement of rural roads to gravel standards. As a result, the paved road network was expanded from 2000 km in 1963 to 11,189 km in 2009.

In 2001, the Ministry of Roads, with financing from World Bank, engaged a Consultant to undertake a Road inventory and Condition Survey for the Classified Roads using Geographical Positioning Systems (RICS). The RICS study led to the establishment of a database for classified roads in a Geographical Information System. Unfortunately, the extent of the unclassified rural and urban roads remained unknown and was estimated to range from 80,000 to 130,00km making it difficult for effective maintenance and development planning.

In view of the above and in order to establish the extent of the existing road network and its condition, Kenya Roads Board, with funding from the Nordic Development Fund under the Northern Corridor Transport Improvement Project, in 2006, commissioned a Consultant to undertake a road inventory and condition survey for the hitherto unclassified road network. Based on the survey data collected, a Geographical Information Systems (GIS) database has been established at Kenya Roads Board.

Based on the RICS, the road network has been established to be 160,886km long comprising of 11,189km of paved roads and 149,689km of unpaved roads. There has been some improvement in the road network condition for the classified roads which is currently estimated at 17% good, 51% fair and 31% in poor condition. However, majority of the unclassified roads are in unmaintainable condition with only 5% good, 22% fair while 72% is in poor condition. Hence a large portion of the network is in either poor or failed condition and requires urgent rehabilitation to restore it to a maintainable condition. The government therefore, urgently needs additional funding to restore the network to a maintainable condition.

Table 2.4.1 CURRENT ROAD CLASSIFICATION

CLASS	DESCRIPTION	FUNCTION
A	International Trunk Roads	Link centers of international importance and cross international boundaries or terminate at international ports or airports (e.g. Mombasa,)
B	National Trunk Roads	Link nationally important centers (e.g. Provincial headquarters)
C	Primary Roads	Link provincially important centers to each other or to higher class roads (e.g. District headquarters)
D	Secondary Roads	Link locally important centers to each other, or to more important centers or to a higher class road (e.g. divisional headquarters)
E	Minor Roads	Any link to a minor center
SPR	G L R S T W	Government Roads Settlement Roads Rural Access Roads Sugar Roads Tea Roads Wheat Roads
U	Unclassified	All other public roads and streets

Source; Kenya Road Board; http://www.krb.go.ke/road-conditions.html

Table 2.4.2 SUMMARY OF CURRENT ROAD CLASSIFICATION IN KM

ROAD CLASS	PAVED	UNPAVED	TOTAL
A	2,772	816	3,588
B	1,489	1,156	2,645
C	2,693	5,164	7,857
D	1,238	9,483	10,721
E	577	26,071	26,649
SPR	100	10,376	10,476
U	2,318	96,623	98,941
TOTAL	11,189	149,689	160,886

Source; Kenya Road Board; http://www.krb.go.ke/road-conditions.html

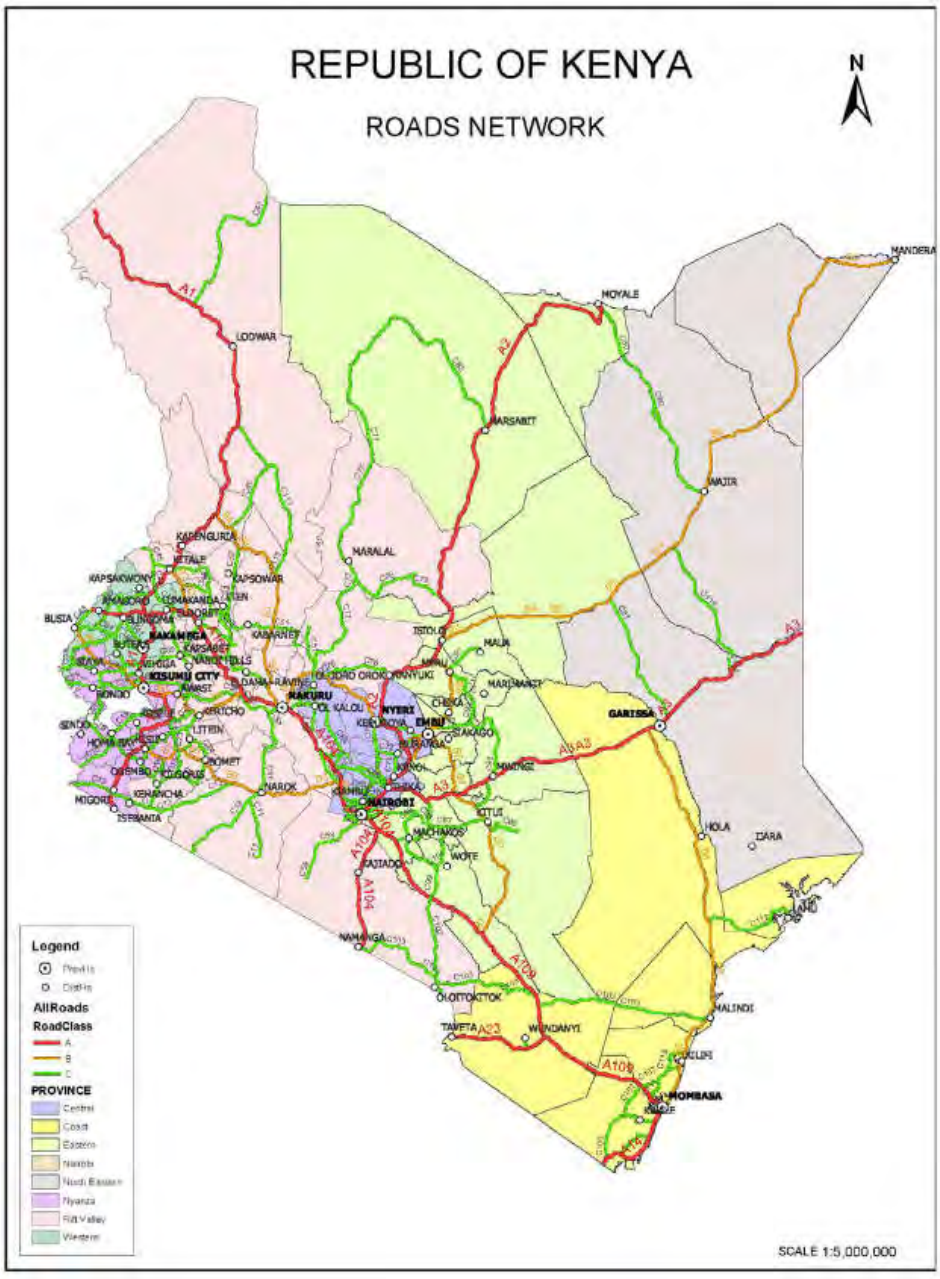


Figure 2.4.1 Road Network in Kenya

(2) Corridor diagnostic study of the Northern and Central Corridors of East Africa

The following is an excerpt 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 are 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 as well as regional integration, the creation of wealth, and poverty alleviation in these countries.

The Heads of State in the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (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.

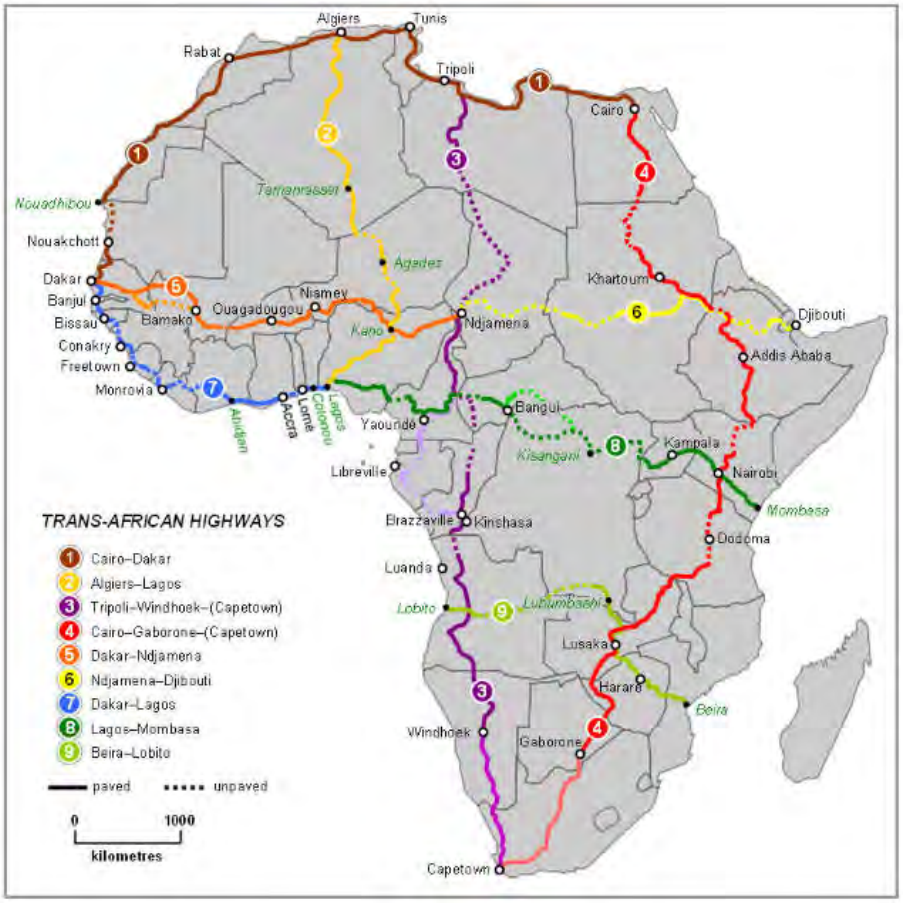


Figure 2.4.2 Trans-African Highways
Source; Corridor Diagnostic Study of the Northern and Central Corridors of East Africa

2.4.2 Railway

The following is an excerpt from the web site of Kenya Railway Cooperation;

(1) Kenya Railway Cooperation

Kenya Railways is a State Corporation established under the Kenya Railways Corporation Act (Cap 397) of the Laws of Kenya. Vision, Mission and Mandate are show below;

Vision; To be the preferred provider of rail transport services

Mission; To provide a customer focused efficient and sustainable rail transport system

Our Mandate;

- -Provide skills and technology for the railway sector
- -Provide efficient and effective railway services
- -Leverage our assets to grow business
- -Promotion, facilitation and participation in national and metropolitan railway network development

(2) Railway Master Plan

Kenya Railways is committed to providing the country with reliable and efficient railway transport services. This will be achieved through the construction of the proposed Standard Gauge Railway line which is expected to be fully rolled out by the year 2050.

The Project will involve:

- Construction of a Standard Gauge Railway line from Mombasa to Malaba with a branch line to Kisumu
- Construction of the Standard Gauge Railway line for Northern Kenya region under the Lamu Port Southern Sudan Ethiopia transport corridor (LAPSSET) project

This will include a railway line from

- Lamu to Isiolo to Nakdok onward to Juba in South Sudan
- Lamu to Isiolo to Wajir and onward to Addis Ababa in Ethiopia
- The two lines will branch to Nairobi at Archer's Post in Isiolo

Progress:

- The governments of Uganda, Rwanda and Kenya have signed an agreement for the construction of the Standard Gauge Railway line for the region.
- The governments of South Sudan, Ethiopia and Kenya have signed a bilateral agreement for the construction of Standard Gauge Railway line under the LAPSSET project.
- Construction on the Nairobi to Mombasa section has begun. Nairobi to Malaba and the branchline to Kisumu feasibility study is ongoing.
- Feasibility study for the Lamu-Isiolo- Nakdok and Nairobi-Isiolo-Moyale sections is complete.
- Government of Kenya has identified funds for the Mombasa to Nairobi section.

(3) Launch of LAPSSET Project

Kenya is on the starting line for the development of the Lamu – South Sudan – Ethiopia Transport (LAPPSET) corridor. The economic and transport corridor will open up vast parts of Kenya and stimulate economic and social development. The project will also create vital links with Ethiopia and South Sudan, thereby increasing trade and investment in our region.

The long distance Standard Gauge Railway (SGR) project under LAPPSET will comprise building a total of 3,250 kilometers of SGR within Kenya and connected to the region;

- Lamu Isiolo Nakdok; 1,250 kilometers form the Great Equatorial Bridge to be extended to

Juba in -Southern Sudan and to Douala in Cameroon
- Nairobi Isiolo Moyale; 700 kilometers to be extended to Addis Ababa
- Mombasa Malaba; 1,300 kilometers to be extended to Kampala with a branch line to Kisumu

The LAPSSET project is one of the largest transport and infrastructure projects in East Africa and was launched on 2nd March 2012 by Presidents Mwai Kibaki of Kenya, General Silva Kiir of Southern Sudan and Ethiopian Prime Minister Menes Zenawi. Part of the project involves the development of a modern high speed, high capacity standard gauge railway for passengers and freight within the proposed Lamu Corridor. The development will open up Northern Kenya for exploitation of stranded resources and will provide the landlocked Republic of Southern Sudan and Ethiopia with access to the sea.

(4) Standard Gauge Railway Project to Mombasa Port

Please refer to the Section 4.4.2.

(5) Rift Valley Railways (RVR)

The following is an excerpt from the web site of Rift Valley Railways;

As the region's oldest socio-economic binding asset, Rift Valley Railways currently operates a total of 2541.44 kilometers of track network linking the shores of the Indian Ocean to the agriculturally rich hinterland of the Kenya Highlands and into Kampala, Uganda on the shores of Lake Victoria in a 25-year concession agreement originally signed in 2006.

The Concession Agreement sealed between Kenya and Uganda governments commits the Concessionaire (RVR) to provide freight service for a period of 25 years, and passenger services, in Kenya only, for five years. Under this Agreement, both the Kenya and Uganda governments still own the railway infrastructure and facilities while RVR operates trains and maintains the infrastructure.

Figure 2.4.3 Route Map of RVR

The key objective of RVR is to improve the Management, Operation and Financial performance of the two railway networks in a coordinated manner.

The other objectives of the concession are to:-

- Standardize infrastructure maintenance and operations
- Increase market share for the railways in freight traffic by providing reliable service to customers
- Foster regional economic integration and growth
- Improve the competitiveness of the Northern Corridor and the port of Mombasa.

RVR is predominantly a freight transporting company with this segment constituting 95% of all volumes and revenue. The percentage ratio of the remaining is as shared by the commuter business (4%) and the passenger business (1 %.)

Our main customers in the freight business are categorized as Logistics Service Providers (42%), Cargo Owners (39% of total volumes moved) and Shipping Companies (19%) of total volumes moved. The company has put in mechanism to further improve its freight business. For instance, RVR posted a 21% increase in freight business (250,000 tons) in H1 of 2011/2012 over the same period in 2010/2011 (206,240 tons).

RVR Freight Services is your flexible partner for overland transport by rail. We run freight trains or goods trains on a regular schedule to various destinations in Kenya and Uganda.

The movement involves groups of freight cars or goods wagons hauled by locomotives on railway lines, ultimately transporting cargo between two points as part of the logistics chain. The trains haul bulk material, intermodal containers, general freight or specialized freight in purpose-designed cars. These include flat wagons for containerized cargo, covered wagons for conventional cargo, Tallow Tank Bogies for Vegetable Oil, White/Black Tanks for white and black oils respectively.

2.4.3 Air

The followings are excerpts from web site of Kenya Airport Authority, Civil Aviation Authority and ICAO;

(1) Air transportation system

Most airports in Kenya are used for domestic flights. The largest airport is Jomo Kenyatta International Airport (NBO) located in Nairobi (the capital of Kenya). The second largest is Moi International Airport (MBA) located in Mombasa.

Airports in Kenya are managed by three authorities, the Ministry of Transport and Infrastructure (MOTI), Kenya Airports Authority (KAA) and Kenya Civil Aviation Authority (KCAA).

In Kenya, there are 4 international airports, 7 local airports and 150 airstrips. Majors are shown in the next map and table.

Figure 2.4.4 Major Airport Locations in Kenya

(2) Kenya Airports Authority (KAA)

-Mandate

The Kenya Airports Authority (KAA), established in 1991 under KAA Act, Chapter 395 of the Laws

of Kenya, provides facilitative infrastructure for aviation services between Kenya and the outside world. Its main functions are;

- Administer, control and manage aerodromes,
- Provide and maintain facilities necessary for efficient operations of aircrafts
- Provide rescue and firefighting equipment and services
- Construct, operate and maintain aerodromes and other related activities
- Construct or maintain aerodromes on an agency basis on the request of any Government Department
- Provide such other amenities or facilities for passengers and other persons making use of the services or facilities provided by the Authority as may appear to the Board necessary or desirable
- Approve the establishment of private airstrips and control of operations thereof

The main airports we manage are in the table below.

Table 2.4.3 Major Airports in Kenya

International Airports	Domestic Airports	Airstrips
Jomo Kenyatta International Airport	Wilson Airport	Ukunda Airstrip
Moi International Airport	Malindi Airport	Manda Airst
Eldoret International Airport	Lokichoggio Airport	
Kisumu Airport	Wajir Airport	

(3) Kenya Civil Aviation Authority (KCAA)

Kenya Civil Aviation Authority (KCAA) was established on 24th October 2002 by the Civil Aviation (Amendment) Act, 2002 with the primary functions towards; Regulation and oversight of Aviation Safety & Security; Economic regulation of Air Services and development of Civil Aviation; Provision of Air Navigation Services, and Training of Aviation personnel KCAA; as guided by the provisions of the convention on international civil aviation, related ICAO Standards and Recommended Practices (SARPs), the Kenya Civil Aviation Act, 2013 and the civil aviation regulations.

Mandate

To plan, develop, manage, regulate and operate a safe, economically sustainable and efficient civil aviation system in Kenya, in accordance with the provisions of the Civil Aviation Act, 2013.

Vision

To be a model of excellence in civil aviation

Mission

To develop, regulate and manage a safe, efficient and effective civil aviation system in Kenya.

Core Values

Commitment to Safety and Security: We endeavor to maintain a safe and secure environment in all areas of our operations and entire civil aviation industry within our jurisdiction.

Strategic Achievements

- Achieved an effective and sustainable safety and security oversight system.
- Developed an effective and sustainable air transport system and established a modern CNS/ATM Systems.
- Ensured safe, orderly and expeditious flow of air traffic.
- Attracted and retain competent, motivated and performance driven human capital.

- Became a financially sustainable Authority by ensuring collection and appropriate usage of revenue.
- Enhanced Customer Service through publication of KCAA Corporate Service Charter.
- Established an international aviation training center of excellence by revamping the facilities and capacity at the East African School of Aviation by acquisition of training simulators and achieving ICAO trainer plus status.
- Became ISO certified to ensure quality service provision.

The Establishment of a vibrant and highly competitive civil aviation industry is critical for the development of any country. In recognition of the foregoing role, KCAA encourages investments from both domestic and international air operators. In so doing, KCAA is fully implementing Vision 2030 which aims to make Kenya a middle income country by the year 2030.

(4) Nairobi - Jomo Kenyatta International Airport

Jomo Kenyatta International Airport (JKIA) is the biggest Airport in East and Central Africa, and is the focal point for major aviation activity in the region. Its importance as an aviation center makes it the pacesetter for other airports in the region. JKIA, located 18 kilometers to the East of Nairobi, is served by 49 scheduled airlines. JKIA has direct flight connections to Europe, the Middle East, Far East and the African Continent.

Airport Data:

International, Nairobi 16km (9miles), Position 01°19´09"S, 036°55´40"E, Elevation 1 625m (5 331ft), 24 hours, 3 Passenger Terminals, 1 Cargo Terminal, 20 Aircraft Stands

Airfield Data:

Fire Category 9

Navigational Aids:

VOR-DME, NDB, VOR

Aircraft Maintenance:

Kenya Airways

Runway 1:

Heading 06/24, 4 117m (13 507ft), 065/F/A/W/T, ICAO Cat. 1, Aircraft size max: B747 OR LCN 100, ILS, Lighting: Taxiway edge lighting

Airlines Serving Airport:

Express Airways, Air India, Air Madagascar, Air Malawi, Air Mauritius, Air Zimbabwe, Astral Aviation, British Airways, Brussels Airlines, Daallo Airlines, East African Safari Air, Egyptair, Emirates, Ethiopian Airlines, Jet Link, KLM, Kenya Airways, Precision Air, Qatar Airways Cargo, Rwandair Express, SWISS, Saudi Arabian Airlines, Sudan Airways, Virgin Atlantic Airways

Cargo Facilities:

Capacity 250 000tonnes (551 150,000lbs), Warehouse 12 351m² (132 945sq ft), Bonded Warehouse, Transit Zone, EU Border Post, Aircraft Maintenance, Mechanical Handling, Air-Conditioned Storage, Refrigerated Storage, Deep Freeze Storage, Animal Quarantine, Fresh Meat Inspection, Livestock Handling, Health Officials, X-Ray Equipment, Decompression Chamber, Security for Valuables, Dangerous Goods, Radioactive Goods, Very Large/Heavy Cargo, Express/Courier Centre, 401m² Animal holding compound, Fresh produce export zone. 1000m² dedicated to perishables inspection and re-packing area, Cargo Handling Agents:African Cargo Handling Ltd, Cargo Service Center East Africa BV, Kenya Airfreight Handling Ltd

Passenger Facilities:

Annual Capacity 2 500 000, 30 check-in desks, 13 gates, 8 air bridges, 4 baggage claim belts, 900 short term parking spaces, 100 long term parking spaces, 2 Airport Hotels, Min. Connection Times Intl-Intl: 60mins, Dom-Intl: 60mins, Post Office, Bank, Bureau de Change, Auto Exchange Machine, Restaurants, Cafeterias, Bars, VIP Lounge, Duty Free Shop, Newsagent/Tobacconist, Chemist Shop, Gift Shop, Travel Agent, Tourist Help Desk, Car Rental, Taxi Service/Rank, First Aid, Baby/Parent Room, Disabled Access/Facilities, Business Centre

Additional Information:

The airport is currently under major rehabilitation for a new terminal in line with our plan to turn Jomo Kenyatta into a hub center within Africa.

Second Runway;

A new instrument landing system-equipped runway 5,500 meters (18,000 ft.) in length has been approved for construction at a cost of 12.8 billion Kenyan shillings (US$146.5 million). An airport official has stated that the second runway will allow for continuous airport operations should an aircraft incident render the existing runway unusable. The runway also will enable direct long haul flights to destinations such as New York City, carrying up to 32 tones. Construction is scheduled to begin in January 2016 and be completed in December 2017.

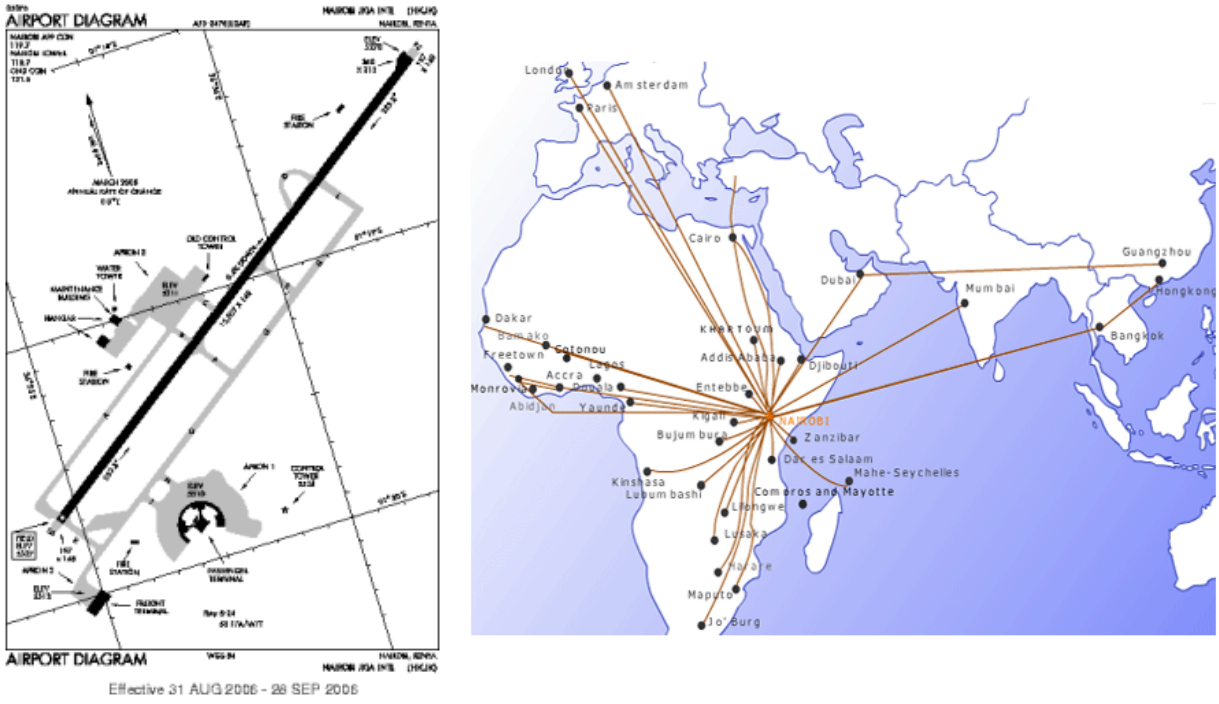


Figure 2.4.5 Airport Facilities and International Network

Table 2.4.4 Traffic of Jomo Kenyatta International Airport

Traffic	2004	2005	2006	2007	2008	2009	2010
Passenger throughput	3 999 711	4 251 663	4 449 023	4 861 706	4 922 542	5 104 791	5 485 771
Cargo handled (tonnes)	183 110	202 578	242 494	276 881	-	290 000	-
Cargo handled (1000s lbs)	403 684	446 603	534 602	610 411	-	639 334	-
Aircraft movements	59 927	57 587	61 516	72 692	-	-	-

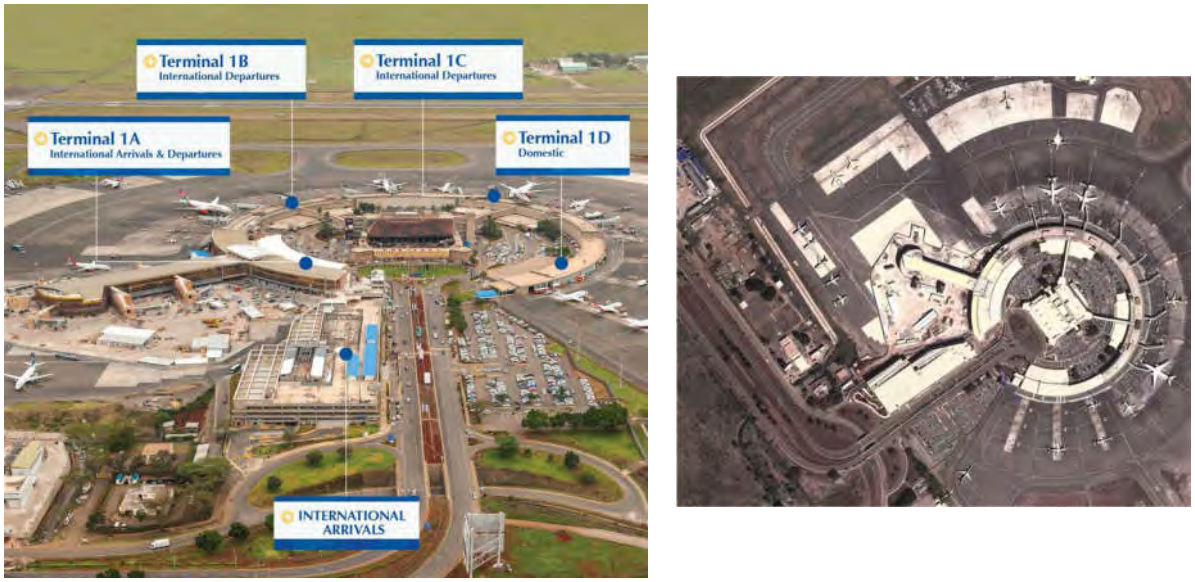


Figure 2.4.6 Jomo Kenyatta International Terminal

(5) Mombasa - Moi International Airport

Moi International Airport serves the city of Mombasa and surrounding communities. It lies approximately 425 kilometers (264 mi), by air, southeast of Jomo Kenyatta International Airport, the largest and busiest airport in the country. Mombasa Airport is operated by Kenya Airports Authority. It was named after former Kenyan President Danielarap Moi during his tenure.

Moi International Airport handles tremendous traffic with more than eighteen airlines flying directly from and to Europe, and offering connections to over twenty cities in the region. Mombasa region has remained attractive to tourist and it has eventually required that the airport be developed to handle long haul international flights.

At 61 meters (200 ft) above sea level, the airport has two runways: Runway 1 measures 3,350 meters (10,990 ft) in length and Runway 2 measures 1,260 meters (4,130 ft) in length.[3] Runway 1 is also known as Runway 03/21, while Runway 2 is also known as Runway 15/33. Runway 1 is equipped with an ILS (Instrument Landing System).

Airport Data:

International, Mombasa 12km (7miles), Position 04°02´05"S, 039°35´39"E, Elevation 61m (200ft), 24 hours, 3 Passenger Terminals, 1 Cargo Terminal, 10 Aircraft Stands

Airfield Data:

2 Runways,

Fire Category:

IX

Emergency Services:

Category IX International

Navigational Aids:

VOR-DME, NDB (MC,MD), PAP1, TXY Lights

Aircraft Maintenance:

One hangar for light aircraft

Runway 1:

Heading 03/21, 3 350m (10 990ft), 80/F/A/W/U, Aircraft size max: All sizes, ILS, Lighting: Runway light and approach lighting

Runway 2:

Heading 15/33, 1 363m (4 471ft), 008/F/C/Y/U, Aircraft size max: Light aircraft

Airlines Serving Airport:

African Express Airways, African Safari Airlines, Air Berlin, Air Europe, Airkenya Express, Caledonian, Condor, Kenya Airways, LTU Int´l

Cargo Facilities:

Capacity 2 000tonnes (4 409,000lbs), Warehouse 1 083m² (11 657sq ft), Deep Freeze Storage, Animal Quarantine, Fresh Meat Inspection, Handling Equipment: Forklifts, highloaders, trolleys, pallets, push back trucks

Cargo Handling Agents:

Kenya Airfreight Handling Ltd (Mombasa Airport)

Passenger Facilities:

Annual Capacity 901 194, 19 check-in desks, 4 gates, 3 air bridges, 6 short term parking spaces, 4 long term parking spaces, 4 Airport Hotels, Min. Connection Times Intl-Intl: 10mins, Dom-Intl: 15mins, Dom-Dom: 10mins, Post Office, Bank, Bureau de Change, Restaurants, Cafeterias, Bars, VIP Lounge, Duty Free Shop, Gift Shop, Travel Agent, Car Rental, Taxi Service/Rank, First Aid, Disabled Access/Facilities, Business Centre

Additional Information:

The airport is 12km from the railway station. Terminals I and II have 10 aircraft stands. Terminal III (General Aviation) has 22 stands.

Table 2.4.5 Traffic of Moi International Airport

Traffic	2004	2005	2006
Passenger throughput	966 542	1 059 731	1 007 783
Cargo handled (tonnes)	6 534 295	7 709 009	9 844 868
Cargo handled (1000s lbs)	14 405 506	16 995 281	21 703 995
Aircraft movements	15 759	16 008	17 104

This airport was built during the Second World War by the Engineer Corps of the South African Army. During that war it was used by the Fleet Air Arm as a land base of the British Eastern Fleet which was based at nearby Kilindini Harbor from 1942, by the Royal Air Force (RAF) which operated anti-submarine Catalina flying boats off the East Africa coast and by the South African Air Force which was engaged in the war against Italy in Abyssinia. It was originally known as Port Reitz Airport.

Mombasa Airport was expanded to an international airport in 1979. Aircraft Maintenance facilities for private and light- to medium-size commercial aircraft are provided from government and private hangars by Benair Aircraft Engineering, licensed by the Kenya Civil Aviation Authority (KCAA) as an approved maintenance organization (AMO).

From July to September 1994, Moi International Airport was used almost continuously as a refueling station during the Operation Support Hope humanitarian mission into Rwanda. Empty C-141 and C-5 freighter jets returning to Europe flew to Mombasa due to the scarcity of fuel in the African interior. The airlift through Mombasa was ceased by October due to runway expansion work financed by Japanese ODA loan. The project including runway/taxiway expansion and terminal building expansion was completed in October 1996.

Figure 2.4.7 Moi International Airport and Costal Line Nearby

The aerial restriction area of runway for small air crafts covers the future port area of Port Riz. The height of ships and cranes should be carefully examined.

(6) Other Airports

Eldoret International Airport

The airport is located some 16 kilometers south from Eldoret Town on the Eldoret-Kisumu road. The airport is open from Monday to Sunday from 0330hours to 1730hours GMT, but the hours can be extended on request. Currently the airport has three scheduled international cargo flights and several ad hoc freighters per week.

Wilson Airport

Wilson Airport is located 5 kilometers south of Nairobi. Wilson Airport is mainly used for domestic flights with light aircrafts. It is used for cargo transport and to fly passengers to popular tourist attractions in Kenya. Wilson Airport also has flights to Tanzania, Somalia and the Democratic Republic of Kongo.

Figure 2.4.8 Aerial Restriction of Airport.

Malindi Airport

Malindi Airport is 2.5 Km west of Malindi Town. It is by the Mombasa road on it's southern side, where the access road is connected. Eastwards the suburbs of Malindi are developing in the proximity of the Airport boundary. In particular two schools are located along the Eastern boundary fence. Westwards some land is used for a coconut plantation.

According to Kenya Airports Authority (KAA) Malindi International Airport has an annual passenger handling capacity of 300,000 passengers. Plans are underway to extend the runway from 1.4 km to 2.9 km and to increase the size of the apron to accommodate more aircraft.

Kisumu Airport

Kisumu is the the most Westernly city in Kenya Located on the shores of Lake Victoria, The largest fresh water lake in Africa. It is a center of trade between the East African countries due to its proximity to their borders. The airport is located to the North West of Kisumu town. The site is bordered on the Western and the Southern sides by Lake Victoria and on the Eastern and Northern sides by the main road to Uganda. It has two terminals and a 3.3 kilometers runway.

Wajir Airport

The Airport is located about 5km West of Wajir town. The Airport which opens daily operations at 0630hours and closes at 1830 hours is open to propeller aircraft at its current state due to loose chips on the runways, taxiways and apron, and its restricted to jet engined aircraft for safety purposes. .

Lokichoggio Airport

Lokichoggio airport is located 370 nautical miles North West of Nairobi and 214 Km North West of Lodwar Town, 24 Km to border of South Sudan. The Government took over the running of this Airport in 1999 and this saw the deployment of officers from key Government departments and the Kenya Airports Authority to spearhead the core functions of the airport.

Ukunda Airstrip

Ukunda Airsterip is a feeder Airstrip that deals mostly with tourists from south coast hotels taking them to and from national parks, lodges, airports and privately owned Airstrip. The main air operators are the charter companies on scheduled chartered basis, depending on tourism season. Their clients are mostly tourist who would like to go on air safaris to the national parks, lodges and other airports.

Manda Airstrip

Manda airstrip is situated on Manda Island in the Lamu Archipelago. The airstrip was established between 1962 and 1963 as landing strip for the colonial administrators.

(7) JICA support for airport development in Kenya

a) Jomo Kenyatta International Airport (JKIA) Expansion Projects

Package 1 – Construction of the terminal T1A passenger apron, the taxiways and associated civil and electrical works which was completed in April 2008.

Package 2 – Construction of terminal T1A, the multi-storey car park and the grade parking which was completed in 2014.

Package 3a – Construction of Arrivals Hall in T1A to increase capacity to handle arriving passengers, and scheduled for completion by April 2015.

Package 3b – Renovation and re-organization of terminal T1B, T1C, T1D and arrivals building including construction of new infill building to commence in August 2015 and be completed in June 2018.

Package 4a – Rehabilitation and upgrading of aircraft pavements and upgrading of ILS system from CAT I to II to increase capacity to runway and to improve on safety of operation on the runway, construction to commence in March 2015 and be completed in October 2016.

Package 4b – Construction of 16 no. CAT C remote stands including fuel hydrant to increase capacity for parking of aircraft, construction which is due for completion early 2015.

Package 5 – Construction of the New Domestic Terminal T2, which is due for completion in December 2014.

Package 6 – Construction of the New Green Field Terminal Complex and Associated Facilities – construction having commenced in December 2013 and scheduled for completion in 2018.

b) Kisunu Airport Expansion

Kisumu Airport Expansion Phase 1

Kisumu Airport is being upgraded to an international airport. The upgrading works in progress include: runway reconstruction, runway extension by 300 Meters to accommodate bigger planes, a new terminal building and relocation of Uyoma Primary School to create room for new works. Funding is from GOK. Works completed in March 2012.

Kisumu Airport Expansion Phase 2

Kisumu Airport phase 2 includes structural strengthening of the full runway, new taxiway, cargo apron and extensive landscaping. Funding is from GOK. Works due for completion in 2015.

c) Airstrips rehabilitation

Our vision is to provide aviation facilities evenly all over the country by way of developing and maintaining at least one airstrip within each county. Rehabilitation works are ongoing at Nyeri (Nyaribo), Embu, Kitale, Kakamega, Isiolo and Lodwar airstrips. We intend to complete works at these airstrips within this financial year. Funding is from GOK.

d) JKIA commuter rail service

The government intends to introduce commuter train services in Nairobi in its efforts to ease congestion in the city. The proposed project will link the city with places such as Jomo Kenyatta International Airport (JKIA) through Syokimau. The 2.2 Km spur line from Embakasi intermodal railway station to Syokimau is already complete and operational.

KR and RVR jointly rehabilitated old locomotives and coaches previously in disuse which kicked off the JKIA Interim Service.

e) KCAA CAT I status – Institutional strengthening

For Kenya Civil Aviation Authority (KCAA) to achieve Federal Aviation Administration's International Aviation Safety Assessment (IASA) Category 1, they were required to recruit and retain qualified and experienced Flight Safety Inspectors.

Through technical support, Foreign Inspectors were brought on board as a temporary stop gap vides the Sofreavia / Egisavia contract which ended in January 2010. During the period, KCAA recruited local experts some of who have since left due to low remuneration. The only option is institutional strengthening (Flight Safety Oversight) of KCAA through the following:

- A new organizational structure
- Enhanced grading and salary structure
- Separation of their Regulatory Functions from Service Provision

This process of institutional strengthening is ongoing.

f) KCAA improvement of CNS aids from CAT I to CAT II status

The Kenya Civil Aviation Authority (KCAA) is also investing in new and modern Communication, Navigation and Surveillance Aids. This will enhance management of our airspace and also make it easier for pilots to see, identify and interact in the sky.

Coupled together with airspace aids, we are also improving the Instrument Landing Systems from Category I to the higher Category II by replacing/installing the following:

- New approach lights
- Runway Centre Line Lights ,
- Runway Touch Down Zone Lights ,

- Runway Threshold/End Lights and Wing Bar Lights,
- Taxiway Edge Lights and Centre line lights
- ATC Centre System, Recorders, Voice Control System, VOR/DME, Digital ATIS, Radar – Primary Surveillance, Radar – Secondary Surveillance - Mono-pulse (Mode "S"), VHF Transmitters & Receivers, GPS Clock, Surface Movement Guidance & Control System, ADS-B / ADS-C

3. Existing Port Plans and Relevant Information

3.1 National Development Plan and other plans in the related Sectors

3.1.1 Kenya Vision 2030

Kenya Vision 2030 is the country's new development blueprint covering the period 2008 to 2030. It aims to transform Kenya into a newly industrializing, "middle-income country providing a high quality life to all its citizens by the year 2030". The Vision is based on three "pillars": the economic, the social and the political. The economic pillar aims to improve the prosperity of all Kenyans trough an economic development program, covering all the regions of Kenya, and aiming to achieve an average Gross Domestic Product (GDP) growth rate of 10% per annum beginning in 2012. The social pillar seeks to build a just and cohesive society with social equity in a clean and secure environment. The political pillar aims to realize a democratic political system founded on issue-based politics that respects the rule of law, and protects the rights and freedoms of every individual in Kenyan society.

The Kenya Vision 2030 is to be implemented in successive five-year Medium-Term Plans, with the first such plan covering the period 2008-2012. For that reason, the reader will find frequent references to projects and programs scheduled for implementation between 2008 and 2012. While the "flagship" projects are expected to take the lead in generating rapid and widely-shared growth, they are by no means the only projects the country will be implementing. At an appropriate stage, another five-year plan will be produced covering the period 2012 to 2017, and so on till 2030.

The economic, social and political pillars of Kenya Vision 2030 are anchored on macroeconomic stability; continuity in governance reforms; enhanced equity and wealth creation opportunities for the poor; infrastructure; energy; science; technology and innovation (STI); land reform; human resources development; security as well as public sector reforms. Regarding infrastructure, the 2030 Vision aspires for a country firmly interconnected through a network of roads, railway, ports, airports, water and sanitation facilities, and telecommunications. By 2030, it will become impossible to refer to any region of our as "remote". Furthermore, to ensure that the main projects under the economic pillar are implemented, investment in the nation's infrastructure will be given the highest priority. Development projects recommended under Vision 2030 will increase demand on Kenya's energy supply. Currently, Kenya's energy costs are higher than those of her competitors. Kenya must, therefore, generate more energy at a lower cost and increase efficiency in energy consumption. The Government is committed to continued institutional reforms in the energy sector, including a strong regulatory framework, encouraging more private generators of power, and separating generation from distribution. New sources of energy will be found through exploitation of geothermal power, coal, renewable energy sources, and connecting Kenya to energy-surplus countries in the region.

Regarding the economic vision and strategy, the six key sectors described below have been given priority in acting as key growth drivers in the journey to 2030. Flagship projects for these sectors are:

a) Tourism

- 3 resort cities: two new resorts cities at the coast (one in north and the other at south coast). The third one will be located in Isiolo.
- Better marketing of little-visited parks so as to bring more tourists to game parks that have not been receiving many visitors, and which are located in all parts of the country.
- The premium parks initiative: this will provide more high-end tourists with a unique experience in popular destinations, such as Maasai Mara and Nakuru.
- The under-utilized parks initiative: this aims to upgrade the standards of attractive but seldom visited e.g. Ruma and Marsabit.
- The niche products initiative: this will provide 3,000 beds in high cost accommodation for tourists interested in cultural and eco-tourism, as well as in water-based sports and related

activities. It will initially target four key sites in Western Kenya.
- The certification of 1,000 home-stay sites to promote cultural tourism in Kenyan homes.
- The business visitors' initiative: this will attract five additional international hotels to Nairobi, Mombasa and Kisumu, and also leverage Isiolo as a new high-end tourist destination.

b) Agriculture

- Preparation and passage of consolidated agricultural policy reform legislation.
- Development and implementation of a 3-tiered fertilizer cost reduction program.
- Improving the value gained in the production and supply chain through branding Kenyan farm products.
- The planning and implementation of 4-5 Disease Free Zones and livestock processing facilities to enable Kenyan meat, hides and skins to meet international marketing standards. There will be more domestic processing of these products for regional and international markets.
- The creation of publicity accessible land registries, under an improved governance framework.
- Development of an Agriculture Land Use Master Plan.
- Tana River Basin Agriculture development Scheme.

c) Wholesale and retail trade sector

- Creation of at least 10 wholesale hubs and 1,000~1,500 Producer Business Group (starting with a pilot project in Maragua, Central Province, that is to be extended to other regions).
- Building of at least 10 'Tier 1' retail markets (starting with a pilot project in Athi River).
- The building of one free trade port at the coast in order to "bring Dubai to Kenya". This port will serve eastern and central Africa.

d) Manufacturing

- The development of a strategy for the establishment of at least 2 special "economic clusters", that is, related industries located together to gain from economies.
- The development and creation of at least 5 Small and Medium Enterprise (SME) Industrial Parks.

e) Business process offshoring

The flagship BPO project for 2012 is to design and establish one major BPO park in Nairobi (possibly in Athi River) that will have world class infrastructure developed by top international IT suppliers. Kenya will offer competitive incentive packages for companies to locate in the park, provide a-one-stop shop for administration and talent and serve as a "show-case'" park to attract more top foreign IT companies.

f) Financial services

- Facilitate the transformation of the banking sector to bring in fewer stronger, larger scale banks.
- Develop and execute a comprehensive model for pension reform.
- Pursue a comprehensive remittances strategy.
- Formulate a policy for the issuing of benchmark sovereign bonds.
- Implement legal and institutional reforms required for a regional financial center.

3.1.2 First Medium Term Plan (2008-2012)

The First Medium Term Plan (MTP) of Vision 2030 identifies key policy actions, reforms, programs and projects that the Government will implement in the 2008-2012 period. It is the foundation for the first phase of implementing Kenya Vision 2030, Kenya's new, long term policy blueprint. The overall objective is to realize a higher and sustainable growth of the economy in a more equitable environment,

accompanied by increased employment opportunities. The MTP incorporates the activities identified in the report of "the National Accord Implementation Committee on National Reconciliation and Emergency Social and Economic Recovery and Country's One-Year Economic and Social Recovery Plan", all of which target a quick economic and social recovery, following the destructive aftermath of the December 2007 general elections.

a) Economic growth target

The MTP aims at increasing real GDP growth from an estimated 7 per cent in 2007 to 7.9~8.7 per cent by the years 2009-2010; and to 10 per cent by 2012. Over the next five years, savings 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.

b) Tourism

The overall strategy for the tourism sector is to treble national earnings by increasing international arrivals from 1.6 million to 3 million, while also increasing the average spending per visitor from Kshs. 40,000 to 70,000. In this regard, three tourist resort cities will be established in the next five years: one in Isiolo and two at the coast to entrance bed capacity and improve the standards of tourist accommodation and facilities.

c) Agriculture

Agriculture contributes directly to over a quarter of the GDP and provides a source of livelihood to the majority of Kenyans. It is expected to grow at a pace of about 6-8 per cent as a result of various measures to be implemented under the MTP, including a reduction in the cost of farm inputs such as fertilizer; improving farm prices; providing higher value addition; improved marketing and the implementation of policies to revitalize the sector, while increasing overall agricultural productivity.

d) Manufacturing, wholesale and trade

The sector is targeted to increase from the current 5 per cent to 10-12 per cent by 2012. To meet this target, two Special Economic Clusters will be set up in Mombasa and in Kisumu for manufacturing establishments. Additionally, at least five Small and Medium Enterprises (SMEs), industrial Parks and Specialized Economic Zones will be set up.

e) Financial Services

In order to implement the Flagship Project in the six economic sectors falling under the Economic pillar of Plan, an estimated Kshs. 500 billion will need to be invested. The government will invest Kshs. 250 billion in the next five years to ensure the implementation of these projects, with the remaining half expected to be financed by both local and foreign private investors, and many through PPP arrangements. The Financial Services sector is thus expected to play a key role in mobilizing the savings and investments required to implement the Medium Term Plan.

f) Physical Infrastructure

The development of high quality national physical infrastructure is a critical foundation for this Medium Term Plan. The strategies and measures to be pursued in the medium term period include 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 so that they are completed within the specified time frames. A National Spatial Plan to optimize the development and utilization of infrastructure facilities and services will therefore be developed. The operationalization of the PPP policy will also be expedited to facilitate private sector participation in infrastructure facilities and services strategically complemented by public sector interventions.

The five-year target is to have 64,500 km of well-maintained and motor roads with a total of Kshs. 186 billion spent on road construction and upgrade during the 2008-2012 period. Over the same period, the government will concession many toll roads to be built by the private sector. A new transport corridor

linking Ethiopia, Southern Sudan and Somalia to a second port to be constructed at Lamu will be developed and implemented through Build, Own, Operate and Transfer (BOT) arrangements at a cost of USD 15-20 billion while a free port at Dongo Kundu in Mombasa will also be developed. The other major transport infrastructure projects will be the development of a rapid bus and light rail system in the Nairobi Metropolitan area, which is expected to serve as a prototype for the other main urban areas in the country.

g) Energy

An Energy Access Scale-up Program will be implemented through which a million households will be connected with energy in the next five years at a cost of Kshs. 84 billion. A major project to connect Kenya to the Southern Africa power pool through Tanzania at a cost of USD 110 million will also be implemented in two years, while other projects in the power sector will include geothermal, solar and wind power.

3.1.3 Second Medium Term Plan (MTP2) (2013-2017)

The Second Medium Term Plan (MTP) of Vision 2030 identifies key policy actions, reforms, programs and projects that the Government will implement in the 2013-2017 period in line with its priorities, the Kenya 2010 constitution and the long-term objective of Vision 2030. Accordingly, the theme of this MTP is "Transforming Kenya: Pathway to Devolution, Socio-Economic Development, Equity and National Unity". The second MTP also aims to build on the successes of the first MTP (2008-2012), particularly in increasing the scale and pace of economic and social pillars of Vision 2030. Under this MTP, transformation of the economy is pegged on rapid economic growth on a stable macro-economic environment, modernization of infrastructure, diversification and commercialization of agriculture, food security, a higher contribution of manufacturing to GDP, wider access to African and global markets, wider access for Kenyan to better quality education and health care, job creation targeting unemployed youth, provision of better housing and provision of improved water sources and sanitation to Kenyan households that presently lack these. The overall aim of the plan is that by 2018 Kenyan families will have experienced a positive transformation in their earnings and quality of their livelihoods, and Kenya will be a more united, more prosperous society commanding respect in African and the world.

- In the initial year of the first MTP, a number of projects aimed at national healing and reconciliation following the post-election violence were implemented. Repair of damaged infrastructure; assistance to affected small-scale businesses; and resettlement of IDPs were all undertaken in order to raise GDP growth (which fell to 1.5 per cent in 2008) and to promote national reconciliation. Up to the year 2012, progress achieved under the first MTP included the following:
- Enrollment in early childhood education increased by 40% from 1.72 million in 2008 to 2.4 million,
- Transition rate from primary to secondary education increased from 64% in 2008 to 77%,
- The number of students enrolled in university education increased by 103% from 118,239 in 2008 to 240,551,
- A total of 2,200 km of roads were constructed exceeding the MTP target of 1,500 km,
- Three undersea submarine fiber optic networks linking Kenya to the global internet networks were completed including 5,500 km of terrestrial fiber optic network,
- Total installed capacity for generation of electricity increased by 22 %, and
- The Constitution of Kenya (2010) was enacted.

Despite the achievements made during the first MTP Kenya still faces significant development challenges which need to be addressed during the second MTP. These include:

- Low domestic savings and investments: Kenya's saving rate was 13 per cent of GDP during the last MTP period, just half of the average for low income countries, and less than the 17 per cent of sub Saharan Africa average,

- Low-per capita income growth: Real per-capita income grew by 7.8 % in the last 5 years,
- High levels of unemployment and poverty: The last published rate of unemployment by the Kenya National Bureau of Statistics is 12.7per cent based on the 2005/6 Kenya Integrated Household Budget Survey. Recent estimates by non-Bureau sources puts the youth unemployment rate at 25 per cent which suggest almost doubling of the unemployment over the last 8 years,
- High energy costs: 21 US cents per Kwh compared to approximately 6 US cents per Kwh in India and China,
- High costs of finance: high bank lending rates and wide interest rates spread,
- Inefficiencies in rail and port operations, inhibiting regulations and procedures to business and investors,
- Major economic and social disparities across regions of the country,
- A rapid population growth rate, proliferation of informal settlements, governance problems and insecurity,
- High dependence of the country on rail-fed agriculture and low agricultural productivity, remain problems in the sector which employs more Kenyan than any other,
- Slow structural transformation exemplified by low and declining share of manufacturing to GDP and low share of export to GDP,
- Narrow range of exports and the slow growth in their value compared to the growth of imports,
- Upsurge in non-communicable diseases across the country and global pandemics,
- Cyber-crime, and
- Threats emanating from climate change.

The key priority areas that Government will implement over the second MTP period are described below.

(1) Macroeconomic framework

Macro-economic stability will continue to be a key objective in national economic management. The second MTP aims at sustained growth in agriculture, manufacturing, and service sectors in order to achieve an overall GDP growth rate of 10 per cent by 2017. To sustain and increase the growth momentum inherited from the first MTP, this plan aims to increase local savings and foreign direct investment in all the sectors. The second MTP also aims at an enhanced regional and international trade strategy to grow and diversify exports, in order to improve balance of payments position and ensure exchange rate stability.

(2) Foundations of the economy and society

The second MTP will sustain and expand physical infrastructure to ensure that it can support a rapidly-growing economy, the demands imposed on it by higher rural and urban incomes, and by new economic activities. A national spatial plan and country specific spatial plans will be developed in order to rationalize utilization of space for economic and social development. In addition, air transport facilities will be expanded within the country, and Kenya will strengthen its position as the air transport hub in the region. Priority will also be given to improving the efficiency of ports, and the implementation of the single window clearance system. With the construction of the standard gauge railway line from Mombasa to Malaba, rail transport will be expected to handle 50 per cent of the freight cargo throughput, thus easing the pressure on roads, lowering the cost of doing business, and enhancing trade and regional integration in Eastern Africa. The new Lamu port and the LAPSSET corridor will be implemented as part of upgrading the national transport framework in collaboration with other countries in Eastern Africa. To relieve congestion in main urban areas, planned mass rapid transit systems will be constructed. Expansion of roads will be continued, aiming at achieving a road network with 75-80 per cent of the classified roads in good condition and construction or rehabilitation of 5,500 km of roads.

With regard to energy, a strategy in place for modernizing the energy infrastructure network, increasing the share of energy generated from renewable energy sources, and providing energy that is

affordable and reliable to businesses and homes. This will ensure that energy supply is adequate and efficient in order to support increased use in manufacturing, agriculture, services, public facilities and households. The plan aims at increasing installed capacity for electricity generation by 5,538 MW in 2017.

(3) Economic pillar

The economic pillar in the second MTP consists of six priority sectors. The overall strategy for the tourism sector is to turn the country into a top 10 long haul tourist destination in the world. This will be achieved through growth and diversification of tourist sources from the traditional areas (i.e. Western Europe and North America), and from non-traditional sources in the Middle East and East Asia. The sector will also market new high-end tourist segments like business, cultural and ecological tourism. Tourist arrivals are expected to double from an average of 1.5 million in recent years, to 3 million each year by the end of the plan period. Construction of two coastal resort cities and three upcountry tourist resort cities in Isiolo, Lamu and Lake Turkana will be initiated, and measures to increase bed capacity, to open more five-star hotels, and improve the standards of tourist accommodation and facilities will be taken.

(4) Agriculture and livestock

The second MTP will give top priority to increasing acreage under irrigation in order to reduce the country's dependence on rain fed agriculture. A total of 404,800 hectares will be put under irrigation during the plan period. Measures will be taken to mechanize agricultural production, revive cooperatives and farmers unions, and subsidize farm inputs to raise productivity.

The foreign policy will aim at increasing international trade and international economic partnerships. This policy will encourage Kenyan products and the private sector to open new product lines to meet demand in new African and global markets that will be identified. The government will also intensify reforms to improve the overall climate of doing business in Kenya.

The second MTP will give additional attention to growth and diversification in the manufacturing sector with the aim of increasing the sector's contribution to the GDP and foreign exchange earnings. To achieve this, three special economic zones targeting manufacturing in Mombasa, Kisumu and Lamu will be established. Other initiatives in the sector will include building clusters for meat and leather products, a stronger dairy sector, and the development of industrial and SME parks that will provide linkages to other sectors like agricultural and services.

(5) Oils and other mineral resources

Oils and other mineral resources is a new priority sector under the economic pillar of this plan given the continued discovery of oil and other minerals in Kenya. In the plan period, the government will develop the policy, legal, and institutional framework for the exploitation and management of Kenya's natural resources (oil, gas and other minerals) for the maximum economic benefit of the country and local communities in a transparent and accountable manner. It will also ensure that legislation for transparency and fair sharing of the revenue generated is enacted, and safeguards erected to protect the environment and to avoid risks usually associated with huge inflows of resource-based external earnings.

(6) Trade

The country will focus on expanding trade to increase its share in the fast expanding regional and other emerging markets. Trade in the broader region will be backed by joint infrastructural investments with neighboring countries. During the plan period, the government will facilitate research in business development and entrepreneurship under a new entity called "Biashara Kenya" to provide funding and leverage investment from local banks. This will develop capacity and productivity of local manufacturing geared to competitively priced quality exports to Africa and the global market.

(7) Regional and National Economic Environment

Growth in the sub-Saharan Africa region is projected to remain robust at about 5 percent in 2013 and 6

percent in 2014, backed by continuing investment in infrastructure and productive capacity. It is projected to rise gradually to more than 5.5 percent over the plan period. Global headwinds moderately lowered sub-Saharan Africa's growth in 2013, but the pace is expected to pick up in 2014. Strong investment demand continues to support growth in most of the region. Softening and increasingly volatile global economic conditions are expected to have only a moderate downward impact on sub-Saharan Africa this year and over the plan period.

The economic outlook for the EAC (East African Community) region remains favorable, driven by increased infrastructure investments and an expected surge in private-sector lending. East Africa is expected to post strong growth in 2014, but falling commodity prices and the region's mounting debt burden could offer the greatest challenge to its 136 million citizens. The region's growth is expected to average six percent in 2014, up from about 5.5 percent in 2013 and grow by between 5.5 and 6 percent over the plan period.

Kenya's Gross Domestic Product (GDP) expanded by 4.7 percent in 2013 compared to 4.6 percent in 2012 (according to the latest Economic Survey 2014, released in April). This performance was supported by;

- A stable macroeconomic environment for the better part of the year,
- Low and stable inflation supported by improved supply of basic foods, lower international oil prices and lower costs of electricity,
- Infrastructural development, and
- A vibrant construction sector.

This growth is expected to reach 6.1 percent in 2014 and 6.7 percent in the outer years, reflecting continued normal weather and strong growth in the sub-region. Going forward, the macroeconomic outlook remains favorable although risks remain. The main sectors that drive the economy recorded positive growths of varying magnitudes, as indicated below:

Table 3.1.1 Economic Sector Performance in 2012 and 2013

Sector	Year 2012 (%/year)	Year 2013 (%/year)
Agriculture & Forestry	4.2	2.9
Transport & Communication	4.7	6.0
Manufacturing	3.2	4.8
Financial Intermediation	6.5	7.2
Construction	4.8	5.5
Wholesale and Retail Trade, Repairs	9.0	7.5
Electricity & Water	10.3	5.9

Source: Economic Survey 2014

3.2 Transport Policy and Master Plan

3.2.1 Integrated National Transport Policy

The transport sector is recognized as a key pillar and a critical enabler in achievement of the "Kenya's Long Term Development Strategy, Vision 2030". It will be important not only in improving the competitiveness of products from Kenya and the region, but also serve as a significant basis upon which the economic, social and political pillars of this long term development strategy will be built. Further, the sector is expected to remain 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.

(1) Road transport

a) Road transport infrastructure

The significance of road transport in the national economy is illustrated by the fact that during the period 1998-2008, output in road transport averaged over 30 per cent of total output annually in the transport and communication sector. This mode accounts for over 93 per cent of the total internal freight and passenger traffic in the country with the remainder being mainly carried by rail and air. The Northern Corridor is important as a freight transport corridor for both import and export for the countries in the eastern and central Africa. The following statements are described in the "Integrated National Transport Policy" in May 2009.

Mission

"To provide an integrated, efficient, reliable, and sustainable road transport infrastructure that meets national and regional passenger and freight transportation goals and supports the government's socio-economic development strategies to promote accessibility to services and the safe movement of people and goods, while being environmentally and economically sustainable"

The desired scenario for road transport infrastructure is to:

- Make Kenya the hub for road transport in the East African region,
- Promote sustainable economic development by removing constraints on demand in development regionally and provide the catalyst role for private investment,
- Be structured to encourage public passenger transport and discourage excessive use of private passenger road transport,
- Allow for a seamless inter-modalism through flexibility and interconnectivity with other transport modes,
- Be financed through a combination of user charges and private/public sector investment,
- Provide adequate accessibility together with safety and security within the constraints of social affordability,
- Incorporate technological advances, which promote and enhance the role of transport in the economy and in development,
- Be structured to ensure environmental sustainability and internationally accepted standards.

b) Institutional framework for roads sub-sector coordination

With the enactment of the Kenya Roads Act 2007, three new Road Agencies have been established namely, the Kenya National Highways authority (KeNHA) responsible for Class A, B and C roads; Kenya Rural Roads Authority (KeRRA) responsible for Class D, E and other roads and Kenya Urban Roads Authority (KURA) responsible for urban roads. The Kenya Roads Board (KRB) is now responsible for financing the maintenance of roads and undertaking technical audits.

The critical challenge is operationalization of the new agencies and capacity building for the subsector to perform optimally. The new agencies should come up with new strategies to address governance issues in the road sector.

Policy

- Appropriate linkage/working mechanisms between the Ministry responsible for Roads, Road Agencies, Kenya Roads Board and Development Partners shall be established within the Roads Sub-Sector to enhance service delivery,
- Stakeholders' participation shall be encouraged at all levels where road development, rehabilitation and maintenance is undertaken,
- Deliberate efforts will be made to build capacities (both institutional and human) in the Roads Sector, and
- The Ministry will endeavor to register all road reserves with a view to protecting them from encroachment.

c) Development and maintenance of road transport infrastructure to enhance service delivery

There is urgent need to integrate road transport infrastructure planning with overall economic planning, to take into account the changing local and regional economic activities and population issues. The rate of road deterioration has tended to exceed that of road maintenance/rehabilitation despite the adoption of various road Development and maintenance strategies. This situation has been aggravated particularly by inadequate finances, low contractor capacity and poor supervision mechanisms in force.

There is an imbalance in road transport infrastructure development in the country. The Northern, Eastern and Southern Parts of the country are poorly served by roads, with North Eastern being the worse hit. The North Eastern province, which covers approximately 30 per cent of the country's land mass, has less than one per cent of its roads network paved. There is a need to embrace "corridor development approach" to improve road conditions to enhance urban and regional linkages, facilitate service delivery and efficient mobility of both people and goods.

Policy

- A strategic approach on long term, integrated and sustainable planning and provision of the road transport infrastructure consistent with the needs of the country shall be developed to respond to various regional land use and road transport demand management,
- Where road transport is identified as the major constraint to the stimulation of economic development, the GoK shall take the lead in establishing necessary road transport infrastructure by promoting the participation of other public and private sector institutions in its development and maintenance in order to facilitate and accelerate the development process.
- The development of main road corridors and access links will enhance both internal and regional mobility while facilitating the movement of inputs and outputs between production and market centers, particularly to rural areas. In particular, the development and improvement of roads in Northern region and other arid and semi-arid lands of the country would facilitate the establishment of livestock based industries and enhance the development of irrigation agriculture in the region.
- A comprehensive management information system, based on performance indicators and models that enable the provision of an integrated demand and supply driven road transport infrastructure shall be established.
- On road maintenance, the government shall adopt the most appropriate and efficient contracting methods, which provide for input-based and performance-based contracting for maintenance works. The process will involve private sector participation while reducing current excessive and cumbersome contracting process.
- To ensure that the quality for delivery mechanism is constant, standards for development and maintenance shall be adhered to with a view to ensuring efficient road transport infrastructure.

d) Development of multi institutional financing for the development and maintenance roads

e) Environmental protection and resource conservation relating to transport infrastructure

f) Advancement of human resource development in the provision of transport infrastructure

g) Non-motorized and intermediate means of transport policy (NMIMTs)

h) Road passenger transport services

i) Road freight transport

j) Trade and competitiveness

k) Road traffic and safety

(2) Railway transport

Railway network in Kenya comprises a one-meter gauge total truck of 2,765 km owned by Kenya Railway (KRC). Magadi Railways, a subsidiary of Magadi Soda Co. Ltd., owns and operates 146 km of the railway truck under a 25-year lease agreement with the government, for the exports of its soda ash from Konza to Mombasa. From November 1, 2006 the Kenya Government and KRC concessioned the management and operations of railway services to Rift Valley Railways (RVR). Under this agreement, freight services were conceded for a period of 25 years while the passenger services were conceded for 5 years from the concession commencement date.

Freight services are offered on almost all routes for both domestic and regional markets while passenger services are provided three times a week in the up and down direction between Nairobi and Mombasa and between Nairobi and Kisumu and once a week between Nairobi and Nanyuki. Current business levels and operations at the railways have not been able to fully utilize the excess capacity of the workshop.

Mission

The mission in railway transport sub-sector is to provide efficient, reliable, safe and secure railway transport services that are integrated with national and regional railway, road, water, pipeline and air transport services for the transportation of goods and passengers on a sustainable and competitive basis.

Railway transport is the most suitable mode for haulage of goods over long distance on land, i.e. beyond 4,000 km. The performance of railway transport has over the years declined considerably due to lack of investment among other factors and hence the restructuring and concessioning of its management and operations. GoK through the KRC will closely monitor the concessionaire to meet the obligations and targets set in the concession contract. The challenges and constraints facing the railways are:

- Stiff competition from road and pipeline transport,
- Tax policies that result in the railways subsidizing road transport which is its major competitor through payment of the road maintenance fuel levy,
- An unreliable and aging infrastructure and rolling stock capacity particularly the single track, bridge, telecommunication, signaling and other facilities,
- Lack of investment by the Government, KRC and the Concessionaire.

The above problems have resulted in poor operational and financial performance in the sub-sector. The GoK will ensure that the railway capacity is developed and exploited fully. The following key policy areas and critical issues will be addressed.

a) Legal, institutional and regulatory framework

The legal and institutional environment in which KRC operates is not conductive for flexibility in decision making. For instance it receives directions from various government agencies, including the

Office of the President, the Treasury, the Ministry of Transport and the Inspectorate of State Corporations. There is therefore,

- Need for a review of the KRC and State corporations Acts to reduce or eliminate restrictive regulations that do not allow fast response to changes in the market environment,
- Need to establish a policy that allows institutions to streamline business processes and to respond effectively to market changes.

Policy

The Government will review the KRC and State corporations Acts to facilitate managerial autonomy for KRC and flexibility in decision making.

b) Infrastructure development and financing

The network is not well integrated with major urban centers within the country and other neighboring countries. The current railway track is old and unreliable. It has sharp curves and high gradient in certain sections that limit train speeds and haulage. The telecommunication and signaling systems used for train operations are also old and unreliable. The current infrastructure in its present state cannot be expected to fully provide effective services to industry and people and to contribute to national and regional economic development. Critical issues are:

- Need to promote multi modal transport through integration of railway systems with other transport modes,
- Need to improve the current infrastructure facilities,
- Need to construct new modern standard gauge railway networks linking the port of Mombasa and the proposed port of Lamu to the neighboring countries,
- Need to closely monitor the railway concession to ensure the concessionaire meets the minimum investment set in the agreement,
- The funding of railways infrastructure is expensive and the Government may not have adequate funds for railway infrastructure development.

Policy

Gok will:

- Spearhead infrastructure provision and development,
- Continue to monitor the implementation of the Concession Agreement to ensure that the anticipated objectives are achieved,
- Facilitate the construction of a railway line connecting the Central Business District to JKIA,
- Initiate a long-term railway development program aimed at phasing out the present railway system and replacing it with a modern railway network system
- Finance railways infrastructure development,
- Encourage private sector investment in railway development and rehabilitation on a competitive basis,
- Utilize the land along the track to generate more revenue.

c) Railway operations

- The railway services in the country are provided by a private operator (RVR) and Magadi Soda Company whose services are limited to transporting its own products. Critical issues are:
- The freight and passenger services offered in the country do not fully meet the demand by the industry and the public. The freight services offered do not provide “just-in-time” services as required by the industry,
- Operational performance is affected by poor infrastructure and rolling stock,
- Weak enforcement of operations and procedures,

- Need to ensure that operations are well integrated with other transport modes,
- Need to ensure that operations are spread in the country in order to improve the quality of life and achieve regional development,
- Need to provide an efficient passenger railway services especially in urban areas that are accessible to all.

Policy

- Ensure that public service obligations offered where necessary are compensated for. This is to ensure that railway operations do not lead to undue losses for the operator,
- Ensure that freight charges and passenger fares charged by railway operators are competitive,
- Provide railway infrastructure for mass rapid transport in Nairobi and its environs, undertake and implement feasibility studies for the provision of similar services in other local authorities and urban centers,
- Ensure that railway infrastructure and rolling stock are maintained at levels capable of supporting effective operations and the national economy. The distribution of traffic among modes shall be improved to ensure the optimum utilization of resources for the benefit of the economy.

d) Land use planning and management

e) Information and communication technology

f) Safety

g) Establishment of a level playing ground

h) Human resource development

i) Regional and international integration

j) Environmental and energy issues

(3) Maritime transport

Maritime transport plays a significant role in the social and economic development of Kenya. In view of the fact that over 95 per cent of Kenta's international trade is conveyed by sea, maritime transport continues to play a pivotal role in the development of the national economy since maritime transport is the most economical mode of transport especially for bulky goods. This mode of transport enhances the competitiveness of Kenya's exports in the international markets and helps attract foreign direct investment to the country. An efficient and affordable maritime transport will support increased economic activities as envisaged in Kenya's Vision 2030, Kenya's long-term national planning and development strategy. Developments in the maritime sector have to be in tandem with this Vision.

The policy addresses maritime transport issues relating to economic principles, international trade, domestic participation, ship financing, ownership and registration, commercial maritime support services, shipping operations, ports, safety of life and property at sea, training, certification and employment of seafarers, prevention and control of marine pollution, search and rescue services, security of ships and port facilities and the institutional and regulatory framework.

Mission

"To promote an efficient safe, secure, and environmentally sound maritime transport system that supports the integration of the global network of the maritime supply chain, expansion of the productive capacity of the economy and the improvement of the quality of life and well-being of Kenyans"

Objectives

To realize this mission the Government will pursue the following objectives:

- Develop the maritime transport sector in support of the economy in general and Kenya's international trade in particular,
- Develop the port of Mombasa as a main gateway to Kenya and the hinterland serving the Great Lakes region,
- Develop the port of Lamu as an alternative commercial port with emphasis on developing links to Sudan, Ethiopia and Somalia (second transport corridor),
- Develop a Free Trade zone at Dongo Kundu,
- Restructure the Kenya National Shipping Line as a national carrier,
- Enhance the legal framework within which to ensure safety and security of life and property, the prevention and control of pollution of the sea and of the inland waters,
- Promote public/private partnerships in maritime transport operations and infrastructure development,
- Develop an awareness of maritime transport issues in Kenya amongst the policy makers, the stakeholders and the general public,
- Ensure provision of globally competitive, quality maritime education and training for seafarers and other workers in the maritime industry,
- Strengthen the framework for the co-ordination of activities of service providers in line with the established policies, rules and regulations targeting among others code of conduct, cost and quality of services,
- Enact and expedite the implementation of the Merchant Shipping Bill, 2008,
- Ratify and domesticate international and regional conventions, agreements and protocols,
- To strengthen the Kenya Maritime Authority and Kenya Ferry Services to fully deliver their mandates,
- Develop and enhance cruise tourism,
- To promote the appropriate use of Incoterms by Kenyan shippers in a way that will give Kenya maximum economic benefits in the international transport industry.

a) Legal, Regulatory and Institutional Framework

b) Admiralty Jurisdiction

c) Ports Infrastructure

Critical issues

- The port's entrance approach channel is shallow thus restricting entry of large ships such as post-Panamax vessels. There is a need for the port to accommodate all types of ships, including post-Panamax vessels,
- The existing container terminal was designed to handle a throughput of 250,000 TEUs per annum through three berths i.e. 16, 17 and 18. The terminal has since surpassed this capacity as evidenced by the fact that in 2008 a total of 605,000 TEUs were handled through the terminal. This growth in container traffic has put a strain on the existing facilities and compounded the congestion. A second container terminal is being developed by KPA at the port of Mombasa which will have an additional throughput of 1.2 million TEUs. The proposed development of the port of Lamu as a second commercial port in Kenya, however, will enhance the country's capability to service the region's seaborne trade. Lamu is endowed with deep natural waters and adequate space which will facilitate the handling of larger vessels and more traffic. The project is aimed at creating a second transport corridor emanating from Lamu to serve Southern Sudan, Ethiopia and Somalia and will include the construction of a standard gauge railway line and a modern highway from the port to the hinterland. This will alleviate the growing pressure on space and capacity available at the port of Mombasa.
- The port of Mombasa has not fully exploited its position as a logistics center which can be used to support the development of industry and the export trade, although it has adequate room for development of export processing and assembly facilities to support free port services, all of which would add value to the operations of KPA. Although land has over

the years been set aside at Dongo Kundu in the south-western part of the port for the development of a Free Trade Zone with the accompanying transport infrastructure, the GoK has been slow in implementing this project.

- The three Inland ICDs owned and operated by KPA at Nairobi, Kisumu and Eldoret were set up to ease congestion at the port; bring services closer to the hinterland and to customers in the neighboring countries and to divert bulky from road to railway, taking advantage of inter-modal transportation. These ICDs which are rail-served and connected to the Mombasa container terminal by rail have not performed well and hence have not been able to live up to their objective of diverting cargo from road to rail. This has been due to poor railway services by Kenya Railways, and more recently, RVR.
- The port of Mombasa lacks purpose-built cruise ship reception facilities which are essential for attracting more cruise ships and contribute to the development of cruise tourism in Kenya despite the fact that this is one of the fastest growing forms of tourism in the world. Kenya must endeavor to tap this business by ensuring the port has adequate facilities.

Policy

The GoK shall:

- Develop Dongo Kundu area as a Free Trade Zone. This will transform the port to an international logistics center generating traffic in terms of shipping and creating employment,
- Expedite plans to construct the second container terminal facility at the port of Mombasa to cater for the growing business in container traffic and introduce public private participation for its operation and management,
- Expedite plans to construct a new port at Lamu,
- Develop Cruise ship reception facilities at the port to promote cruise tourism,
- Promote development and use of ICDs by revamping railway transport services.

d) Ship financing and registration

e) Port operations and administration

Critical issues

Over the years the port of Mombasa has been beleaguered by inefficient cargo clearance processes causing delays and rendering the port expensive and uncompetitive. This scenario caused by cumbersome documentation and cargo clearance procedures has contributed to the high costs of maritime transport logistics along the Northern Corridor and increased the cost of doing business in Kenya and the region as a whole. The situation has also contributed to an average cargo dwell time of 12 days at the port an aspect which also contributes to the perennial congestion at the port.

Although Kenya Revenue Authority and KPA have introduced computerized systems in their operations, the delays are still prevalent due to lack of complete integration between the two systems and the fact that the other clearance agencies are not integrated. The solution to this has been identified as the introduction of a single window electric platform which will enable electronic lodging and processing of cargo clearance documentation and integration of relevant GoK agencies and other stakeholders involved in the process. The system will reduce cargo dwell time to a maximum of 3 days at the port.

Cumbersome and expensive Customs procedures have also increased the cost of transit traffic passing through the port and hence hampered the growth in this traffic. The port of Mombasa competes with the port of Dar es Salaam for transit traffic to the landlocked countries. It is important therefore to introduce policies which will help Mombasa to maintain the lead in this business.

Efforts by KPA to serve the port's hinterland efficiently have been hampered by the poor off-take of cargo from the port by the railway operator. Despite efforts to run dedicated container trains the operator has not been able to provide the optimal level of service and capacity.

The road infrastructure is also not adequate to serve the level of traffic demand emanating from the port. The poor transport infrastructure has contributed to delays in cargo off-take from the port. This is due to poor turnaround of railway wagons and trucks along the northern corridor route. There is need therefore for transport infrastructure to be in tandem with port development in order to cope with the ever growing port traffic.

Policy

The GoK shall:

- Expedite the implementation of the Port Community Based System,
- Ensure timely upgrading of the infrastructure emanating from the port to the hinterland in order to cope with increasing traffic from the port,
- Liaise with the Governments of the neighboring countries to ensure upgrading of the infrastructure in those countries in order to cope with the increasing traffic from the port,
- Streamline customs procedures at the port to encourage business growth at the port.

f) Port reform

Critical issues

Currently KPA plays the roles of both a landlord and a service provider at the port of Mombasa. Apart from managing the port KPA also provides stevedoring and shore handling services. To some extent this dual role has contributed to inefficiencies in port operations. There is therefore the need to inculcate efficiency in port operations by transforming the port into a landlord port in order to facilitate the involvement of the private sector in port operations such as stevedoring, storage, and shore handling activities. The involvement of private sector in the crucial cargo handling activities will enable quick decision making by eradicating bureaucracy and political interference in crucial issues like equipment acquisition and engender discipline in port operations. This is the trend in ports administration world over.

Further KPA will privatize the stevedoring, storage and shore handling of conventional cargo operations followed by the container handling operations with priority given to companies with majority Kenyan shareholding through a transparent public bidding process. This will be done by outstanding through licensing, leasing, concession and build operate and transfer arrangement where appropriate hence making KPA a Landlord Port Authority.

Policy

GoK shall:

- Transform the port into a landlord port status and promote regulated private sector participation in stevedoring, storage and shore handling operations at the port,
- KPA will be restructured through private sector participation in stevedoring, shore handling of conventional cargo operations, container handling operations; companies with majority Kenyan shareholding will be selected to participate in this process, i.e. through appropriate provisions of the privatization Act,
- Ensure that revenues derived from port operations are dedicated to the improvement of port infrastructure.

g) Greenhouse gas emissions – Marine and inland waterways air pollution

h) Ferry transport

i) Commercial maritime services

j) Maritime safety and security

k) Human resource development, management and research

3.2.2 National Transport Master Plan (Transport Sector Plan for Vision 2030)

Transport Sector Plan for the 2008-2012 has been prepared in order to provide guidance on policy measures, transport reforms, projects and programs that will be implemented to enable the country achieve the Vision 2030.

(1) Challenges in the transport sector

The Transport Sector Plan identifies the following key challenges that will be addressed during the plan period:

- The challenge for the Port of Mombasa is that of attracting and servicing increased traffic from the hinterland within Kenya and from the neighboring countries. However this is constrained since only small sized vessels are call at the port while larger post-panamax vessels cannot access the port due to its shallow channel,
- The ferries being operated are quite old while the ferry services on Lake Victoria, which were being offered by KRC and now transferred to RVR, have been suspended due to lack of insurance cover,
- The existing railway track is still a one meter gauge whose capacity is limited. Therefore, the capacity of the rail operations may not be enhanced beyond a certain point given the poor state of the existing infrastructure and lack of rail extensions into economic zones, which need to be served by rail lines, which is a pre-requisite for upcoming economic areas,
- The over-reliance on one transport corridor, the Northern Corridor, is also a source of concern as noticed during the post-election crisis in January and February 2008 when transport to the neighboring countries was cut off. The one corridor has also left most parts of the country and the hinterland of the neighboring countries such as North Eastern, Eastern; Southern Sudan and Ethiopia without a good road and rail network link to the sea,
- Apart from the increasing demand for an efficient public transport system in the City of Nairobi, the prevailing traffic congestion and environmental pollution in the City still remains a major challenge in the transport sector,
- The rapidly growing aviation industry in Kenya faces major challenges including inadequate funding, oversight capacity; regulations and enforcement, accident investigation capacity, air transport infrastructure and limited capacity in local training institutions. The aircraft accidents that have occurred in the recent past and the real threat to aviation security that is faced today make it more compelling for the country to work harder towards improving the safety of the airspace and aviation security in order to sustain the growth,
- In addition to fragmented transport systems, the low investment in transport infrastructure is a major challenge to be addressed if the country will be expected to have in place adequate transport systems that support all the economic activities envisaged in the Vision 2030,
- Existence of conflict of interest as some Agencies undertakes both regulatory and service provision roles.

(2) Strategies for the transport sector

In order to address the challenges to ensure there is efficient and affordable transport that supports increased economic activities envisaged in the Vision 2030, the following are some of the strategies which will be adopted:

- Expansion and upgrading of the railway gauge from Mombasa to Kampara, Uganda from one meter to standard gauge,
- Construction of the 35 km rail by-pass around Kibera and Mukuru slum areas in addition to the removal of encroachers away from the track to create a safety zone for fast moving trains,

- Expansion of training capacity at the Railway Training Institute to offer quality and relevant railway training to the industry,
- Develop a second Transport Corridor comprising a highway, rail network, an oil pipeline, airport at Lamu and Isiolo and second port of Lamu linking Southern Sudan, Ethiopia and Northern Eastern Kenya to the sea to reduce over-reliance on one transport corridor to Mombasa,
- Besides, the deepening of the Mombasa channel to 16 meters to accommodate large post-panamax vessels, expansion of container handling facilities, comprehensive computerization of port services, effective restructuring and commercialization of port operations and facilitation of the development of a free zone will be undertaken. In addition, modernization of port facilities and establishment of a Free Port at Dongo Kundu and Lamu will be undertaken. A road by-pass will also be constructed to provide a link to the Free Port from the Mombasa-Nairobi Highway,
- Improvement of marine safety and security through enactment of the merchant and shipping bill and implementation of the integrated security system at the port,
- Expansion of training capacity at the Bandari College to offer quality and relevant maritime training to the industry,
- Separation of regulation role from provision of training services, air navigation services and port services,
- Modernization of Motor Vehicle Inspection Facilities to ensure compliance,
- Development of Rapid Mass Transit System and Light Rail within Nairobi Metropolitan to reduce traffic congestion,
- Build capacity for monitoring the compliance and enforcement of all traffic laws,
- Development of Driving School curriculum to provide guidelines for standardized training will be completed during the plan period,
- The Integrated National Transport Policy through presentation of a Sessional Paper in Parliament will be operationalized,
- Expansion and rehabilitation of Airport and Airstrip facilities to increase passenger handling capacity and improve connectivity into and out of the country and to other parts of the world to enhance JKIA's position as a hub of Arica,
- Improvement of aviation safety through implementation of the Kenya Airspace Master plan and capacity to provide effective oversight,
- Expansion of training capacity at the East Africa School of Aviation to offer quality and relevant aviation training to the industry,
- Negotiations and review of existing Bilateral Air Services Agreements for strategic and beneficial air transport routes will be pursued to enable airlines from Kenya penetrate most parts of the world,
- Regulations related to all the relevant ICAO annexes to make the Airspace will be developed to ensure compliance and as well improve the regulatory and air accident capacity through training and recruitment,
- A comprehensive framework for funding and management of aviation infrastructure will also be developed,
- In recognition of the low investment by the private sector in the transport systems and the dwindling government resources toward development of the new infrastructure due to completing needs, Legal Framework to support Private Public Partnerships in the Transport Sector will be developed to encourage private sector resources in the sector.

(3) Policies and programs for 2008-2012

The Ministry identified the following policies, projects and programs that will be implemented during the next five years through own resources or a private public partnerships in the rail and road sub-sector; maritime sub-sector and aviation subsector.

Table 3.2.1 Rail and Road Sector

Project	Summary
1. Second Transport Corridor	The idea is to develop another Transport Corridor with Lamu as a second port providing sea access to Southern Sudan, Ethiopia and Somalia.
(1) Lamu Free Port	The Port has following options except the above: -Supplementary port for Mombasa Port, -Alternative port for the Port of Dar-es-salaam, -The great equatorial land bridge to Douala in Cameroon, -Transportation route to Kinshasa in DRC.
(2) The Lamu-Addis-Juba Railway Line Component	Construction of a standard gauge railway lines from ①Rongai to Juba to link up Southern Sudan to Kenya/Uganda rail, and ②Nairobi-Addis Ababa to link Ethiopia to the port of Mombasa.
(3) The Southern Sudan -Lamu Oil Pipeline	Southern Sudan is expected to be exporting a lot of crude oil. It is therefore proposed that the pipeline be constructed alongside the railway line thus linking the oil field to Lamu Free Port and a second pipeline going to the opposite way could be constructed from the Lamu Rifinery to Addis Ababa to transport oil products to Ethiopia.
(4) The Lamu Oil Refinery	A second oil refinery is proposed as part of this regional initiative to serve, not only the Kenyan and sub-regional market, but rather to be set up as a Merchant Refinery.
(5) The Lamu/Addis/Juba Super Highway (Road)	It is proposed that a super highway be constructed alongside the railway and the pipeline as an integrated part of the sub-regional transport and communication corridor. An access road would be constructed from Mombasa to Lamu.
(6) Fibre Optic Cable	A cable similar to a fiber optic cable which is currently being laid along the coastline of the African continent is proposed to be laid along the transport and communication corridor linking the sub-region to the rest of the world. The cable will also be an integral part of the security management system, particularly for monitoring the pipeline.
(7) Airport at Lamu	Once the Lamu Free Port is established, the Lamu Town will become a nuclear city even for tourists and business people. It is proposed that an airport also be developed at Lamu to serve the busy city.
(8) Resort Cities	It is expected that resort cities will be developed at Lamu and Isiolo.
2. Mass Transit System	This will comprise of two components namely: ①Development of a Bus Rapid Transit System and ②Development of a Light Rail Transit System.
(1) Bus Rapid Transit System	The Bus Transit System is defined as a flexible, rubber-tired rapid transit mode that combines stations, vehicles, services, running ways, and Intelligent Transportation Information Systems (ITIS) elements into an integrated system with a strong positive identify that evokes a unique image.
(2) Right Rail Transit System	The Study on Master Plan for Urban Transport in the Nairobi Metropolitan Area (March 2006) acknowledges improvement of existing railway network into four lines. The area expected to be served by the Light Rail stretches from Nairobi Railway Station, situated in the Central Business District to Embakasi/JKIA to areas bordering the heavily populated industrial area.
3. Lake View Resort Kisumu	The project will entail development of the idle Kenya Railways Land on the shores of Lake Victoria into income generating venture with classic hotels, business centers and recreational facilities that could become tourist's destinations.
4.Development of the Kibera By-Pass	The project involves development of a 35 km by pass standard gauge railway from Mombasa road along Nairobi national park outside the Kibera slums all the way to Dagoretti.
5.Upgrading of the Existing Railway Track to Standard	The Project involves provision of a regional standard gauge railway network. Currently, the line is operated by a meter gauge line which is dilapidated and

Project	Summary
Gauges	over 100 years old. The objectives of upgrading the current track is: (a) To increase the capacity of the railway line from 14 rains to 30 rains a day; (b) To reduce tariff charges from KSH 2.5 to 0.7 per ton-km; (c) shorten transit time from 12 hours to 4 hours from Mombasa to Malaba and increase annual tonnage from 5 million to 29 million.
6.Golf City Project	The project will focus on conversion of the underutilized Kenya Railway land into a revenue generating Golf City with five star hotels, conference center and recreational facilities on 18 acres piece of land.

The maritime sub-sector plays a critical role in the transportation link as it provides not only the gateway at the ports to the rail and road sub-sector but also a cheap means of transportation of bulky cargo in and out of the country. In this regard, the Sector Plan places great emphasis on improvement of the port handling capacity and development of new container terminals, redevelopment of berths into container terminals, development of free ports as well as port dredging.

Table 3.2.2 Maritime Sub-Sector

Project	Summary
1.Second Container Terminal	The project entails the construction of a new container terminal covering an area of 100 ha west of Kipevu Oil Terminal and will have a capacity to handle 1.2 million TEUs per annum.
(1) Phase 1 (2008-2013)	-Construction of 2 Main Berths (No.20, No.21 & Small Berth) -Construction of Apron, Container Yard and Yard Roads -Construction of Inner Roads behind the terminal -Construction of Access Road from Road No. C110 to the new terminal and Parking Areas -Construction of Main Buildings and Utilities -Dredging Works (new basins and channel) -Procurement of Equipment (Ship to Shore Gantry Cranes and Rubber Tired Gantry Cranes)
(2) Phase 2 (2013-2017)	-Construction of Berth No.22 -Construction of Yard behind Berth No. 22 & 23 -Procurement of Equipment (4SSG & 8 RTG) -Dredging Works (Turning Basin at Berth No. 22 & 23
(3) Phase 3 (2017-2022)	-Construction of Berth No. 24 -Procurement of Equipment -Dredging Works of Turning Basin and Approach Channel
2.Re-develop Berth No. 12-14 into Container Berths	The objective of the project is to increase container traffic from 666,000 TEUs in 2008 to 840,000 TEUs in 2012. The project entails the following: -Procurement of Equipment (6SSG & RTG etc) -Reconstruction and Reinforcement of the existing Berths No. 12-14 -Dredging Works
3.Development of Small Ports	The proposed infrastructure development will include: (a) construction of new landing sites; (b) construction of access roads; (c) dredging works; (d) construction of utilities and miscellaneous works; (e) provision of requisite equipment and other facilities.
4.Port Dredging/Deepening Program	The draft and relatively sharp bends of the channel entrance at the port of Mombasa impose restrictions on large vessels and preclude post Panamax vessels from entering the port. This restriction is mainly due to the “S” bend in the outer channel between Ras Serani and Ras Mzime where the radius of curvature of the bend is about 1,000 meters on the inside bend and the restricted width of 300 meters on the “Florida gap”. Solution to this problem is to deepen the channel to 16 meters. In view of the above, dredging of the

Project	Summary
	main channel to accommodate both small and large vessels is the most compelling capital project that KPA has prioritized.
5.Development of a Free Port in Mombasa	KPA has proposed that a Free Port be established at Dongo Kundu in the south mainland. A study was done by Dravo Van Houten in 1984 that recommended the establishment of an FTZ zone at Dongo Kundu in the south mainland on 3,000 acres of land. There will need for a fixed crossing connecting the area to the mainland south and the main Nairobi-Mombasa Highway.
6.Ferry Service in Lake Victoria	The scope of the project comprises the following: -Rehabilitation of Kisumu Port (wharves and dredging of basin and channel) -Rehabilitation of the port workshop, dry dock and slipways -Improvement of landing facilities (landing ramps etc) -Procurement of vessels and navigational aids
7.Cruise Ships and Floating Hotels	The development of Floating Hotels/Markets along the Creeks and Coastline will entail: -The floating markets/hotels where tourists can be transformed into the creeks will be constructed and equipped with landing facilities for the small ferries, -Procurement of cruise ships for long cruise journeys to Lamu/Shimoni, Building of Cruise Terminals in areas identified, Development of navigational aids along the creeks trough hydrographical surveys.
8.Others	-Great Mombasa Ferry Services -Strengthening the Capacity of Regulatory Framework within the Transport Sector -Maritime Search and Rescue -Regulatory Framework for Maritime Human Resource Capacity Building

3.3 Existing port development plans

3.3.1 Review and update of Port Master Plan Study of the Port of Mombasa including Development of Free Trade Zone (2009)

(1) Introduction

This reports the 2004 Mombasa Port Master Plan prepared by Royal Haskoning. Since 2004 there have been several changes which require the Master Plan to be updated. These include:

- Pronouncement of Vision 2030 by the Government
- Faster than expected traffic growth
- The decision to build a new Japanese-funded container terminal at Kipevu West, with a capacity of 1.1m TEU p.a. The first phase of this development is expected to become operational in 2013.
- The decision to dredge the channel to -15.0m CD as far as the new container terminal, allowing container ships of up to 4,500 TEU to use the port.
- The Government's intention to construct a Free Trade Zone on the other side of the creek at Dongo Kundu.

Although KPA is making progress with the modernization of its infrastructure, it still faces major challenges:

- The principal problems continue to be the shortage of storage space for containers. Most Kenyan import containers are now stored and cleared at private off-dock CFS depots, although containers for the transit countries are still handled within the port. The new terminal provides only temporary relief, as large numbers of containers will continue to be handled across the existing container berths.
- There is still generally enough quay line for the handling of dry bulks and general cargoes, although handling rates for some commodities remain disappointing. However the open storage space behind Berths 1 to 10 is very congested because of the large number of containers stacked there, and some of the infrastructure is in poor condition and in need of repair.
- The failure of the national railway system to provide an adequate service for the transfer of cargoes to and from the port has resulted in a large increase in truck movements and vehicle circulation and parking.
- Continuing failure to resolve inland storage and pipeline constraints has resulted in high berth utilization rates at the two oil jetties. These are now so high that any stoppage due to an accident could seriously disrupt oil supplies to Kenya and neighboring countries.

Strong traffic growth and improvements to the business environment have increased private sector interest in the development of new port facilities, as demonstrated by:

- A proposal by African Gas & Oil Company Ltd to construct a new single buoy mooring in Port Reitz for LPG and compressed natural gas imports.
- A proposal by GBHL to install new bulk handling equipment and conveyors on Mbaraki Wharf.
- Requests for permission to install grain handling and conveying equipment leading to new silos just outside the port boundary.
- Shipping line interest in developing Berths No. 12-14 as a privately-operated container terminal.
- A proposal by Tiomin to build a new berth for titanium ore exports.

(2) Review of traffic forecasts

At the beginning, the traffic forecasts were based on Vision 2030 GDP growth assumptions (10% p.a. from 2012-2020). After discussions with KPA about the amount of physical infrastructure that would

be required to support the Vision 2030 growth rates, and the risk that these will not be achieved because of the global recession, a more modest GDP growth rate of 7% p.a. between 2012-2020 was agreed for port planning purposes and is referred to in this report as the "base case". This is still slightly above the GDP rates that have been achieved in the recent past.

Table 3.3.1 shows the growth rate of the 1st MTP (2008-2012) Macro-Fiscal targets and actual performance. During the period, the actual growth rate slowed down with a nearly half of the target rate and showed a big fall compared to the target.

Table 3.3.1 Growth Rate of MPT 2008-2012 Targets and Actual Performance

GDP Growth (%)	2008/09	2009/10	2010/11	2011/12	2012/13
Target	6.2	8.3	9.1	9.7	10.0
Actual	2.1	4.2	5.1	4.1	5.4

Source: VISION 2030 "Second Medium Term Plan (2nd MTP) 2013-2017"

The Government projects growth to continue gathering momentum from about 6.1 per cent in 2013 to 10.1 per cent in 2017 as shown in Table 3.3.2. The higher growth is premised on increased investment which is targeted to reach 30.9 per cent of GDP in 2017 from 24.7 per cent in 2013 and mainly contributed to by the private sector including foreign direct investments. The above projections based on the increased investment is rather optimistic considering the past investment level from 19.6 per cent of GDP in 2008 to 20.5 per cent in 2012 and as a result the growth rate of 5 to 7 per cent estimated by IMF is quite reasonable for GDP from 2013 to 2017.

Table 3.3.2 Real GDP Growth Targets 2013-2017

GDP Growth (%)	20013/14	2014/15	2015/16	2016/17	2017/18
Growth Projection	6.1	7.2	8.7	9.1	10.1
IMF Forecast	4.6	5.3	6.2	6.4	6.5

Source: VISION 2030 "Second Medium Term Plan (2nd MTP) 2013-2017" and IMF Database, Oct. 2014

Table 3.3.3 shows summary of base case traffic forecasts reported in "Review and update of Port Master Plan Study of the Port of Mombasa including Development of Free Trade Zone (2009)" and comments on the traffic forecasts after reviewing are shown in Table 3.2.4.

Table 3.3.3 Summary of Base Case Traffic Forecasts ('000 tons)

	2007	2013	2018	2023	2028
Existing Cargoes					
Imports					
Liquid bulks					
Petroleum	4,798	5,080	5,482	6,080	8,212
Vegetable oils	676	932	1,277	1,727	2,442
Total	5,474	6,012	6,759	7,807	10,854
Dry bulks					
Clinker	1.051	1,692	2,433	3,433	5,136
Wheat	858	1,245	1,717	2,312	3,118
Fertilizers	383	402	423	443	466
Coal	176	283	408	575	860
Others	328	381	330	380	585
Total	2,796	4,003	5,311	7,143	10,165
Break bulk (except vehicles)					
Iron & Steel	621	856	1,176	1,591	2,250
Other	255	280	330	390	450
Total	876	1,136	1,508	1,981	2,700
Exports					
Liquid bulks	167	81	44	24	10
Dry bulks					
Soda ash	77	180	267	299	299
Other	128	62	34	19	8
Total	205	242	301	318	307
Existing Non-unitised (import+export)	9,518	11,474	13,921	17,273	23,836
Existing Unitised (import+export)					
Containers ('000 TEU)	585	1,002	1,544	2,199	3,284
Vehicles ('000 units)	74	137	214	291	411
New Cargoes					
Power station coal	0	1,000	1,000	1,000	1,000
Titanium ore	0	0	440	440	440
Compressed natural gas		50m cu ft/day			

Source: Review and Update of Port Master Plan Study of the Port of Mombasa including Development of Free Trade Zone (2009)

Table 3.3.4 Comments on the Traffic Forecasts

Commodity	Comments
(Import)	
Wheat and Other Cereals	Per capita consumption of wheat has increased by more than 3 %/year for the last decade (2003-2013), while per capita consumption of maize has remained with a volume of 70-100 kg/year for the last decade. Further local wheat production is dependent on the weather and has fluctuated with a production volume of minimum 219,000 tonnes in 2009 and maximum 512,000 tonnes in 2010 for the last five years. As a result, it should be expected that much more volumes will be imported in the future.
Fertilizers	According to "Kenya Fertilizer Assessment in 2012" by International Fertilizer development Centre (IFDC), the total fertilizer requirement for cereals and non-cereals is estimated using two scenarios below: -Scenario 1: the minimum level of fertilizer needed to close the gap between current and target production levels (= 662,000 tonnes). -Scenario 2: fertilizer requirement using the DSSAT model to derive a more refined set of initial conditions and estimates of production potentials (=910,000 tonnes). Based on the above scenarios, it should be expected that fertilizer volumes close to the above figures will be imported in the future.
Titanium Ore	According to KPA statistics, 363,000 tonnes of Totanium was exported in 2014. Tiomin, a Canadian company, plans to export 450,000 tonnes p.a. of titanium, zircon etc. as a target.
Rice	According to "National Rice Development Strategy (2008-2018)" by Ministry of Agriculture in Kenya, production volumes up to 2030 are projected, for example 136,389 tonnes in 2015 and 518,416 tonnes in 2030. Rice forecast should be estimated using the above figures (import volumes = consumption volumes – production volumes).
(Export)	
Tea	Tea should be considered as one of major export commodities. It is recommended that future export volumes of tea are calculated based on the relation between export volumes and GDP of export partners.
Soda Ash	It is recommended that future export volumes of soda ash are calculated based on the relation between export volumes and GDP of export partners.
Coffee	Coffee should be considered as one of major export commodities. It is recommended that future export volumes of coffee are calculated based on the relation between export volumes and GDP of export partners.
(Container)	
Container cargoes	Generally the containerized ratio tends to increase in the future for developed countries having relatively small ratios. So it is recommended that the containerized ratio should be incorporated into the container volume forecast, especially for import containers. Because an increase of the containerized ratio in the future will bring more container cargo volumes compared to no consideration of the ratio.

Source: JICA Study Team

(3) Future shortfall in port capacity

After 2013 there will be a temporary surplus of ground slots, but the Kipevu West terminal is likely to be full by 2020, when additional capacity will be needed. A further 1,100m of quay with around 400-500m of back up spaces will then be required to meet the growth in container traffic up to 2030.

For dry bulks and general cargoes there is currently a surplus of around 800m of berth length on Mbaraki Wharf and Berths No. 1 to 10. However Mbaraki Wharf does not have enough capacity to handle all of the dirty bulks traffic, some of which will have to use Berth No. 1-10. If clinker, coal and fertilizers are handled over Berths No. 1 to 10, additional berth length will not be required until about 2022. The latter could be developed jointly by KPA and the Ministry of Energy, which is considering building a new coal jetty for a proposed power station at Dongo Kundu. If there is no development at Dongo Kundu and Berth No. 11 is not used for general cargoes, there will be a berth shortfall for dry bulks and general cargoes of about 815m by the end of the study period (2030).

The traffic forecasts do not take into account any additional traffic that might be generated by the Free Trade Zone at Dongo Kundu, and the Master Plan does not include the construction of additional berths at Dongo Kundu to kick-start the Free Trade Zone development.

(4) Review of Port Master Plan proposals

Projects to be included in the Revised Port Master Plan have been divided into two groups: short-term (for completion by 2013) and long-term (projects which may be started in the next five years but will not be completed until 2013, and longer term development up to the end of the planning period in 2028.

a) Short-term proposals

- The short-terms proposals include:
- Investigation of further improvements to the entrance channel and the channel within the port, to determine if it would be possible to accommodate container ships of 6,000+ TEU capacity.
- Transfer of most of the dirty dry bulk operations to Mbaraki Wharf, combined with the construction of wider access bridges and dredging of the wharf to 12.5m CD.
- Repairs to buildings in the Dockyard which are needed for safety reasons.
- Clearing of all of the old buildings from Area G, and conversion of the area into two separate open storage areas, one for vehicles and the other for containers.

This part of the port can be made accessible to the public without putting port security at risk, and developed for commercial uses:

- Improvements in handling efficiency on general cargo Berth 1-10. The need to retain all of the transit sheds should be reviewed, as open storage space for containers and subsequently vehicles would be more useful.
- At Berth 4 GBHL is proposing to install a third grain unloader once there is sufficient demand. Alternatively a second grain operator could be allowed to install unloading equipment at Berth 5, with an elevated conveyor to off-dock silos.
- At Berth 9 Magadi Soda is proposing to upgrade its loading equipment for soda ash. As handling rates for this commodity are very low, this will increase the capacity of the berth.
- Transfer of LPG from Shimanzi Oil Terminal to a new single buoy mooring to be built at Port Reitz by the African Gas and Oil Company Ltd.
- Extension of Berth 14 to join Berth 16, rearrangement of the stockyard area behind Berth 11-15, and improvements to the traffic circulation pattern. This provides an extra 206m of quay and 300 TEU of additional ground slots.
- Construction of Berth 19, rearrangement of the stockyard area behind Berths 16-19, and improvements to the traffic circulation pattern. This provide an extra 160m of quay and 2,050 TEU of additional ground slots, and will allow a further three ships to shore gantries

to be installed in addition to the four in use.

- Enlargement of Gate 19 to provide three additional check-out booths, and widening of the truck waiting area near the gate to avoid long queues of vehicles impeding other port operations.
- Widening of the road behind Berths 16-19 to improve access to the Kipevu West container terminal.
- A study of the need for new hydrocarbons berths (LPG, compressed natural gas and petroleum products). If productivity improvements at KOT cannot be achieved quickly, a new oil berth will be needed in the short-term.
- Upgrading of the incoming power supply to 132 kV and provision of a second power line. Other power-related improvements include the purchase of three new generators to provide back-up power to communications equipment.
- Construction of a new water pipeline and upgrading of the sewage system.

Table 3.3.5 shows lists of the short-term proposals for the revised Master Plan for the port of Mombasa where the planning and design should be started in 2009 or 2010 and the work completed by 2012, and the present status of these proposals.

Table 3.3.5 Short Term Proposal and Present Status

Short term proposal	Present status
Entrance channel improvements	The project was divided into two phases. Phase 1 covered the navigational channel, turning basin, the proposed berths 20-23 at the second container terminal and the ancillary works. The first phase commenced in February 2011 and was completed in April 2012. Further dredging for Phase 2 is required to accommodate the development of Dongo Kundu Freeport, Relocation of KOT and the LNG jetty for the Gas Fired Electricity Generation plant. The Government is expected to avail more funds and explore other funding opportunities for the Phase 2 project.
Extension of Mbaraki Wharf	The project is under planning and expected to obtain the external funding source.
G-Section-Holding ground for cars	The project is not determined yet.
Development of additional bulk grain facility	The project is embarked for development under PPP arrangement, in which the private sector will construct, equip, market and operate the proposed facility. A detailed feasibility study has been completed and funding for due diligence and transaction advisory services will be needed to facilitate PPP in the project. Presently the project is pending.
Conversion of berth 11-14 into Container Berths	The project entails infrastructural modification to berths 11 to 14 to support loadings from modern container handling equipment and procurement of handling equipment. The project will be conducted by the PPP scheme and is under planning.
Relocation of Kipevu Oil Terminal	The development of berth 19 and the development of the container terminal West of KOT necessitate re-location of KOT. Niras Port Consultant of Denmark have carried out a feasibility study and further activities require undertaking detailed design study, determine the financing options and funding, and re-location of the terminal facility.

Source: JICA Study team

b) Long-term proposals

The long-term proposals expand the port further westwards into the Port Reitz area, and across to the other side of the creek at Dongo Kundu. They include:

- Construction of another 1,100m of container berths, either as an extension of the 1.1m TEU p.a. container terminal to be built at Kipevu West or as a new container terminal at Dongo Kundu.
- Construction of a common user terminal for dirty bulks at Dongo Kundu, capable of

handling Panamax size vessels.

- Deepening of Berths No. 1-5 at the existing port to allow the use of larger grain and RoRo ships. This would also allow general cargo ships to carry larger consignments of steel, and would be of benefit to the dirty dry bulks (clinker, coal and fertilizers) until the new facility at Dongo Kundu would be built. Berths 1-2 would be deepened to -12.5m CD, and berths 3-5 to -14.5m CD.
- Development of a car import terminal at Dongo Kundu by 2023.
- Construction of a new cruise terminal close to the proposed southern by-pass connecting Dongo Kundu to the north shore of Port Reitz. Although KPA intends to convert the buildings on Berth 1 into a cruise terminal.
- The proposal by Tiomin Kenya Ltd to build a privately-funded berth for mineral exports 500m west of the Likoni Ferry on the south side of Kilindini Harbor.
- Further widening of the entrance channel to allow container ships of 6,000+ TEU and large bulk carriers to enter the port.

Table 3.3.6 shows lists of the long-term proposals and present status including the Consultant's comment.

Table 3.3.6 Long Term Proposal and Present Status

Long term proposal	Present status/Comments
MPDP Phase 4 & 5	A further 1,100 meters of the container berth will be required to provide enough capacity to meet demand in 2030. The project will be studied in "The Project for Technical Assistance to Kenya Ports Authority on Dongo Kundu Port, Mombasa Master Plan" whether additional container berths will be built at Kipevu West or as a new container terminal at Dongo Kundu
Freeport at Dongo Kundu	The project is one of the flagship projects to be implemented during the first Medium Term Plan (2013-2017) under Vision 2030. Development of the container berth, the bulk berth for dirty dry bulk and the car import terminal has been proposed in the revised Master Plan. The feasibility study by JICA is under way and expected to be studied on the berth type to be developed. The immediate handicap to the development is inaccessibility to the area and its development is dependent on the construction of a fixed sea crossing bypass to the south with a bridge/causeway combination from Miritini Station to Dongo Kundu.
Cruise Ship Terminal	As a short term measure limited rehabilitation of the Shed No.1 has been undertaken to provide basic facilities. Conversion of berth No.1 & 2 into a passenger terminal has been carried forward. Though the Port Master Plan has recommended the development of a cruise liner terminal at the western end of Port Reitz, it is advised that its development should be reconsidered due to piracy and security concerns thus adversely affecting the port of Mombasa.
Titanium Ore Terminal	Tiomin, a Canadian company, plans to export 450,000 tonnes p.a. of titanium, zircon etc. from a site at the south of Mombasa port. Though the project was delayed, about 363,000 tonnes of titanium was exported in 2014.
Widening of Entrance Channel Bends	If the study proposed in the short term plan demonstrates that it would be possible to bring container vessels larger than 4,500 TEU capacity safely into the port, there may be a demand from shipping companies to carry out some widening of the entrance channel bends. It is therefore recommended by the revised Master Plan that KPA should carry out further simulations to assess whether or not larger vessels up to 6,000 to 6,500 TEU capacity can enter and leave if the bends in the channel are dredged to allow a larger radius of curvature of the bends. Presently KPA doesn't list up the above project in "The Port Investment Programme 2013-2030". It is advised that environmental impacts should be identified before the project is going on.

Source: JICA Study team

3.3.2 SAPROF Review Report (2013)

(1) Purpose of SAPROF Review

SAPROF Review was originally intended to provide a basis for designing the concession plan for the Second Container Terminal, through understanding the background of Mombasa Port Development Project (MPDP) and updating necessary data and information for required assessments, such as demand forecast, cost estimate, and financial modeling, for concession.

However, it is anticipated that SAPROF Review Report will also serve as a part of a feasibility study report under the process stipulated in PPP Act 2013. Therefore, the Consultant additionally provided economic and financial evaluations, which were originally not included in the Review Report.

It should be noted that the SAPROF study evaluated the feasibility of the Project wherein no separate feasibility evaluation for KPA and for Concessionaire was made. Hence, this SAPROF Review Report only provided the feasibility of the entire Project.

(2) Review of Demand Forecast

a) Socio-economic Framework in SAPROF Review

Table 3.3.7 shows Socio-economic framework in SAPRO Review. The latest indices obtained from IMF and WB is introduced.

Table 3.3.7 Socio-economic Frameworks in SAPROF Review

Item	Specified Figure	Source
GDP (Kenya) [%]	6.0 (2013-2018) 5.0 (2019-2024) 4.0 (2025-2030)	IMF "World Economic Outlook" Based on a possible slowdown in Kenya's economy after 2018.
Population (Kenya) [1,000]	46,332 (2015) 52,563 (2020) 59,054 (2025) 65,928 (2030)	UN, Medium Variant Projection.
GDP (Uganda) [%]	4.8 (2013) 6.2 (2014) 7.0 (2015-2018) 6.0 (2019-2024) 5.0 (2025-2030)	IMF "World Economic Outlook" Based on a prospect of Ugandan economy's slowdown after 2018.

Source: SAPROF Review Report (2013)

The latest estimates indicate higher growth rates than those in SAPROF report, by reflecting increasing developments in this region.

b) Results by Microscopic Approach

Table 3.3.8 shows demand forecast of general cargoes.

Table 3.3.8 Future Demand of General Cargoes

(Unit: 1,000 tons)

	2012	2015	2020	2025	2030
Micro (Import/ General Cargo/ton)	8,057	10,514	15,667	21,278	27,138
Index (Figure as of 2012 is 1.0)	1.00	1.30	1.94	2.64	3.37
Micro (Export/ General Cargo/ton)	1,872	2,442	3,352	4,323	5,318
Index (Figure as of 2012 is 1.0)	1.00	1.30	1.79	2.31	2,84

Source: SAPROF Review Report (2013)

c) Results by Macroscopic Approach

Table 3.3.9 shows full (loaded) container demand forecast. Table 3.3.10 shows total container demand of Mombasa Port.

Table 3.3.9 Full (Loaded) Container Demand

(Unit: 1,000 TEUs)

	2012	2015	2020	2025	2030
Macro (Import/Container/full)	441.0	579.9	893.5	1,249.8	1,627.7
Index (Figure as of 2012 is 1.0)	1.00	1.31	2.02	2.83	3.68
Macro (Export/ Container/full)	120.8	159.7	228.7	290.3	361.5
Index (Figure as of 2012 is 1.0)	1.00	1.32	1.89	2.40	2,84

Source: SAPROF Review Report (2013)

Table 3.3.10 Total Container Demand

(Unit: 1,000 TEUs)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2025	2030
SAPROF Review		987.1	1,096.8	1,213.7	1,388.9	1,472.3	1,614.8	1,740.3	1,877.5	2,634.2	3,441.6
SAPROF	763.0			912.0					1,174.0	1,450.0	1,672.0
Actual	903.4										

Source: SAPROF Review Report (2013)

d) Conclusion

Based on the demand forecast and the design capacity for containerized cargo at Mombasa Port, it is estimated that container terminals of Phase II and Phase III should be operational by 2018 and 2021, respectively, if conventional cargo terminals (berth Nos. 1-8) are not used and CFSs are not utilized. However, the Port will need to continue using conventional berths and CFSs until 2016 to meet the increasing demand, and it may not be realistic to completely stop using them after 2016. Phase II and Phase III projects also need more comprehensive approaches, taking into consideration of other factors, such as phasing implementation or possible design change in Phase III, which has shorter berth length and shallower water depth, in accordance with the direction of Master Plan of the Port.

(3) Cost Estimate

The latest total cost is estimated at JPY35.956 million, compared with JPY19.365 million in SAPROF. Major increase was due to inflation for 6 years (from 2006 to 2012) and lower than actual unit rates in

SAPROF. KPA has implemented capital dredging for channel and basin by utilizing domestic funds (from Central Government) at US$ 71.67 million, so two (2) cases, with and without capital dredging, are shown in the table below:

Table 3.3.11 Estimated Cost

Unit: Million JPY

Category	SAPROF 2006		LA (KE-P25) 2007	Detailed Design 2010	Actual Contract 2011	
1. Civil and Building Works	with Dredge	12,623				
	w/o Dredge	11,686	20,058	18,637	23,498	
2. Procurement of Equipment		2,280	2,605	3,443	2,605	
Total of Construction	with Dredge	14,903				
	w/o Dredge	13,966	2,605	22,080	26,103	
3. Consultancy Services		1,937	2,572	2,572	2,685	
4. Contingenty		2,526	1,476	1,476	0	
Grand Total	with Dredge	19,365			35,956	w Capital Dredge
	w/o Dredge	18,429	26,711	26,128	28,788	w/o Dredge
	@120JPY/$				@1.117JPY/KS	

For the purpose of comparison, costs are shown only in JPY.
Source: SAPROF Review Report (2013)

(4) Legal and Institutional Framework

There are some legal issues that should be clarified by the relevant authorities, or that require amendments to the relevant laws or regulations, including the following:

- The application of the PPP Act to the Project, which should be clarified by an official interpretation from the relevant authorities.
- The power and authority of KPA to enter into and execute the Concession Agreement, which should be clarified by an amendment to the KPA Act or, at least, by an official interpretation from the relevant authorities.
- Section 16 of the Merchant Shipping Act, from which the Project should be carefully reviewed and an amendment of the Act or exemption of an application to this project needs to be considered to increase competitiveness of bidding.

(5) Environmental Aspects

Environmental survey/monitoring has been being implemented in accordance with the Environmental Management Plan (EMP) stipulated in the Environmental Impact Assessment (EIA) Report for MPDP, May 2007. There have been no specific issues reported so far.

Terminal operator (Concessionaire) should be responsible for any environmental issues relating to the operation of Second Container Terminal and water area in front of the terminal. Environmental responsibilities of the Concessionaire will cover garbage and litter, accidental spills, dry cargo release, sanitary wastes, noise and vibration, dust and other airborne emissions and traffic burden.

(6) Facilities and Equipment for Containerized Cargo

Current facilities and operation for containerized cargo were reviewed and updated. KPA has been improving facilities and equipment, as well as operational productivity. Major expansion was realized with the construction of new berth No. 19 which has been operational since April 2013. KPA also procured additional container handling equipment, three (3) ship to shore gantry cranes (STS) and

rubber tired gantry cranes (RTG) in 2011, and introduced a computerized terminal operating system (CATOS) in 2008.

(7) Handling Capacity for Containerized Cargo at Mombasa Port

KPA has been increasing the port capacity for containerized cargo by introducing the measures mentioned above, as well as utilizing/cooperating with private Container Freight Stations (CFSs) to shorten dwell time of containers at the port. SAPROF estimated handling capacity for containerized cargo at 535,000 TEUs/year, but the design handling capacity is calculated at 720,000 TEUs/year without using conventional berths No.1 to No.8 and CFSs which are acting as off-dock container yard.

It is expected that Mombasa Port will be able to handle the increasing container traffic until the completion of the Phase I of the Second Container Terminal, scheduled for the beginning of 2016, by using conventional berths No.1 to No.8 and CFSs.

(8) Economic Evaluation

The economic internal rate of return (EIRR) based on a cost-benefit analysis was used to appraise the economic feasibility of the Project. The EIRR is the discount rate that makes the costs and benefits of a project equal during the project life. The resulting EIRR of the Phase I Project is 40.6% compared with 51.2% in SAPROF. Difference mainly came from: (a) increased construction cost, and (b) decreased economic benefit by removing optimistic components in SAPROF.

The leading view is that the Project is feasible if the EIRR exceeds the opportunity cost of capital. It is generally considered that a project with an EIRR of more than 12% is economically justifiable for infrastructure or social service projects.

Net Present Value is estimated at 809 million USD by adopting an opportunity cost of 12%. Benefit-Cost Ratio is estimated at 5.35.

(9) Financial Evaluation

The financial internal rate of return (FIRR) has been used to appraise the financial feasibility of the Project (Phase I). The resulting FIRR is 18.4 %, exceeding 1.38% of Weighted Average Cost of Capital (WACC). Hence, the Project (MPDP Phase I) has been judged to be financially viable.

The FIRR estimated in the SAPROF study was 12.5%, while the estimated FIRR in SAPROF Review is higher than SAPROF. Compared with the stage of SAPROF study, demand forecast yielded higher figures and container handling volume at Second Container Terminal reaches its capacity from the initial year of operation (2016) as shown in the figure below.

(10) Timing of Phase II and Phase III Projects

Based on the demand forecast and the design capacity for containerized cargo at Mombasa Port, it is estimated that container terminals of Phase II and Phase III should be operational by 2018 and 2021, respectively, if conventional cargo terminals (berth Nos. 1-8) are not used and CFSs are not utilized. However, the Port will need to continue using conventional berths and CFSs until 2016 to meet the increasing demand, and it may not be realistic to completely stop using them after 2016. Phase II and Phase III projects also need more comprehensive approaches, taking into consideration of other factors, such as phasing implementation or possible design change in Phase III, which has shorter berth length and shallower water depth, in accordance with strategic direction of the Port.

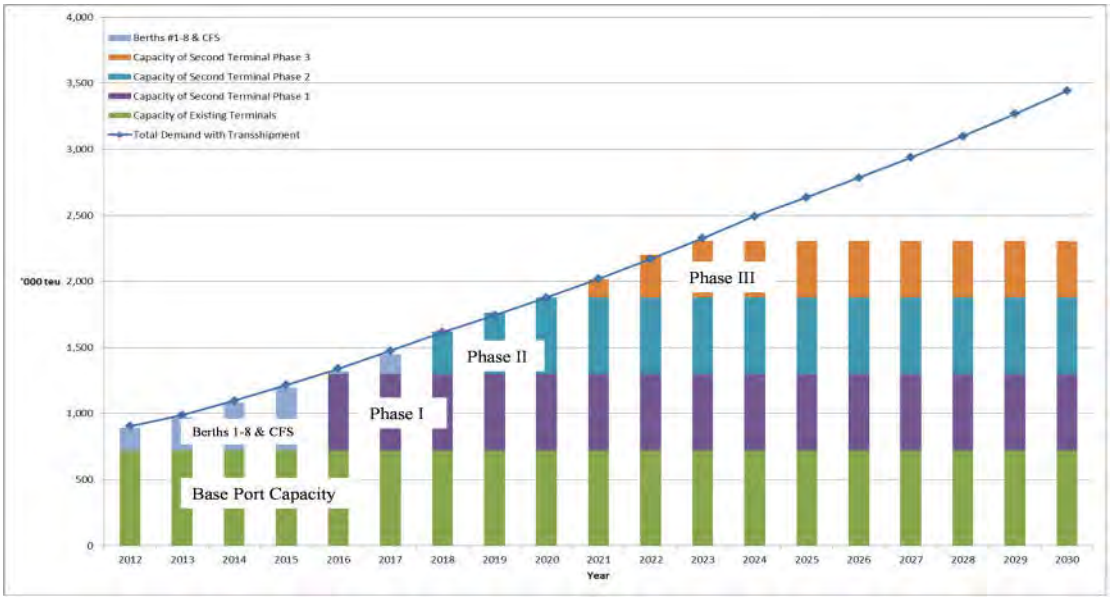


Figure 3.3.1 Container Demand and Capacity (Unit: 1,000TEUs)
Source: SAPROF Review Report

3.3.3 Strategic Plan 2013-2017 by KPA

This strategic plan will guide the Authority to focus its resources on offering a unique value proposition based on modern infrastructure that supports efficiency, economies of scale and fast, consistent access to its markets. It is expected to align the Port's development priorities and outcomes, as well as serve as a roadmap to ensure the Port remains competitive in the coming years and consistently meets its customer demands. The Plan is also anchored on the Vision 2030 and the Second Medium-Term Plan, whose themes is "Transforming Kenya's Pathway to Devolution, Socio-Economic Development, Equity and National Unity".

The strategic plan, which outlines the feasibility programs and projects that will be undertaken to meet the short and medium term demands and progressively position the Port as the obvious port of choice in East and Central Africa, builds on the current strategic road map for 2010-2015 and takes cognizance of the Constitution, the broad Integrated Transport Sector Policy and Vision 2030, whose aim is to transform Kenya into an industrialized nation by the year 2030.

(1) Review of Previous Strategic Plan

The previous Plan covered the period 2010-2015. This was, however, not fully adopted and implemented, thus most of its proposals rolled over to the present planning period. Main projects and programs for the Strategic Roadmap 2010-2015 are shown below.

Table 3.3.12 Previous Strategic Roadmap Projects

Project	Key Strategy	Status at End 2013
1.Optimizing performance of the Container Terminal	Corporatization as a first step towards full privatization	Pending. Carried forward using new strategy
2.Increase container handling capacity	Construction Berth 19 & back fill Conversion of Berths 11-14 trough BOT arrangements Construct a new Container Terminal West of KOT	Completed & operationalized Converted but under KPA operations In progress and ahead of schedule Done

Project	Key Strategy	Status at End 2013
	Use of private CFSs Equipment acquisition	Done
3.Enhance efficiency of Conventional Cargo operations	Concessioning of stevedoring services	Pending. Carried forward through revised strategy
4.Reform Marine Services	Develop new organizational structure, aimed at remaining with residual KPA-Landlord port	On-going. Carried forward
5.Reform Bandari College	Rehabilitation of infrastructure and acquisition of additional land Make it Autonomous	Done Pending
6.Cruise Passenger Terminal	Conversion of Berth No.1 & 2 into a passenger terminal by KPA Rehabilitation of berth and Shed 1	Pending. Carried forward Done
7.Improve Dockyard operations	Concessioning of dockyard operations	Pending. Strategy revised
8.Revitaliza ICDs	Concessioning of ICD operations	Pending. Carried forward through new Business Plan
9.Support the development of Free Port and Special Economic Zones (Vision 2030 targets)	Avail Dongo Kundu for consideration Set aside land for waterfront development	Land availed Done
10.Attain e-Port status	Improve efficiency through use of IT Upgrade coverage of VTMIS Implement the NSWS ERP upgrade KWATOS full implementation Implement ISS	Done Done Done Done Done Done
11.Reposition Mombasa as a regional hub	Dredge to widen and deepen the navigation channel & turning basins	Pending
12.Develop an LPG common user facility	Issue 30 year license to Africa Gas Oil Company Limited	Pending
13.Relocation of KOT	Build new terminal to increase crude oil handling capacity and safety of oil terminal	Pending. Carried forward in new Strategic Plan
14.Development of additional bulk grain facility	Licensing of additional capacity for bulk grains	Pending

Source: Strategic Plan 2013-2017 by KPA

(2) Strategic Model

The focal areas identified and the planned outcomes are also designed in a manner to achieve the broader national objectives of deploying world class infrastructure facilities and services, as enlisted in the Second Medium Term Plan of the Vision 2030.

Strategic Objective 1- To Be a Competitive Regional Hub

The Port of Mombasa needs to revamp and position itself as a competitive regional hub. The competitiveness will be realized by improving efficiency in port services. This will entail among other things, investment in infrastructure and facilities.

(Strategies)

- Expand berths, yards and gates
- Invest in and maintain modern port equipment
- Reduce cargo dwell time
- Improve documentation processes

- Harmonize and integrate KPA systems and other cargo intervening systems
- Establish corporate social responsibility programs targeting key existing and potential/upcoming clients.

(Planned Outcomes)

- Increased berth, yard and gate capacity
- Reduced ship waiting time
- Reduced service time
- Improved traffic flow
- Increased throughput
- Reduced cost of doing business
- Enhanced corporate image
- High levels of customer satisfaction
- Interface with the National Single Window System (NSWS), KRA amd transit market Revenue Authorities' systems

Strategic Objective 2 – To Promote Principles of Good Corporate Governance

The constitution of Kenya 2010 introduces devolution, leadership and integrity which will be considered in the implementation of this Strategic Plan. Leadership capacity must continually be enhanced for good corporative governance and management. The act will therefore be aligned to the current international standards in shipping and with the Constitution with local community for public participation.

Strategic Objective 3 – To Enhance Partnerships, Collaborations and Linkages

The business involves diverse players including government agencies and the private sector. Mechanism for collaboration and cooperation with stakeholders will be established to bring about synergy that will accelerate the achievements of KPA goals.

(Strategies)

- Establish mechanisms to enhance cooperation and collaboration with cargo interveners
- Enhance media engagement
- Grow regional markets
- Develop a platform for growth in trade volumes for transit business, especially in the EAC region, through specialized approaches and customer focus mechanisms
- Enhance collaboration with partners in the transport sector including Kenya Railways; RVR; Kenya Pipeline; Kenya Roads Board; among others, to develop seamless transport connectivity from the Port to the hinterland
- Enhance collaboration with the local community for public participation
- Establish a positive and lasting port-city relationship
- Identify key players and partners for the Authority, such as the drivers of new growth areas identified, including international mining companies operating in the region

(Planned Outcomes)

- Improved stakeholder engagement
- Quality exchange of ideas and information on port development
- Increased cargo fluidity
- Increased market share for transit countries
- Increased cargo throughput
- Enhanced corporate image
- Enhanced flow of domestic cargo from the port to the hinterland and transit cargo from the port to other countries
- Increased awareness on the role of the Port
- Streamlined processes
- Increased presence

- Harmonized port and city development plans
- Enhanced port-city relationship

Strategic Objective 4 – To Manage Business Risks

The risks relate to potential revenue loss, low throughput and profitability arising from negative externalities such as: Stiff competition from neighboring ports, frequent breakdowns in machinery and equipment, poor talent management and industrial unrests, among others. Corruption is also another risk that hinders full attainment of corporate goals.

Strategic Objective 5 – To Enhance Financial Sustainability

Provision of efficient port services is dependent on availability of sufficient financial resources as well as their optimal use. The policy and legal framework is limited to traditional sources of funding. These sources have remained inadequate especially for capital projects. In this regard policy and legal review will be necessary to enable KPA diversify its revenue base as well as resources.

Strategic Objective 6 – To Realize the Workforce for Enhanced Labor Productivity

The Authority needs to implement strategies to increase labor productivity, inculcate positive organizational culture, accountability, and foster industrial harmony. KPA has reviewed and rationalized its organizational structure to align it with its business model. Results-based performance management and core skills training will be given priority in enhancing productivity. Bandari College which offers relevant capacity building, including training in port management will be transformed to enable it contribute to productivity enhancement programmes.

Strategic Objective 7 – To Revitalize Inland Container Depots (ICDs)

The ICDs house Customs and other agencies, competent to clear goods for domestic use, warehousing, temporary admissions, re-export, temporary storage for onward transit and outright export. Transshipment of cargo can also take place from ICDs. Currently, Nairobi ICD has registered poor performance, coupled with high operational costs that reduce its commercial viability. Kisumu ICD has also been greatly affected by the discontinued RVR services to the Nyanza region, which was the main means of transportation from the port of Mombasa.

(Strategies)

- Develop a Business Plan to refocus growth and efficiency of ICDs
- Increase operational independence of the Nairobi ICD, with clear oversight functions over the Kisumu and Eldoret ICDs
- Support infrastructure development and repairs of damaged equipment and machinery, including yard expansion, provisions for quick access to spares and parts required for maintenance, among others.
- Improve the security and surveillance system and ensure linkages to the system at the port headquarters in Mombasa
- Provide adequate communication and other equipment to facilitate operations
- Consider identification of new sites for additional ICDs to serve the growing hinterland market
- Create close collaboration with the Rift Valley Railways in order to develop a working mechanism for rail freight to and from the Port of Mombasa
- Strategically align ICDs to effectively and efficiently serve existing customers, as well as enable the Authority to grow its customer base
- Support the construction of the Standard Gauge Railway, which will greatly improve operations of the ICDs

(Planned Outcomes)

- Clearly defined and well-structured path to recovery and growth of ICDs
- Improved operational efficiency enhanced by quick decision making
- Better and faster receipt and dispatch/delivery of cargo

- Expanded transit operations by rail/road to and from serving ports
- Improved security for both personnel and infrastructure
- Increased space for temporary storage of cargo and containers
- Increased revenues and cargo handling capacity
- Well maintained and repaired facilities
- Increased customer loyalty and growth in customer numbers, coupled with increased revenue generation and profitability

Strategic Objective 8 – To Develop a Growth Strategy for Small Ports

A small port master plan which takes cognizance of the long term development framework in Vision 2030 was developed. Generally, the port developments in the master plan can be categorized as:

- Local fish ports (with small trade)
- Tourist ports
- Semi-industrial fish & cargo ports

Strategic Objective 9 – To Develop and Operationalize the Port of Lamu

The Authority is implementing the development of the Port of Lamu under the LAPSSET initiative. The proposed port will have 32 berths, a capacity to handle 23.9 million tons per annum and chartered depths of 18 meters to accommodate bigger ships. The first phase of the port development involves construction of three berths expected to take three years from 2014. The Port will handle container, conventional and bulk cargo vessels, as well as liquid and bulk minerals, coal, livestock and fish, in both imports and exports.

Once completed the port will complement the Port of Mombasa and will especially serve the emerging markets of Ethiopia, South Sudan and Somalia, as well as the transshipment market.

(Strategies)

- Construct the first three berths
- Operationalize the Port
- Position and market the port for transshipment cargo destined for the northern parts of Africa

(Planned Outcomes)

- Second commercial port operational by 2016
- Increased transshipment cargo
- Accommodation of bigger vessels

(3) Strategic Goals

KPA's target, in the medium to long term, is to have a full complement of the following strengths that will define its success in the development, execution and evaluation of this Strategic Plan.

- To have a multi-skilled and committed workforce
- To be consistently achieving: ship turnaround time of less than 48 hours; container dwell time of 72 hours; handle 1.6 million TEUs and 28.5 million tons of cargo
- To become a lean E-Port that is Green and has the right staff levels
- To be able to provide 130 % capacity in space, equipment and infrastructure
- To achieve a return on Investment of 10 to 15 %
- To have a more diversified client base that is satisfied with its services
- To have reliable/adequate equipment and infrastructure
- To be in a position to increase profitability consistently, above 25 % of revenue

3.4 Development of Northern Corridor from Mombasa to Nairobi and surrounding countries

Figure 3.4.1 Northern Corridor full view

3.4.1 Outline of Northern Corridor

The landlocked countries in East Africa are fully dependent on the Northern Corridor transit route and Port of Mombasa as its sole gateway port. Efficiency and cost competitiveness of the Port and Corridor are critical for the economies of the countries. The corridor traffic has been experiencing numerous barriers including longer/unpredictable transit time and high/unclear cost of transportation.

In order to overcome transit transport constraints affecting them, the government of Burundi, Kenya, Rwanda and Uganda decided to negotiate a treaty, the Northern Corridor Transit Agreement, with a view to promoting an efficient, cost-effective and reliable transit transport system. The agreement was signed in 1985 and came into force in 1986 after the necessary ratification. The Democratic Republic of Congo became the fifth member in 1987.

The objectives of the Northern Corridor Transit Agreement are:

- Ensure freedom of transit among the member states
- Safeguard right to access to/from the sea for landlocked countries
- Develop and integrate the regional transport facilities and services
- Facilitate inter-state and transit trade

The agreement provides the legal framework for collaboration among those countries on matters related to transit transport, customs control, documentation and procedures and development of infrastructure and facilities relating to sea ports, road, railways, pipelines and border crossings.

Northern Corridor Transit Transport Coordination Authority (TTCA-NC) is the responsible institution for the management of the Northern Corridor based on the inter-governmental Northern Corridor Transit Agreement. The overall mandate of the TTCA-NC is the removal of all obstacles to the flow of trade and services along the Northern Corridor. Permanent Secretariat Office, based in Mombasa, is responsible for coordinating implementation of the Northern Corridor Agreement and any other institutional decisions and resolutions of the organization. Due to recurring challenges faced by the users and regulators along the Northern Corridor transport system, TTCA-NC conducts periodical surveys to identify and address the obstacles along the Corridor under the program of Corridor Observatory.

The East African Community (EAC) members, including signatories of the Northern Corridor Transit Agreement, adopted a regional approach for reducing border-crossing delays by setting up the concept of "One Stop Border Post (OSBP)". Further step is going to be implemented under the concept of "Single Customs Territory", whereby the goods are cleared at the port of entry (Port of Mombasa) to eliminate multiple documentary processes at every border.

Principal mode of transport in the Northern Corridor is road and rail. However, rail service is not widely utilized due to deterioration of aged railway infrastructure, coupled with a lack of maintenance and service. About 95% of the corridor traffic relies on road. According to Corridor Diagnostic Study (2011), modal split of the Northern Corridor is as follows.

Table 3.4.1 Northern Corridor Traffic by type of mode (2009)

(unit: 1,000 tons)

Type of Traffic	Road		Rail		Total
	quantity	share	quantity	Share	quantity
Transit	5,509	93%	417	7%	5,926
Regional	2,974	95%	151	5%	3,125
Domestic	11,817	95%	622	5%	12,439
Total	20,300	94%	1,190	6%	21,490

Source: Nathan & Associates, Corridor Diagnostic Study 2011

3.4.2 Current status of infrastructure and system

(1) Road

Figure 3.4.2 Northern Corridor Roads Network
Source: TTCANC

The entire Northern Corridor road network extends approximately 8,800 km across Kenya, Uganda, Rwanda, Burundi and the DR Congo. Key transit transport routes are from Mombasa to Bujumbura, Burundi covering a distance of about 2,000 km and from Mombasa to Kisangani, DR Congo which stretches for about 3,000 km.

From Kenya to Uganda, Mombasa-Malaba-Kampala road (1,170km) is the main trunk line.

From Uganda to Rwanda, Kampala-Kagitumba-Kigali is the principal route.

Bujumbura, Burundi can be reached from Kampala through Rwanda.

About two thirds of the road network is paved, although the condition is generally poor due to inadequate resources for rehabilitation and maintenance. Overloaded trucks and poor enforcement of axle load regulations further deteriorate the quality of the road network and reduce road life spans.

a) Roads in Kenya

Total road network in Kenya is 160,886 km. Out of the total road network, 61,936 km is classified road. Total length of paved road is 11,189 km. Details of road system in Kenya is described in 2.3.1.

The entire segment of A109 and the northern segment of A104 comprise the main parts of the Northern Corridor. This is the busiest route in the country as it is the trunk line used to carry most of export and import traffic through Mombasa Port for Kenya, Uganda and other landlocked countries.

b) Roads in Uganda

Total national road network in Uganda is about 149,800 km. Total length of paved road is 5,917 km. National road network comprises four types of roads (National, District, Urban and Community

Access Road). Dual carriageways account for about 20 km, and are mainly found in the urban areas of Kampala and Jinja.

Table 3.4.2 National Road Network in Uganda

(unit: km)

Road Class	Paved	Un-paved	Total
National Roads	3,795	17,205	21,000
District Roads	-	33,000	33,000
Urban Roads	2,122	8,678	10,800
Community Access Road	-	85,000	85,000
Total	5,917	143,883	149,800

Source: National Development Plan 2015/16-2019/20, Uganda National Road Authority

Uganda National Road Authority (UNRA) is responsible for the management of National Roads. Since its formation in 2008, 1,527 km of new National Roads have been built. Project for another 1,563 km is ongoing and an additional 1,872 km is planned in future.

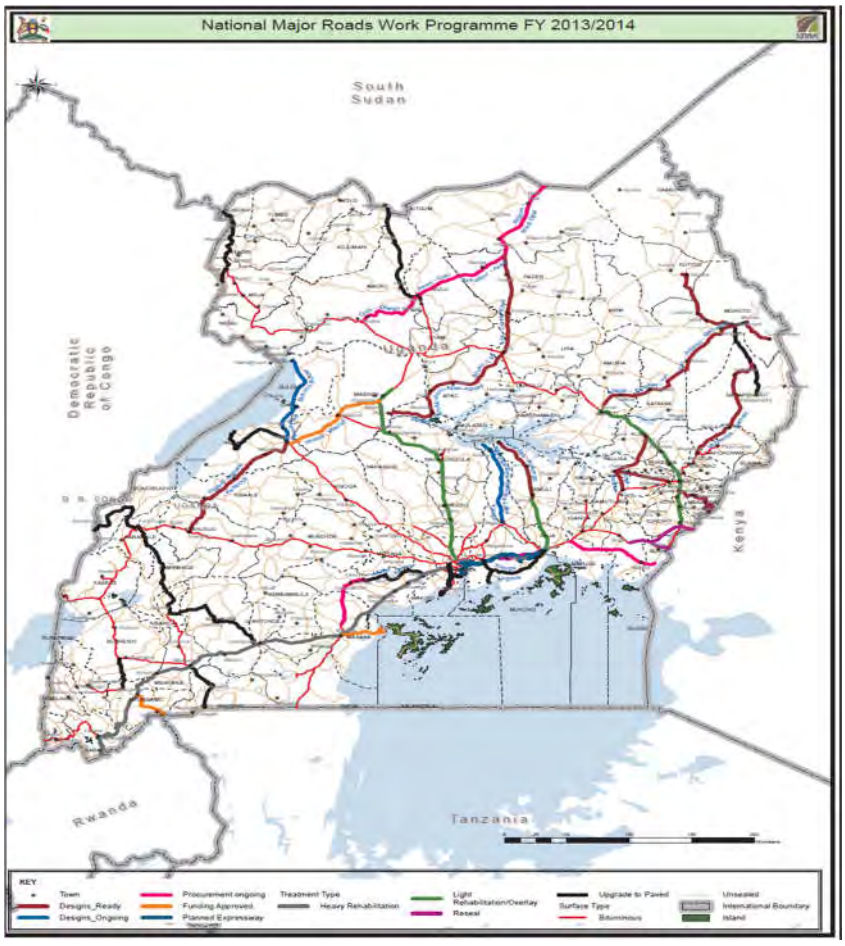


Figure 3.4.3 Road Network in Uganda
Source: UNRA

c) Axle load control

In order to prevent road destruction due to overloaded trucks, axel load limitation policy and

regulations have been established by North Corridor governments to regulate the weight of transport vehicles moving on the highways. In the case of Kenya, the following axle load limit and maximum gross vehicle weight are set in the Traffic Act (Cap. 403):

Table 3.4.3 Permissible Maximum Axle Loads

	Axle Group (with Pneumatic Tyres)	Max. Axle Load (Kg)
A	Single Steering Axle (2 wheels-single tyres)	8,000
B	Single Axle (4 wheels-dual tyres)	10,000
C	Tandem Axle Group (8 wheels-dual tyres)	18,000
D	Triple Axle Group (12 wheels-dual tyres)	24,000

Source: KeNHA website: October 2014

Table 3.4.4 Maximum Gross Vehicle Weights

	Vehicle and Axle Configuration (Pneumatic Tyres)	Max. Gross Vehicle Weight (Kg)
A	Vehicle with 2 axles	18,000
B	Vehicle with 3 axles	26,000
C	Vehicle and semi-trailer with total of 3 axles	28,000
D	Vehicle with 4 axles	30,000
E	Vehicle and semi-trailer with total of 4 axles	36,000
F	Vehicle and drawbar trailer with total of 4 axles	36,000
G	Vehicle and semi-trailer with total of 5 axles	44,000
H	Vehicle and drawbar trailer with total of 5 axles	44,000
I	Vehicle and semi-trailer with total of 6 axles	50,000
J	Vehicle and drawbar trailer with total of 6 axles	52,000
K	Vehicle and drawbar trailer with total of 7 axles	56,000

Source: KeNHA website: October 2014

d) Weighbridges

Axle load control is implemented through the use of weighbridges.

In Kenya, there are nine weighbridges along the national highways. Seven of them are operated along the main Northern Corridor route between Mombasa and Malaba border.

Table 3.4.5 List of weighbridges in Kenya

	Weighbridge location	Road name
1	Mariakani (30km from Mombasa)	A109
2	Mtwapa	B8
3	Athi River (Mollongo, outskirt Nairobi)	A104
4	Gilgil	A104
5	Webuye	A104
6	Rongo	A1
7	Juja	A2
8	Busia	B1
9	Ishiya	A104

Source: KeNHA website: October 2014

Mariakani and Athi River weighbridges are the busiest along the entire Northern Corridor route due to its location close to Mombasa and Nairobi respectively. Weighbridges tend to be the cause of delay in transit transport due to long lines at the weighing location. Mariakani weighbridge implemented "High Speed Weigh in Motion" system to mitigate the congestion.

e) Border crossing

At most of the border crossing points of the region, transit traffic suffers excessively heavy traffic. Factors affecting the efficient operations of the border crossing points range from administrative and legal issues to the lack of infrastructure investment and maintenance.

One stop border post (OSBP) operations are being introduced on the Northern Corridor borders to solve this long standing problem. Construction of OSBP is ongoing at many border posts including the busiest one, the Malaba border point between Kenya and Uganda. EAC OSBP Bill has come into effect which gives each country the legal right to address this issue. Under the OSBP, service will be harmonized with incoming traffic jointly cleared by officers from both countries from one side of the border and the same arrangement is provided for outgoing traffic.

At the Malaba border point, traffic from Kenya to Uganda is handled at the OSBP established on the Ugandan side of the border and traffic from Uganda to Kenya is handled at the OSBP established on the Kenyan side of the border. Construction of infrastructure on the Ugandan side is in final stage while infrastructure on the Kenyan side has already been completed as of December 2014.

Time required to cross the border varies from hours to days depending on the cargo commodity and readiness of necessary documents. Basic industrial materials and cargoes regularly crossing the border all through the year are enjoying faster clearance at the border. An experienced forwarding agent stated that it takes on average 2 days for their trucks to cross the border for general cargo.

Customs clearance of Ugandan cargo is done either at the border crossing point or customs controlled area (bonded warehouse) in Kampala depending on consignee's choice. In case of clearing at border, all Ugandan tax payments should be finished prior to truck arrival at the border. In case of clearing at customs controlled area in Kampala, a Ugandan transit bond should be lodged prior to truck arrival at the border. All necessary information is electronically transmitted from URA head quarter to border office. However, URA information system does not function well and there are frequent down times which increase the time required for border procedures.

For enhancement of international and intra-regional trade, East African Community agreed to work towards "Single Customs Territory (SCT)". Under the scheme, a single customs system in the region will be established which will handle all customs revenue. For Ugandan transit cargo, the taxes are paid while the cargo is in Mombasa and once the cargo is cleared, the cargo can be directly moved to the final destination; thus no entry processing is required at the border. In future, this will significantly reduce time and cost for transit cargo transportation including elimination of transit bond. Government of Uganda has started to implement SCT in phases for selected commodities.

(2) Railway

Figure 3.4.4 Northern Corridor Railways Network
Source: TTCANC

Railway route in the Northern Corridor links Mombasa, Kenya and Kampala, Uganda. There is no further extension to Rwanda, Burundi and other NCTA countries. Kenya Railways Corporation (KRC) and Uganda Railways Corporation (URC) are the government-owned corporations in the respective countries. The original railway lines in East Africa (Uganda, Kenya and Tanganyika) were run by the East African Railways and Harbours Corporation (EAR&H) since World War I. Following the break-up of the EAR&H in 1977, Kenya Railways and Uganda Railway were established to take over the railway lines of each country.

The total length of the Kenyan Railway network is 2,210 km. The main line links Mombasa to Malaba stretching a distance of 1,080 km. A branch line of 217 m is going from Nakuru to Kisumu, where it links with the ferry service on Lake Victoria. There are other branch lines which total 618 km in length, including the line connecting main line to Magadi where a soda ash factory is located.

The total length of the Ugandan Railway network is 1,240 km. The only active line of the network runs from Tororo (Uganda/Kenya border, a counterpart of Malaba) to Kampala over a distance of 250 km. There is a small 10 km branch line linking Kampala to the ferry terminal on Lake Victoria at Port Bell. The remaining part of the railway network is dormant due to deterioration of the infrastructure. The dormant part includes the 500 km Tororo-Pakwach line and the 332 km Kampala-Kasese line.

The overall railway infrastructure is very old and no significant maintenance has been carried out from the days of EAR&H. The railways were built to meter gauge (1,000 mm). Investment in rail infrastructure and equipment has been inadequate for a long time. As a result, the general condition of the railway network from Kenya to Uganda is poor for normal service and in need of rehabilitation. According to the survey conducted by Northern Corridor Infrastructure Master Plan Study, condition of the railway tracks is as follows:

Table 3.4.6 Condition of Northern Corridor Railways Tracks

Section	Length (km)	Condition of the tack	Needed intervention
KENYA			
Mombasa – Nairobi	530	Good/Fair	Spot rehabilitation Replacement of rails and slippers
Nairobi – Malaba	550	Good/Fair	Replacement of rails and slippers Reconstruction of culverts
Nakuru – Kisumu	217	Fair/Poor	Improvement of track for 160 Km Reconstruction of culverts and viaducts
UGANDA			
Makaba – Kampala	250	Fair/Poor	Rehabilitation of the line including bridge
Kampala – Port Bell	10	Good	
Kampala - Kasese	332	Poor	Rehabilitation

Source: Northern Corridor Infrastructure Master Plan Study 2011

In 2006, the Government of Kenya/KRC and Government of Uganda/URC signed two separate concession agreements for management and operations of railway services with Rift Valley Railways (RVR) for 25 years with the objective to revive the railway transport services along the Northern Corridor. The main railway lines of Kenya and Uganda are now under the single operatorship of RVR.

In order to strengthen the role of railway transport in Northern Corridor, the completely new Standard Gauge Railway (SGR) construction project has started. This is one of the flagship projects in Kenya Vision 2030. The official commissioning of the construction was made at Mombasa on November 28, 2013. According to the plan, the SGR will be developed in 3 phases. Phase 1 involves Mombasa to Nairobi portion which will be completed in 2018. It is estimated that SGR would transport 6.15 million tons in 2020 (SGR modal split 23.1%), 11.89 million tons in 2025 (33.56%), 20.20 million tons in 2035 (44.5%). Phase 2 connects Nairobi to Malaba which will be completed in the 2020s. Progress of oil production in Uganda would be one of key factors for development of SGR of this part. A feasibility study and preliminary design of Phase 3 covering Malaba to Kampala is currently being carried out.

a) Time and cost of transit traffic

Time

Time required for moving the goods from gateway port Mombasa along the Northern Corridor to the final destination depends on various factors. Specifically, the overall transport time will be affected by the cargo handling process at the port, necessary documentation work before leaving the port, transportation by truck or rail from the port to the border, border crossing procedure, and transportation after passing the border to the final destination and so on. Various reports present a wide range of transit times and various calculation methods. Based on the available information, it is judged that the best estimate of transit time for the representative Northern Corridor transit passage, Mombasa/Kampala, would be 10 days by truck and 15 days by rail.

Table 3.4.7 Transit Time Mombasa/Kampala by truck

Transit Time	Remark	Source and Date
3.4 days	Including weighbridge, road block, border crossing	CPCS 2010
4.5 days	Total 13.5 days minus 9 days in port	Nathan 2011
6-8 days	Including port and transit clearance	A forwarder in Mombasa 2014
7-10 days	Including port and transit clearance	A forwarder in Kampala 2014
(5.8 days)	(Truck turn-round time starting from Mombasa to Kampala and return to Mombasa)	SCEA 2014
2.8 days	Truck GPS data Mombasa to Malaba (Added 0.5day by consultants)	TTCANC 2014
10 days	Customs electronic data Mombasa to Malaba (Added 0.5day by consultants)	TTCANC 2014

Table 3.4.8 Transit Time Mombasa/Kampala by rail

Transit Time	Remark	Source and Date
4-7 days	A large clearing and forwarding agency	CPCS 2010
5 days	RVR's own target	CPCS 2010
8-14 days	Best estimate	CPCS 2010
10.3 days	Total 19.3 days minus 9 days in port	Nathan 2011
10 days	From the time when the cargo loaded onto the wagon	SCEA 2014
12-14 days	Including port and transit clearance	A forwarder in Mombasa 2014
14-20 days	Including port and transit clearance	A forwarder in Kampala 2014
14 days	Current average required time	KRC in Nairobi 2014

Sources for above 2 tables
CPCS: Analytical Comparative Transport Cost Study Along th Northern Corridor Region (October 2010)
Nathan: Corridor Diagnostic Study of the Northern & Central Corridors of East Africa (April 2011)
SCEA: Shippers Council East Africa Logistics Performance Survey (July 2014)
TTCANC: Northern Corridor Transport Observatory Report (April 2014)
A forwarder: Interview in Mombasa (September 2014), in Kampala (December 2014)
KRC: Kenya Railways Corporation interview in Nairobi (November 2014)

Cost

According to the recent survey by the Shippers Council of East Africa (SCEA) and Transit Observatory Project by Transit Transport Coordination Authority of the Northern Corridor (TTCANC), prevailing rates for transit container by road and by rail are as follows:

Table 3.4.9 One 40' Container Road Freight Rates from Mombasa (unit: US$)

City	Nairobi	Kampala	Kigali	Bujumbura	Goma	Juba
Country	Kenya	Uganda	Rwanda	Burundi	DR Congo	S. Sudan
distance	430km	1,170km	1,700km	2,000km	1,880km	1,750km
2013	1,045	3,700	4,800	6,500	7,000	7,500
2012	1,200	3,000	4,900	9,000	7,500	7,200
2011	1,300	3,400	6,500	8,000	9,500	9,800

Source: East Africa Logistics Performance Survey 2014 and 2012 by SCEA, Transit Observatory Report April 2014 by TTCANC

Table 3.4.10 One 20' Container Rail Freight from Mombasa (unit: US$)

City	Nairobi	Kampala	Kigali	Bujumbura	Goma	Juba
Country	Kenya	Uganda	Rwanda	Burundi	DR Congo	S. Sudan
distance	530km	930km				
2013	1,450	2,400	-	-	-	-
2012	1,110	N/A	-	-	-	-

Source: East Africa Logistics Performance Survey 2014 and 2012 by SCEA

(3) Pipeline

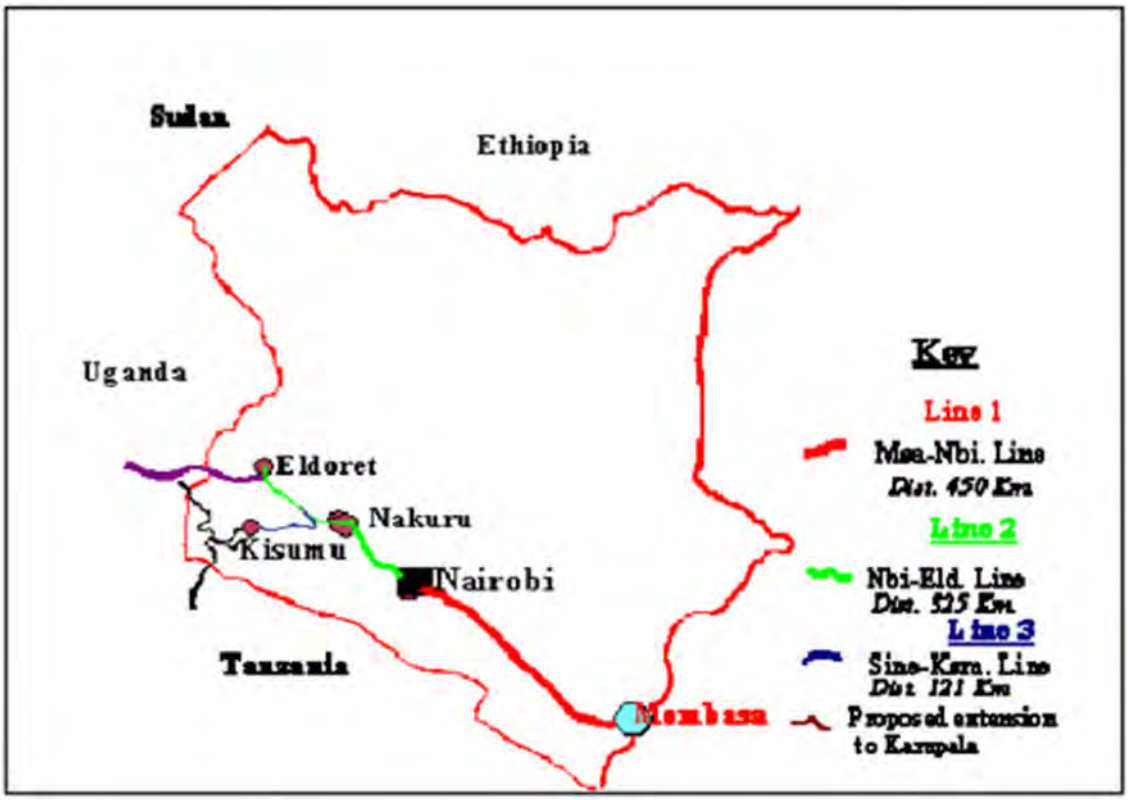


Figure 3.4.5 Pipeline Network in Kenya
Source: KPC

The Kenya Pipeline Company Ltd (KPC) operates a pipeline network in the Northern Corridor.

Total length of existing pipeline is 896 km with following network:

Table 3.4.11 KPC Pipeline Network

Line Section	Length (km)	Pipe Diameter (inches)
Mombasa-Nairobi (Line 1)	450	14”
Nairobi-Eldoret (Line 2)	325	8” & 6”
Nairobi-Eldoret (Line 4)	325 (parallel to Line 2)	14”
Sinednet-Kisumu (Line 3)	121	10”

Source: KPC

Mombasa-Nairobi section was commissioned in 1978. A larger pipeline (from 14” to 20”) is currently being introduced in this section. The renewal work is scheduled to be completed in 2016. Nairobi-Eldoret and Sinednet-Kisumu sections (The Western Kenya Pipeline Extension: WKPE) was commissioned in 1994.In order to match the rising demand in Western Kenya, additional line of 14” diameter was constructed in Nairobi-Eldoret section (Line 4). From the terminals of the pipeline (Eldoret and Kisumu), the products are transported mainly by road to destinations in the landlocked countries.

The governments of Kenya and Uganda have signed a Memorandum of Understanding in 2004 to

promote the extension of the pipeline from Eldoret to Kampala.

The kind of products transported through the pipeline is refined products, such as motor vehicle fuel oil, gas oil, jet fuel and kerosene. Current modal split of oil products is Pipeline 90% and Railway 10%.The volume of products transported through the KPC pipeline system in the past five years is shown in the table below. Mombasa/Nairobi section carries about 60% of the total volume.

Table 3.4.12 KPC Pipeline Throughput

Year	2009	2010	2011	2012	2013
Total throughput (1,000 m3)	4,326	4,204	4,257	4,856	5,167

Source: KPC

There are new oil recoveries in Hoima area of the Lake Albert region in Uganda. Total reserve of two billion barrels has been verified. Several oil companies are participating in this new oil project. This situation may impact the development plan of the pipeline in Uganda.

Feasibility study is currently being conducted for the new pipeline to transport the Ugandan crude oil from Hoima to Lamu Port through Lokichar.

Two pipeline projects are planned in Uganda. One project is a pipeline from Eldoret, Kenya to Kampala (12" line) and the other project is a pipeline from Kampala to Kigali, Rwanda (14" line). Both projects are aiming at 2017 for start-up operation.

3.4.3 Corridor cargo movement

Corridor cargo consists of domestic cargo moving within Kenya and transit cargo moving beyond the border through Kenya. Kenyan domestic cargo accounts for about 70% of total corridor cargo. There is also inter-regional cargo movement between corridor countries such as Kenya and Uganda and Uganda and Rwanda. The cargo volume is minimal at the moment but expected to grow in future in line with the development of inter-regional market. The total cargo volume of domestic and transit has been growing at an average rate of 6.5% per annum over the past five years. Transit traffic shows steady growth during the past five years, rising from 4,981 thousand tons in 2009 to 6,708 thousand tons in 2013, representing an average annual growth rate of 6.8% during the same period.

Table 3.4.13 Mombasa Port Total Throughput (Domestic and Transit)

(unit: 1,000 tons)	2009	2010	2011	2012	2013	Average growth p.a.
Domestic	13,976	13,395	14,131	15,153	15,425	7.2%
Transit	4,981	5,381	5,595	6,624	6,708	6.8%
Transship	105	158	227	143	174	0.8%
Total	19,062	18,934	19,953	21,920	22,307	6.5%

Source: KPA

Destination/Origin Countries of transit cargo through Mombasa Port and the Northern Corridor includes all the EAC countries and South Sudan, DR Congo and Somalia as well. Uganda is by far the largest among those countries in terms of traffic volume in and out. In 2013, out of 6,708 thousand tons of total transit traffic, 4,912 thousand tons were the cargo to/from Uganda, which represents 73.2% of total transit traffic of Mombasa Port. Rapid growth of South Sudan cargo is also notable.

Table 3.4.14 Mombasa Port Transit Traffic by Country

(unit: 1,000 tons)	2009	2010	2011	2012	2013	2013 share
Uganda	3,980	4,233	4,375	4,845	4,912	73.2%
Tanzania	253	179	161	186	192	2.9%
Burundi	20	7	2	39	67	1.0%
Rwanda	251	288	226	261	240	3.6%
S. Sudan	168	223	417	766	775	11.6%
DR Congo	289	430	355	482	511	7.7%
Somalia	16	5	29	16	7	-
Others	4	16	30	29	4	-
Total	4,981	5,381	5,595	6,624	6,708	100%

Source: KPA

Northern Corridor traffic (including both Domestic and Transit) mainly flows one-way. In 2013, 85.8% of the total traffic was inbound traffic. Inbound traffic includes massive movements of dry bulk cargo and liquid oil cargo which flows only one-way as basic materials for economic activities in Kenya and other hinterland countries. Principal import bulk commodities include; Petroleum oil and products, wheat in bulk and clinker.

Table 3.4.15 Mombasa Port Total Throughput (Import & Export)

(unit: 1,000 tons)	2009	2010	2011	2012	2013	2013 share
Import						
GC in Container	4,086	4,591	5,226	5,954	5,974	(GC 40%)
GC conventional	1,359	1,397	1,298	1,298	1,726	
Dry Bulk	4,641	3,827	3,807	3,807	4,913	(Bulk 60%)
Liquid Bulk	6,431	6,386	6,807	6,607	6,537	
Import Total	16,507	16,201	16,938	18,732	19,150	85.8%
Export						
GC in Container	1,952	2,218	2,337	2,626	2,690	
GC conventional	269	192	171	153	128	
Dry Bulk	62	70	122	106	65	
Liquid Bulk	167	95	158	160	100	
Export Total	2,450	2,575	2,788	3,045	2,983	13.4%
Transship Total	105	158	227	143	174	0.8%
Grand Total	19,062	18,934	19,953	21,920	22,306	100%

Source: KPA

Same trend is observed for container traffic (fully loaded). In the case of transit full container movement, 85% of total containers are import/inbound containers on average over the past five years. The volume of outbound/export general cargo from the hinterland landlocked countries is inadequate to be packed in containers. Thus the majority of containers delivered at the hinterland countries are returned to Mombasa in empty condition.

Table 3.4.16 Transit full containers (Import & Export)

(unit:TEU)	2009	2010	2011	2012	2013	average share
Import	110,510	118,221	142,135	161,621	162,004	85%
Export	21,339	20,489	24,280	26,793	29,904	15%
Total	131,849	138,710	166,415	188,414	191,908	100%

Source: KPA

3.4.4 Lamu Port and New Transport Corridor Development to Southern Sudan and Ethiopia (LAPSSET)

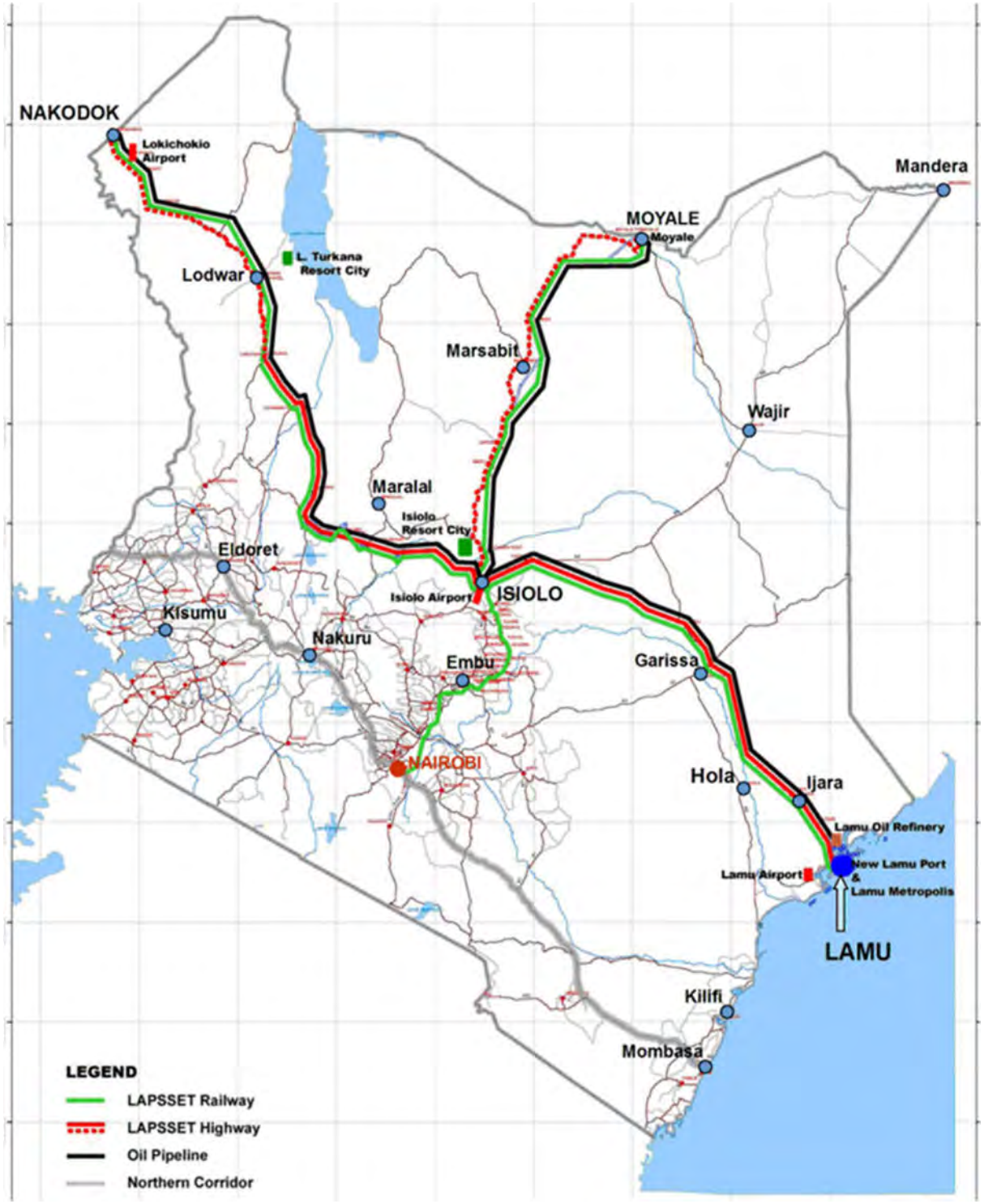


Figure 3.4.6 LAPSSET Corridor full view
Source: LCDA

(1) Introduction

"Study for LAPSSET Corridor FS & Lamu Port MP & DD" contains the feasibility study and master

plan of New Lamu Port and all components necessary for the LAPSSET Corridor. The project is defined as one of the flagship projects in the government long-term policy program "Kenya Vision 2030".

Under the project, a new transport corridor from the new port of Lamu stretching through the northern part of Kenya and branching at Isiolo to Ethiopia and South Sudan will be developed. The main towns along the Corridor's Lamu-Nakodok and Isiolo-Moyale routes will include; Nakodok, Lokichokio, Lodwar, Maralal, Isiolo, Mardsbit, Laisamis and Moyale.

The project was initially conceived in the 1970s but is only now beginning to materialize.

The official ground-breaking ceremony was held in March 2012 in Lamu attended by the Presidents of Kenya and South Sudan and the Prime Minister of Ethiopia.

The LAPSSET Corridor Development Authority (LCDA) was established in March 2013 through the Presidential Order. The Authority is domiciled under the Presidency. The functions of the Authority include followings:

- Plan, coordinate and sequence the Project in collaboration with implementing ministries and agencies
- Provide leadership, direction and guidance in operations and implementation of the Project
- Mobilize funds to project components using various resources including government budget, donor loans, infrastructure bonds and private finance
- Promote the competitiveness and use of the Corridor for the transport of goods and people

a) LAPSSET Corridor Feasibility Study

According to the Terms of Reference for the services, there are seven subsectors involved in the services, i.e. port, railway, highway, oil pipeline, oil refinery, resort city, and airport. The port implies the new Lamu Port at Manda Bay. The railway and highway are the lines connecting Lamu Port and the Sudan border, i.e. Nakodok, and the Ethiopian border, i.e. Moyale. The oil pipeline is from Southern Sudan to Lamu Port. The oil refinery is to be located at Lamu.

The objectives of the LAPSSET Corridor Study are:

- To identify and concretely define the dimensions of a new transport corridor complete with the above basic transport infrastructure meant to initially improve access and connectivity of transport between Kenya and Southern Sudan and between Kenya and Southern Ethiopia, stimulate economic activity in the Northern Province as well as in the neighboring countries and beyond.
- To evaluate and assess the future trade and transport needs and projected demand and define the strategic network of transport routes and modes that will optimally satisfy the expected demand.
- To undertake a full technical, economic and financial feasibility study on the development of the proposed Port of Lamu at Manda Bay and Lamu-Southern Sudan-Ethiopia Transport Corridor components.
- To propose public-private partnership (PPP) options for its development and implementation.
- To advise the Government on appropriate regulatory and institutional framework to support the operationalization of the components of the Lamu-Southern Sudan-Ethiopia Transport Corridor, the Lamu Port at Manda Bay and will provide proposals on at least three investment models, their costs, and their financing options.

b) Lamu Port Detailed Design Study

Following objectives are included:

- To prepare a Master Plan for Development of the Lamu Port at Manda Bay,
- To prepare Detailed designs of the First Three Berths and Associated Infrastructure, and

- To prepare tender documents for the First Three Berths and Associated Infrastructure.

The required berths to be designed in DD at the new Lamu Port are a bulk berth for 100,000 DWT bulk ships, a container berth for 100,000 DWT container ships and a general cargo berth for 30,000 DWT general cargo ships. Three additional sub-sectors are indispensable to be incorporated in the services, i.e. electricity supply, water supply and communication network, as the basic infrastructure which enables the other sub-sector facilities to be operational.

The target year of the plans in the services is set at 2030. It is noted that the study area is limited in the territory of Kenya.

(2) Conceptual Plan of LAPSSET Corridor Development

a) Concept of Transport Corridor

A new transport corridor to the northern region has been proposed in order to meet requirements from Southern Sudan and Ethiopia who have sought suitable transportation routes including seaport outlets and Kenya who has also planned to develop the northern part of the country through the establishment of new transportation routes and other infrastructures. This new corridor is planned to be comprised of railway, highway and oil pipeline. The target year for all components of the LAPSSET Corridor will be year 2020 in tandem with the Government's "Kenya Vision 2030".

Lamu Port has been planned as a new gateway of the proposed Corridor to complement the existing Mombasa Port. It will afford added convenience for the movement of people and goods for Southern Sudan, Ethiopia as well as Kenya. The port must also be designed with adequate capacity to be able to respond to the high volume of cargoes for export and import anticipated by the year 2030.

The Figure 3.4.7 shows a tentative implementation schedule for the Corridor (Railway, Highway and Oil Pipeline), Airport, Resort Cities and Oil Refinery.

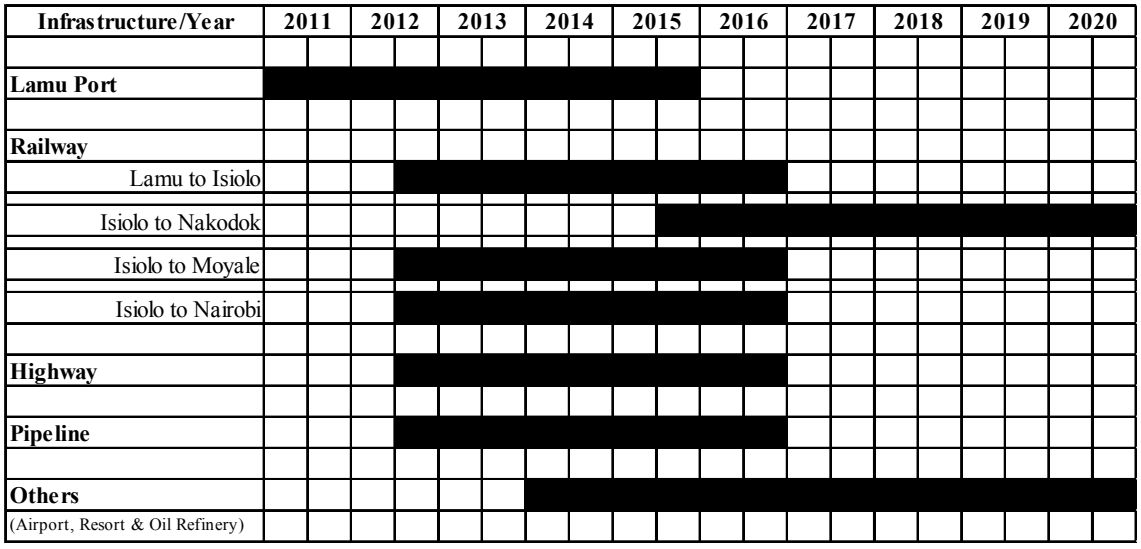


Figure 3.4.7 Implementation Schedule of LASSET Corridor
Source: Study for LAPSSET Corridor FS & Lamu Port MP & DD by JPC & BAC/GKA JV

Total project cost is estimated at around US$ 17 billion. Outline of Project Infrastructure Components is as follows:

Table 3.4.17 LAPSSET Project Components

	Component	Quantity	Cost estimate (million US$)
1	Lamu Port	32 berths	3,095
2	Railway	1,710 km	7,100
3	Highway	880 km	1,396
4	Crude Oil Pipeline	1,320 km	3,060
5	Product Pipeline	990 km	885
6	Resort Cities	3 places	1,212
7	Airports	3 places	188
Total Cost Estimate			16,936

Source: LCDA

b) Demand Forecast

The cargo demand forecast has been undertaken substantially based on the projections of diversion of port cargoes from Djibouti that currently serves as the main port for Ethiopia trade and Port Sudan that serves as the main port for Southern Sudan trade. It is also based on the projections of diversion of local products currently transported through the Northern Corridor transport system to Lamu and on projected diversion of goods expected to be transported from Lamu to the Central region of Kenya to meet local demand.

The cargo volume for each country that directly relates to the LAPSSET transport corridor and its gateway port New Lamu Port by target year 2020 and 2030 is projected and summarized as shown in Table 3.4.19.

Almost half of the cargo demand in Kenya is assumed to be derived from the large-scale agricultural development and increased output of agricultural products comprising mainly cash crops, i.e. fruits and vegetable along the entire area of eastern part of the Tana River basin. This implies that this section of the LASSET Corridor will contribute directly to the economy of Kenya.

The total port cargo demand forecast is summarized in Table 3.4.20. The forecasted cargo volume in the New Lamu Port accounts for around 30-40% of the total forecasted cargo volumes in Kenya. Around 60% of the total forecasted cargo volumes in the New Lamu Port comprise import and export cargoes to/from Ethiopia and South Sudan. The major reason why the forecasted cargo volumes in the New Lamu Port are large is that this port can accommodate larger sized vessels than at Mombasa Port due to its greater water depth.

Table 3.4.18 Cargo Demand Forecast 2010, 2020, and 2030

(Unit: tons per year)

Cargo by Type	2010	2020	2030
Bulk Cargo	1,374,000	2,603,000	4,682,000
Breakbulk Cargo	1,182,000	2,370,000	4,192,000
Live stock	-	18,000	45,000
Liquid Cargo	292,000	529,000	765,000
Refrigerated Cargo	23,000	64,000	95,000
Containerized Cargo	2,874,000	7,914,000	14,082,000
Port Cargo Throughput	5,755,000	13,498,000	23,861,000
Laden Containers in TEU	208,000	72,000	1,313,000
Empty Containers in TEU	38,000	250,000	471,000
Port Container Throughput in TEU	246,000	970,000	1,784,000

Source: Study for LAPSSET Corridor FS & Lamu Port MP & DD by JPC & BAC/GKA JV

Table 3.4.19 Projected Cargo Volume for LAPSSET Corridor by Country

(Unit: tons per year)

Year 2020	Kenya			South Sudan	Ethiopia	Total
	No Agro	W/Agro	Total			
Bulk	500,000	2,100,000	2,600,000	1,006,000	1,097,000	4,703,000
Breakbulk	325,000	0	325,000	423,000	1,622,000	2,370,000
Livestock	6,000	0	6,000	6,000	6,000	18,000
Liquid	385,000	0	385,000	77,000	67,000	529,000
Refrigerated	64,000	0	64,000	0	0	64,000
Container	1,875,000	0	1,875,000	2,285,000	1,654,000	5,814,000
Total	3,155,000	2,100,000	5,255,000	3,797,000	4,446,000	13,498,000

Year 2030	Kenya			South Sudan	Ethiopia	Total
	No Agro	W/Agro	Total			
Bulk	675,000	4,200,000	4,875,000	1,374,000	2,633,000	8,882,000
Breakbulk	446,000	0	446,000	552,000	3,194,000	4,192,000
Livestock	15,000	0	15,000	15,000	15,000	15,000
Liquid	565,000	0	565,000	105,000	95,000	765,000
Refrigerated	95,000	0	95,000	0	0	95,000
Container	2,621,000	0	2,621,000	3,475,000	3,786,000	9,882,000
Total	4,417,000	4,200,000	8,617,000	5,521,000	9,723,000	23,861,000

Source: Study for LAPSSET Corridor FS & Lamu Port MP & DD by JPC & BAC/GKA JV

Table 3.4.20 Total Cargo Demand Forecast of Kenya

(Unit: Million tonnes per year)

Port/Year	2020	2030
New Lamu Port	13.5 (27%)	23.9 (40%)
Mombasa Port	25.7 (53%)	34.8 (60%)
Total	49.2 (100%)	58.7 (100%)

Source: Study for LAPSSET Corridor FS & Lamu Port MP & DD by JPC & BAC/GKA JV

c) Recommendation

New Lamu Port as the Terminal Port of Important Regional Transport Corridor

The cargo demand forecast for the New Lamu Port suggests that Kenya will have another port similar in scale to that of Mombasa Port. However, the New Lamu Port functions as the terminal port of the international/regional transport corridor. The port will be a key regional port for the transport corridor in the African continent.

New Lamu Port as an Alternative Port of Mombasa Port

The capacity of land transport infrastructure need to be expanded to deal with the increasing cargo levels at Mombasa Port and the Northern Corridor or transport cost will increase to prohibitive levels due to transport congestion and port road conditions. The new Lamu Port will function as an alternative port of Mombasa Port when the linkage with domestic highway and railway network with the port is realized.

Stepwise Development of Railway Network

Stepwise Development of New Lamu Airport

Highway Network

The highway network needs to be completed regardless of the development scenario. Prior to the completion of Phase 1 of the New Lamu Port Development Project the highway connecting the New Lamu Port and Mombasa or any connecting point with the Northern Corridor is imperative.

Establishment of Multimodal Transport Linking Facility

Isiolo will become the point of junction for various regional transport infrastructure and transport mode. The estimated cargo passing through this junction can be estimated at around 29.5 million tonnes in 2020 and 34.5 million tonnes in 2030, respectively. The cargo is mixed with international and domestic cargoes. Thus, it is justifiable to establish the inland port or inland container depot for container cargoes.

(3) New Lamu Port

The design vessels can be defined by specifying type of cargoes to be handled and size of the vessels. In the case of Lamu Port, the forecasted commodities consist of the following five kinds:

- Break bulk such as general cargoes to/from neighboring countries, construction materials, livestock, and others.
- Containerized cargoes such as machinery, consumables, and others.
- Dry bulk such as fertilizer, grain, and coal.
- Liquid bulk such petroleum, LNG, and edible oil, and
- Others such as refrigerated cargoes (mostly containerized).

Special cargoes such as crude oil for export and coal and LNG for import are to be handled at designated offshore buoys and specialized berths in the Manda Bay, respectively. The other ordinary cargoes are to be handled at the commercial port, including general cargoes berths for break bulk cargoes, container berths for containerized cargoes, and bulk berths for dry bulk cargoes. Edible oil should be handled at specialized berths in the commercial port.

Size of the design ships corresponding to the above three types of cargoes are determined to be 30,000 DWT for general cargoes, 100,000 DWT for containerized cargoes, and 100,000 DWT for dry bulk cargoes, taking into consideration of the following factors:

- Expected role and competitive position of Lamu Port in the region,
- Expected cargo volumes and necessary capacity of ships at the target year 2030,
- Ship sizes actually calling at the present Mombasa Port,
- Number and composition of ship sizes commissioned in the world shipping,
- Trend of shipbuilding, especially for container ships, which has been enlarging continuously, and
- Capacity and efficiency of the port.

The dimensions and required number of the berths are shown in Table 3.4.21. It is proposed to construct 32 berths by the year 2030.

Table 3.4.21 Dimension and Proposed Number of Berths

Ship Type	Ship Dimension (m)			Berth Dimension (m)		2015 Berth No.	2030 Berth No.
	Loa/Lpp	Breadth	Draft	Length	Depth		
Container 100,000DWT	350/335	42.8	14.7	400	16.0	400m x 1	400m x 6 =2,400m
General Cargo 30,000DWT	182/171	28.3	10.5	240	12.0	240m x 1	240m x 21 =5,040m
Bulk Cargo 100,000DWT	258/246	39.8	15.5	330	17.5	330m x 1	330m x 4 =1,320m
Crude Oil 200,000DWT	296/284	52.2	18.9	-	22.0		(SPMB 2)
Product Oil 30,000DWT	184/175	29.1	10.4	230	12.0		(Dolphin 1)
Coal 30,000DWT	182/171	28.3	10.3	240	12.0		(Dolphin 1)
LNG 30,000DWT	199/188	31.4	9.2	240	11.0		(Dolphin 1)
TOTAL						3	32

Source: Study for LAPSSET Corridor FS & Lamu Port MP & DD by JPC & BAC/GKA JV

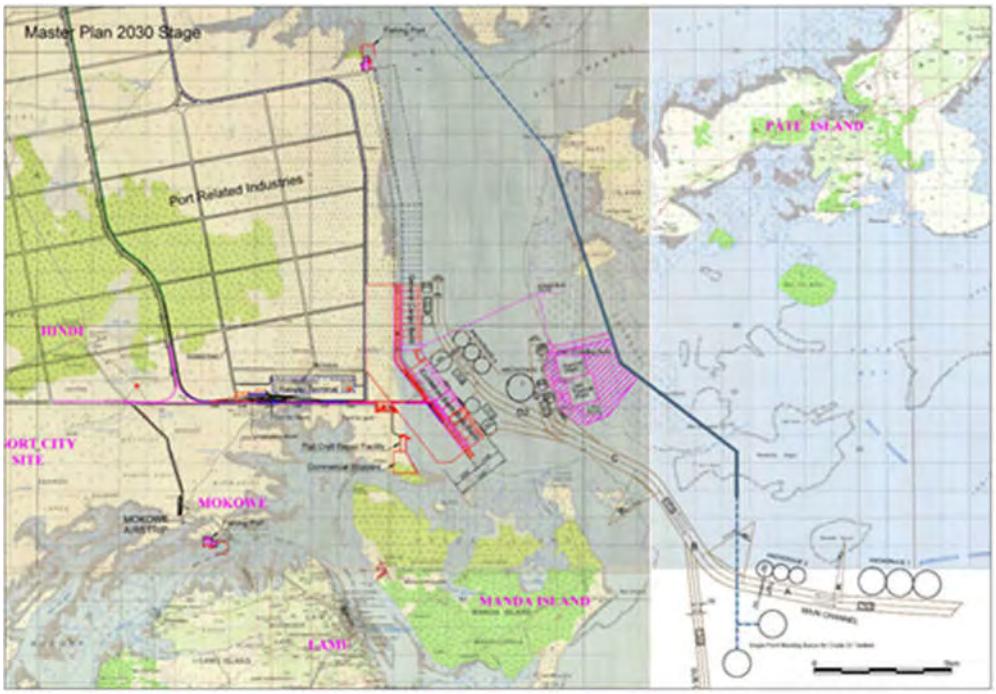


Figure 3.4.8 Lamu Port 2030 stage
Source: JPC

Lamu Port is situated in Manda Bay which is well sheltered from the outer ocean and has deep waters along the main channel. Lamu Port is the key pull factor for all the LAPSSET corridor project components.

The Port Master Plan includes 32 berths with a total quay length of over 9,000m. By the target year 2030, twenty (20) berths will be developed while another twelve (12) berths can be considered during the long term plan beyond 2030. In August 2014, the construction contract of the first three berths was signed between KPA and the contractor, China Communications Construction Company (CCCC). The contract price is US$ 488 million. The construction work started following the signing of the contract.

Project timeline is 3 years from the date of construction commencement.

It is anticipated that development of the first three berths will trigger the subsequent development of all other corridor systems such as main highway, oil pipeline and railway which feeds in and out of the port. KPA intends to develop the first three berths as an incentive to attract private sector participation in Lamu port operations and investment in the rest of the 29 berths. A Bulk Berth (length: 400m, depth: -17.5m), Container Berth (400m, -16.0m), and General Cargo Berth (400m, -16.0m) have been designed for the initial stage.

Figure 3.4.9 Initial three berths of Lamu Port
Source: JPC

Construction works on the port building and port police station building have been commenced prior to the construction of berths and are scheduled to be completed shortly.

(4) Corridor

The LAPSSET Corridor consists of three major transport infrastructure components, the railway, highway and pipeline. The three components are designed to run in parallel to one another in view of the need for road transport in the construction and maintenance of all the other components. The cross section of the Corridor is planned to have a total width of 200m at standard sections where the width of the corridor is shared by the three transport infrastructure components. The width allowance for each component is designed as follows; railway (60m), Subsidiary (10m), highway (100m) and pipeline (30m).

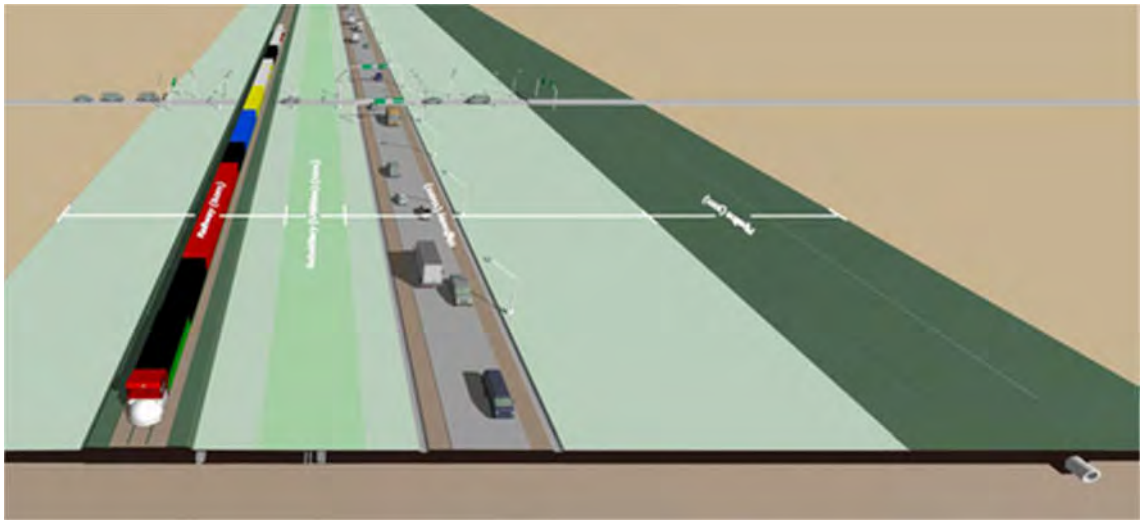


Figure 3.4.10 Corridor Standard Cross Section (1)
Source: JPC

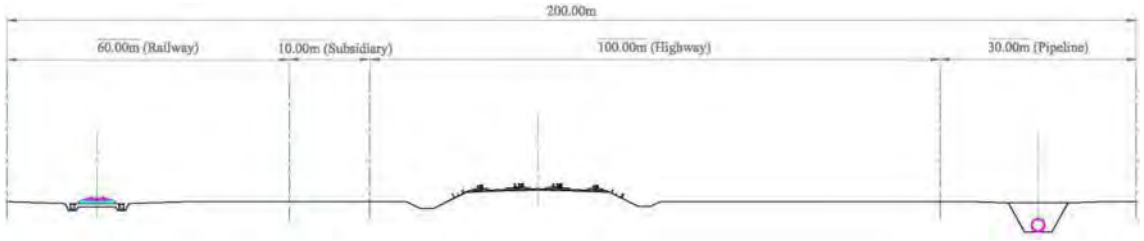


Figure 3.4.11 Corridor Standard Cross Section (2)
Source: JPC

(5) Railway

A railway line will run from Lamu to Juba, a distance of 1,710 km.

The railway construction plan is made based on standard gauge railing for the following segments:

Table 3.4.22 LAPSSET Railway Project

Segment	Section	Length
Segment 1& 2	Lamu Main Section (Lamu – Isiolo)	532km
Segment 3 & 4	South Sudan Section (Isiolo – Nakodok)	737km
Segment 5	Ethiopia Section (Isiolo – Moyale)	454km

It is estimated that number of freight trains on the main Lamu Section will reach 78 trains per day at the busiest section between Lamu – Isiolo in 2030. Until the target year of 2030, the railway will be comprised of a single track line and shall be operated by diesel driven system.

According to the plan, the share of railway transportation volume constitutes more than 90% of long-hauling cargo movement between Lamu and South Sudan/Ethiopia.

(6) Highway

LAPSSET road project will run from Lamu to Isiolo and onwards to Nakodok and Moyale. This 2-lane highway and will cost an estimated US$ 1.4 billion. The highway construction plan is made for the following segments:

Table 3.4.23 LAPSSET Road Project

Segment	Section	Length
Segment 1	Lamu – Garissa	252km
Segment 2	Garissa - Isiolo	280km
Segment 3	Isiolo – Lokichar	345km

Some LAPSSET road construction works have already commenced. Construction and upgrading of a 136 km section between Isiolo and Merile River, part of Isiolo – Moyale Section (Segment 5), was commenced in 2007 and completed in 2011. The road was upgraded into a 2 lane tarmac road. The construction of remaining portion of Isiolo – Moyale Section, from Mrile River upto Moyale, is currently in progress.

Figure 3.4.12 LAPSSET Road (Isiolo-Moyale section)
Source: LCDA

(7) Pipeline

Crude Oil Pipeline for sending crude oil from South Sudan to Lamu via Isiolo is planned parallel to the highway routes at flat areas, and via a separate route at hilly areas with a capacity of 500,000 barrels per day.

The governments of South Sudan, Uganda and Kenya are currently holding negotiations on the Inter-Governmental Agreement regarding the crude oil pipeline connecting the countries and leading to Lamu Port. The project will be developed through a BOOT scheme to enable the private sector to take the lead in the delivery of the project. Expression of interest for the tender for the development of the pipeline will be announced in due course.

Product Oil Pipeline for refined oil (diesel, kerosene and gasoline) is also planned with a capacity of 97,900 barrels per day. The pipeline will be used supply Kenyan domestic demand as well as 30% of consumption of Ethiopia.

(8) Resort cities

The development of resort cities is planned at Lamu, Isiolo and Lake Turkana near Lodwar in an effort to create a new tourism corridor. In 2012, the Isiolo County Council was asked to set 6,500 acres of land aside for establishment of the resort city. The local government officials, legislators and

professionals were briefed by the central government officials on the importance of the resort city. A PPP scheme will be adopted for the development.

(9) Airports

In the LAPSSET project, airports at Lamu, Isiolo and Lokichokio are earmarked as main airports of the region. The government has embarked on improving existing facilities at the three airports to provide for air travel services to enhance accessibility to the corridor.

Extension of the runway from 1,100m to 2,300m has already been completed at Lamu Airport. Improvement work for the airport terminal building has also been completed. The construction of the new Lamu International Airport is proposed in the FS. Isiolo Airport will have a 1,500 m runway; construction work of the terminal building is being planned. The existing Lokichokio Airport which has an 1,800 m runway is undergoing rehabilitation and improvement works.

4. Relevant Information on Development and Movements in Mombasa Area

4.1 Port activities

4.1.1 Outline of Mombasa Port

(1) Outline of Mombasa Port

Location: Lat 4°04'S; long 39°41'E

The port of Mombasa is the Principal Kenyan seaport and comprises of Kilindini Harbor and Port Reitz on the Eastern side of the Mombasa Island and the Old Port and Port Tudor north of the Mombasa Island.

Kilindini is naturally deep and well sheltered and is the main harbour where most of the shipping activities take place. It has 16 deep water berths, two oil terminals and safe anchorages and mooring buoys for sea-going ships.

The Old Port is entered between Ras Serani and Mackenzie Point and is used only by dhows and small coasting vessel of 55 meters LOA. A cement loading facility is located opposite the old port jetty at Ras Kidomoni (English Point) for bulk cement carriers of up to 150 meters LOA and 8.0 meters draught.

The Port of Mombasa not only serves Kenya but is also the main gateway to the Eastern African hinterland countries of Uganda, Rwanda, Burundi, DRC and Southern Sudan.

Figure 4.1.1 Mombasa Port Area

The Likoni Ferry is a boat service across the Kilindini Harbour, serving both the island city of Mombasa and the Kenyan mainland town of Likoni. Two double-ended ferries alternate across the harbour, carrying both road and foot traffic. The ferries are operated by the Kenya Ferry Services (KFS), and are the only remaining ferry service by KFS. The Likoni ferry started operating in 1937. Passenger services are free while vehicles have to pay a ferry toll. The Mombasa side terminal of the Likoni line is located at the southern end of the Mombasa Island. The distance of the line is about 500

meters.

Figure 4.1.2 Likoni Ferry

(2) Nautical access

The entrance from the sea to Kilindini Harbor is by an approach channel 7 nautical miles long, 300 meters wide and dredged to a maximum depth of 15.0. The channel is well marked by solar powered buoys and leading marks as per IALA system A requirements. Two traffic control stations direct and monitor the movement of ships in the channel. Inside the inner harbor deep and safe anchorages are provided for sea-going ships with draft of up to 13. 8m

Siltation is small in Kilindini harbor and maintenance dredging is done every 5 years. Anchorage for coasters and fishing vessels is also available. Anchorage outside port area is not recommended due to the poor holding ground and heavy swell.

(3) Tides and currents

The Port is a tidal port with a tidal range of 4.1 meters maximum at spring tide and -0.1 meters at low tides. Strong northerly currents of up to 6 knots and heavy swells are experienced near the channel entrance during the South East monsoon between April and October.

(4) Largest vessel

The port can accommodate vessels up to 15.0 meters draught and 300 meters LOA. The channel has been dredged to allow fully laden tankers of up to 80,000 dwt to transit.

4.1.2 Throughput in Mombasa Port

(1) Cargo traffic overview

Cargo traffic is dominated by imports which account for 90% of total cargoes handled at Mombasa Port in 2014. This trend has remained steady in the past decade. Out of total import cargoes, about 30% is transit cargoes destined to hinterland countries and shows a gradual steady increase over the past decade. It is noted that overall cargo traffic at Mombasa Port has been increasing due to growth of the Kenyan economy and landlocked countries as well.

Table 4.1.1 Cargo Traffic in Mombasa Port (Import)

(Unit: 1,000 ton)

Commodity/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Iron & Steel	515	435	493	621	595	780	826	833	854	1,192	1,367
Rice	297	311	311	328	275	387	285	298	340	465	651
Sugar	207	246	289	372	320	281	279	140	102	207	231
Chemicals & Insecticides	169	199	267	299	237	218	244	213	200	254	390
Plastic	218	199	266	308	313	402	454	265	218	398	662
M/Vehicle & Lorries	86	164	202	287	334	296	283	293	332	366	463
Paper & Paper Products	168	143	209	244	208	296	336	265	196	300	503
Cereal Flour	90	92	101	149	143	177	153	91	41	41	49
Fertilizer	140	89	160	103	71	71	59	110	52	80	102
Clothing	74	80	105	115	105	35	105	71	40	132	253
Ceramic	32	52	90	162	143	145	251	246	125	260	415
Edible Vegitables	6	62	70	88	42	45	22	26	30	29	57
Vehicle Tyres & Spares	31	25	37	48	48	30	39	30	11	52	103
Tallow & Oil in Cases & Drums	32	37	35	29	27	33	17	16	15	33	84
Malt	0	32	26	26	30	33	22	9	1	9	2
Maize in Bags	67	22	25	9	15	42	18	50	32	16	37
Wheat in Bags	35	3	13	0	1	6	6	13	7	8	9
Agric. & Other Machinery	36	16	2	3	4	18	4	8	6	10	12
Other Cereals in Bags	17	6	0	0	6	4	5	8	22	2	19
Others	1,571	1,584	1,562	1,883	2,508	2,873	3,105	4,337	5,433	4,792	3,704
Total General Cargo	**3,791**	**3,797**	**4,263**	**5,074**	**5,425**	**6,172**	**6,513**	**7,322**	**8,057**	**8,646**	**9,113**
Motor Vehicle (1,000 cars)											
Wheat in Bulk	543	911	948	858	737	1,074	1,287	1,443	1,559	1,401	1,908
Clinker	164	430	520	1,080	1,013	1,135	1,428	1,368	2,268	2,228	2,065
Fertilizer in Bulk	363	385	337	280	236	388	366	380	336	603	360
Coal	177	137	167	176	174	162	236	346	291	296	436
Other Cereals in Bulk	13	107	204	135	257	103	30	58	104	156	184
Maize in Bulk	206	73	83	0	171	1,561	196	107	33	0	0
Others	122	84	85	193	304	218	284	105	220	229	278
Total Dry Bulk	**1,588**	**2,127**	**2,344**	**2,722**	**2,892**	**4,641**	**3,827**	**3,807**	**4,811**	**4,913**	**5,231**
P.O.L.	4,045	4,320	4,734	4,798	4,889	5,671	5,553	5,783	5,898	5,637	6,286
Other Liquid Bulk	551	598	669	676	552	760	833	824	767	900	906
Total Liquid Bulk	**4,596**	**4,918**	**5,403**	**5,474**	**5,441**	**6,431**	**6,386**	**6,607**	**6,665**	**6,537**	**7,192**
Grand Total	**9,975**	**10,842**	**12,010**	**13,270**	**13,758**	**17,244**	**16,726**	**17,736**	**19,533**	**20,096**	**21,536**

Source: KPA

Table 4.1.2 Cargo Traffic in Mombasa Port (Export)

(Unit: 1,000 ton)

Commodity/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tea	406	405	402	464	421	371	468	433	450	541	554
Soda Ash	185	217	200	309	549	121	391	444	372	423	336
Coffee	180	170	195	235	272	234	199	230	210	264	256
Maize	6	9	17	35	18	17	26	4	0	0	2
Fish & Crustacean	46	35	42	38	28	21	22	17	23	16	20
Tobacco & Cigarettes	32	30	43	42	34	33	38	37	33	28	27
Beans, Peas, Pulses	32	4	12	33	15	17	36	13	27	34	19
Iron & Steel	53	47	42	32	24	15	15	9	5	6	12
Cloths	22	25	22	24	23	18	18	19	21	23	30
Oil Seeds	8	16	27	22	32	59	20	16	15	28	39
Cotton	35	63	22	19	7	14	6	7	4	4	2
Hides & Skins	26	23	32	18	20	18	29	20	26	22	28
Sisal	17	20	22	14	5	5	0	0	0	0	2
Cement Bags	0	0	0	5	2	5	0	0	0	0	1
Casew Nuts	8	4	6	4	8	4	2	1	1	1	0
Rice	2	15	6	4	2	2	2	11	10	7	20
Tinned Fruits, Vegitables & Juices	18	19	18	0	58	43	83	90	71	93	99
Others	166	234	261	278	426	446	422	624	604	578	550
Total General Cargo	**1,242**	**1,336**	**1,369**	**1,576**	**1,944**	**1,443**	**1,777**	**1,975**	**1,872**	**2,068**	**1,998**
Titanium	0	0	0	0	0	0	0	0	0	0	363
Soda Ash in Bulk	92	116	112	77	74	56	0	15	0	0	0
Cement in Bulk	165	92	113	54	10	0	0	0	0	0	0
Flourspar	125	77	87	71	101	6	31	107	106	65	59
Other Dry Bulk	0	0	2	3	15	0	39	0	0	0	0
Total Dry Bulk	**382**	**285**	**314**	**205**	**200**	**62**	**70**	**122**	**106**	**65**	**422**
Bulk Oil	160	104	64	85	122	99	44	95	98	62	19
Bunkers	86	70	68	82	68	68	51	63	62	38	26
Total Liquid Bulk	**246**	**174**	**132**	**167**	**190**	**167**	**95**	**158**	**160**	**100**	**45**
Grand Total	**1,870**	**1,795**	**1,815**	**1,948**	**2,334**	**1,672**	**1,942**	**2,255**	**2,138**	**2,233**	**2,465**

Source: KPA

Table 4.1.3 Berth Performance Overview 2013

Berth No.	No. of Vessel Worked	Berth Hours	Port Hours	Berth Hours per Vessel	Vessel's Turnaround Time (days)	Berth Occupancy (%)	No. of Hours Worked	Ton Handled (Berth Throughput)	Ton/ Working Hour
MBK	9	1,209	1,282	134.4	5.9	13.8	1,126	283,984	252
1	160	5,145	11,174	32.2	2.9	58.7	4,429	673,267	152
2	3	95	220	31.8	3.1	1.1	72	1,027	14
3	69	5,866	9,333	85.0	5.6	67.0	5,295	1,551,456	293
4	88	6,763	14,185	76.9	6.7	77.2	5,352	416,593	78
5	89	6,635	14,141	74.5	6.6	75.7	6,152	1,064,433	173
7	61	7,087	8,285	116.2	5.7	80.9	6,499	834,529	128
8	54	4,592	8,142	85.0	6.3	52.4	3,464	70,103	20
9	56	5,744	7,804	102.6	5.8	65.6	4,830	907,566	188
10	65	6,545	8,743	100.7	5.6	74.7	5,974	1,602,983	268
11	107	6,611	10,363	61.8	4.0	75.5	5,779	635,310	110
12	97	6,502	8,932	67.0	3.8	74.2	5,182	120,129	23
13	97	6,502	8,932	67.0	3.8	74.2	5,182	120,129	23
14	78	4,850	5,687	62.2	3.0	55.4	4,427	91,104	21
16	90	6,962	9,481	77.4	4.4	79.5	6,519	113,027	17
17	111	7,785	10,638	70.1	4.0	88.9	7,346	122,651	17
18	126	8,048	11,160	63.9	3.7	91.9	7,453	153,314	21
19	2	91	127	45.4	2.6	1.0	80	1,996	25

Source: KPA

(2) Container Traffic Overview

The container traffic at Mombasa Port has also increased since year 2005 and reached 1,012,002 TEUs in 2014. Annual growth of container traffic in the last 9 years shows a remarkable rate of nearly 10%. The trend of import-dominated trade is also clearly noted. In 2014, about 70% of outgoing containers from the Mombasa Port was empty return. Out of total import containers, about 33% is transit containers.

Table 4.1.4 Container Traffic in Mombasa Port (Unit: 1,000 TEUs)

Container/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Import										
Full	193.2	217.9	277.8	292.3	301.5	338.8	385.9	441.1	441.0	482.1
Empty	14.6	11.6	4.2	5.1	6.4	6.5	6.8	3.7	8.4	6.6
Total	**207.8**	**229.5**	**282.0**	**297.4**	**307.9**	**345.3**	**392.6**	**444.8**	**449.4**	**488.7**
Export										
Full	94.1	86.3	101.3	102.9	95.8	110.3	115.3	120.7	129.5	130.8
Empty	107.5	132.2	165.5	181.0	205.6	225.4	242.9	325.9	298.8	331.7
Total	**201.6**	**218.6**	**266.9**	**283.9**	**301.5**	**335.7**	**358.2**	**446.6**	**428.3**	**462.5**
Transshipment										
Full	22.3	21.8	30.7	30.3	7.4	11.1	16.5	10.6	12.1	52.7
Empty	5.0	9.5	5.8	4.2	2.1	3.5	3.4	1.5	4.2	8.1
Total	**27.3**	**31.3**	**36.5**	**34.5**	**9.5**	**14.6**	**19.9**	**12.1**	**16.3**	**60.9**
Total										
Full	309.7	326.0	409.8	425.5	404.7	460.2	517.7	572.3	582.6	665.5
Empty	127.0	153.3	175.6	190.2	214.1	235.4	253.1	331.1	311.4	346.5
Grand Total	**436.7**	**479.4**	**585.4**	**615.7**	**618.8**	**695.6**	**770.8**	**903.5**	**894.0**	**1,012.0**

Source: KPA

(3) Transit Cargo

Transit cargo traffic has also shown steady growth since 2005. Average annual growth rate of total transit cargoes during 2005/2014 was more than 8%. Total volumes reached 7,199 thousand tons in 2014 from 3,534 thousand tons recorded in 2005. Traditionally, Uganda cargoes have comprised an overwhelmingly large share of transit traffic. In 2014, Uganda cargoes totaled 5,522 thousand tons which is 77% of the total transit cargo.

Table 4.1.5 Transit Cargo at Mombasa Port (including Containers)
(Unit: 1,000 tons)

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Uganda										
Import	2,433	2,572	3,100	3,374	3,687	3,942	4,028	4,499	4,508	5,132
Export	247	250	299	327	293	291	347	346	404	390
Total	**2,680**	**2,822**	**3,399**	**3,701**	**3,980**	**4,233**	**4,375**	**4,845**	**4,912**	**5,522**
Tanzania										
Import	246	246	227	236	231	168	151	168	180	173
Export	35	24	22	15	22	11	10	18	12	15
Total	**281**	**270**	**249**	**251**	**253**	**179**	**161**	**186**	**193**	**188**
Burundi										
Import	29	66	50	56	19	6	1	39	66	79
Export	0	1	2	1	1	1	1	0	1	0
Total	**29**	**67**	**52**	**57**	**20**	**7**	**2**	**39**	**67**	**79**
Rwanda										
Import	194	225	263	277	236	275	216	248	223	221
Export	24	28	24	17	15	13	10	13	17	15
Total	**218**	**253**	**287**	**294**	**251**	**288**	**226**	**261**	**240**	**236**
South Sudan										
Import	141	130	145	220	156	190	376	736	717	697
Export	6	8	0	3	12	33	41	30	59	65
Total	**147**	**138**	**145**	**223**	**168**	**223**	**417**	**766**	**775**	**761**
D. R. Congo										
Import	113	203	225	264	263	402	339	465	491	384
Export	21	24	32	40	26	28	16	17	20	24
Total	**134**	**227**	**257**	**304**	**289**	**430**	**355**	**482**	**512**	**408**
Somalia										
Import	43	30	33	43	16	5	29	16	7	5
Export	0	0	0	0	0	0	0	0	0	0
Total	**43**	**30**	**33**	**43**	**16**	**5**	**29**	**16**	**7**	**5**
Others										
Import	2	0	0	1	4	15	25	29	4	0
Export	0	0	1	0	0	1	5	0	0	0
Total	**2**	**0**	**1**	**1**	**4**	**16**	**30**	**29**	**4**	**0**
Transit Cargo										
Import	3,201	3,472	4,043	4,471	4,612	5,003	5,165	6,200	6,196	6,691
Export	333	335	380	403	369	378	430	424	513	508
G. Total	**3,534**	**3,807**	**4,423**	**4,874**	**4,981**	**5,381**	**5,595**	**6,624**	**6,709**	**7,199**

Source: KPA

(4) Transit Container

Transit container comprises about 33% (={164,977TEUx2}/{1,012,002TEU}) of total containers handled at Mombasa Port in 2014. Out of total transit containers, about 72% (={119,122TEUx2}/{164,977TEUx2}) is container to/from Uganda. Container export traffic from hinterland countries is minimal. Other hinterland countries who have container traffic are South Sudan, DR Congo, Tanzania and Rwanda. Container activities of other countries are minimal.

Table 4.1.6 Transit Full Containers through Mombasa Port
(Unit: TEUs)

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Uganda										
Import	42,827	50,698	70,188	80,054	81,212	87,474	103,199	107,997	109,050	119,122
Export	16,056	14,099	16,939	17,471	17,146	15,630	19,780	22,035	24,029	22,740
Total	**58,883**	**64,797**	**87,127**	**97,525**	**98,358**	**103,104**	**122,979**	**130,032**	**133,079**	**141,862**
Tanzania										
Import	8,379	7,933	9,829	10,134	10,064	7,953	7,694	7,666	7,267	7,604
Export	2,867	1,732	1,562	1,111	1,003	875	830	1,438	972	1,062
Total	**11,246**	**9,665**	**11,391**	**11,245**	**11,067**	**8,828**	**8,524**	**9,104**	**8,239**	**8,666**
Rwanda										
Import	2,584	3,430	4,462	4,234	4,708	4,844	5,441	5,495	4,361	5,601
Export	1,297	1,416	1,280	849	807	670	562	686	900	808
Total	**3,881**	**4,846**	**5,742**	**5,083**	**5,515**	**5,514**	**6,003**	**6,181**	**5,261**	**6,409**
D. R. Congo										
Import	5,276	5,884	6,389	6,789	6,952	8,738	9,770	12,321	14,729	9,495
Export	1,333	1,427	1,857	2,235	1,518	1,658	1,105	1,203	1,422	1,575
Total	**6,609**	**7,311**	**8,246**	**9,024**	**8,470**	**10,396**	**10,875**	**13,524**	**16,151**	**11,070**
South Sudan										
Import	2,467	4,021	5,578	6,189	6,402	8,695	15,205	27,499	25,981	22,186
Export	332	456	38	191	785	1,603	1,970	1,410	2,564	3,343
Total	**2,799**	**4,477**	**5,616**	**6,380**	**7,187**	**10,298**	**17,175**	**28,909**	**28,545**	**25,529**
Burundi										
Import	143	239	176	56	186	101	44	124	135	609
Export	26	68	159	75	55	53	33	15	9	9
Total	**169**	**307**	**335**	**131**	**241**	**154**	**77**	**139**	**144**	**618**
Somalia										
Import	1,113	1,467	753	1,900	833	401	749	422	463	340
Export	16	0	0	1	22	0	0	5	6	0
Total	**1,129**	**1,467**	**753**	**1,901**	**855**	**401**	**749**	**427**	**469**	**340**
Others										
Import	37	13	29	28	153	15	33	97	18	20
Export	18	14	55	41	3	0	0	1	2	6
Total	**55**	**27**	**84**	**69**	**156**	**15**	**33**	**98**	**20**	**26**
Transit Container										
Import	62,826	73,685	97,404	109,384	110,510	118,221	142,135	161,621	162,004	164,977
Export	21,945	19,212	21,890	21,974	21,339	20,489	24,280	26,793	29,904	29,543
G. Total	**84,771**	**92,897**	**119,294**	**131,358**	**131,849**	**138,710**	**166,415**	**188,414**	**191,908**	**194,520**

Source: KPA

4.1.3 Number of arriving and departing ships

The number of arriving ships in Mombasa Port was 1,832 nos. in 2014. The total number of arriving and departing ships is double, 3,664 nos. because the number of departing ships is the same with the number of arrival. The average port days per ship are 3.5 days. The above number includes other ships which are not related to cargo transportation. The breakdown of vessel calls in Mombasa Port is shown in Table 4.1.7.

Table 4.1.7 Vessel Calls at Mombasa Port in 2014

Unit: number of ships

Ship Type	Number of Ship	
	Cargo Ship	Other Ship
Container Ship	557	
General Cargo Ship	285	
RO/RO	49	
PCTV (Vehicle Carrier)	155	
Bulk Carrier	210	
Tanker	194	
Barge		26
Fishing		26
Passenger		5
Tug		71
Yacht		3
Naval		17
Others		234
Total	1,450	382

Source: Annual Review and Bulletin of Statistics 2014 by KPA

According to the above table, vessel calls for cargo ships are 1,450 in 2014, representing 79 % of the total vessel calls. A total of 382 'other' vessels called.

The number of arriving cargo ships at Mombasa Port in 2013 is shown in Table 4.1.8.

Table 4.1.8 Number of Arriving Cargo Ships at Mombasa Port in 2013

Unit: number of ships

Ship Size (GRT)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
0~9,999	27	21	24	24	34	26	23	30	22	23	38	29	321
10,000~29,999	55	50	49	57	50	52	56	61	44	64	50	48	636
30,000~49,999	21	18	21	20	23	19	24	31	29	31	26	29	292
50,000~70,000	14	13	15	15	16	15	17	14	13	13	14	19	178
Total	117	102	109	116	123	112	120	136	108	131	128	125	1,427

Source: Prepared by Study Team based on KPA's statistics data

According to data on vessels calling Mombasa Port in Table 4.1.8, vessel calls by month are stable, ranging from 102 and 136 ships. The majority of vessels (957 or nearly 70% of the total) are smaller than 30,000 GRT and 12% are larger than 50,000 GRT.

Table 4.1.9 shows the number of arriving cargo ships by ship type, ship size and month.

Table 4.1.9 Number of Arriving Cargo Ships by Ship Type and Ship Size in 2013

Ship Size in GRT	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Ratio %
(Container Ships)														
0~9,999	0	0	1	1	1	2	0	1	1	2	0	1	10	0.6
10,000~14,999	3	4	2	0	0	1	3	1	0	2	3	3	22	1.2
15,000~19,999	1	0	2	3	4	4	3	4	1	1	1	1	25	1.4
20,000~29,999	27	25	26	32	23	31	30	27	27	31	25	29	333	18.8
30,000~39,999	6	6	6	7	10	7	10	11	9	11	11	13	107	6.1
40,000~60,000	0	0	1	1	0	0	0	1	0	0	0	0	3	0.2
Total Number of Ships	37	35	38	44	38	45	46	45	38	47	40	47	500	28.3
Ratio (%)	7.4	7.0	7.6	8.8	7.6	9.0	9.2	9.0	7.6	9.4	8.0	9.4	100.0	
Maximum Ship Size (GRT)			**57,391**	40,438				48,148						
(General Cargo Ships)														
0~999	16	11	16	15	22	15	10	18	10	17	25	16	191	10.8
1,000~4,999	4	5	2	4	5	3	4	6	6	2	7	6	54	3.1
5,000~9,999	1	1	1	2	3	3	5	1	2	1	2	3	25	1.4
10,000~14,999	2	2	3	2	2	1	1	4	0	1	4	2	24	1.4
15,000~19,999	2	2	2	0	2	3	1	1	0	3	2	0	18	1.0
20,000~29,999	2	1	0	1	5	1	4	0	1	2	1	2	20	1.1
30,000~60,000	1	1	0	0	2	0	0	0	3	0	2	2	11	0.6
Total Number of Ships	28	23	24	24	41	26	25	30	22	26	43	31	343	19.4
Ratio (%)	8.2	6.7	7.0	7.0	12.0	7.6	7.3	8.7	6.4	7.6	12.5	9.0	100.0	
Maximum Ship Size (GRT)	32,839	31,877			50,772				32,661		31,753	**56,152**		
(RO/RO)														
0~9,999	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
10,000~29,999	0	1	0	0	0	0	0	1	0	0	0	0	2	0.1
30,000~49,999	1	0	2	1	0	2	0	1	1	1	0	1	10	0.6
50,000~60,000	2	2	3	1	3	2	3	3	3	2	2	4	30	1.7
Total Number of Ships	3	3	5	3	3	4	3	5	4	3	2	5	43	2.4
Ratio (%)	7.0	7.0	11.6	7.0	7.0	9.3	7.0	11.6	9.3	7.0	4.7	11.6	100.0	
Maximum Ship Size (GRT)	50,722	50,722	50,772	50,722	50,722	57,692	50,722	50,722	50,722	50,722	50,722	**59,022**		
(PCTV /Vehicle Carriers)														
0~9,999	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
10,000~39,999	2	1	0	0	1	0	0	1	0	1	0	0	6	0.3
40,000~49,999	1	4	3	2	1	2	1	1	4	3	3	5	30	1.7
50,000~59,999	6	6	7	8	3	6	7	7	8	9	8	7	82	4.6
60,000~70,000	1	1	0	2	6	3	4	3	1	1	2	3	27	1.5
Total Number of Ships	10	12	10	12	11	11	12	12	13	14	13	15	145	8.2
Ratio (%)	6.9	8.3	6.9	8.3	7.6	7.6	8.3	8.3	9.0	9.7	9.0	10.3	100.0	
Maximum Ship Size (GRT)	60,131	**72,408**		60,131	60,975	60,203	61,106	61,321	60,065	61,106	61,106	60,975		
(Bulk Carriers)														
0~9,999	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
10,000~14,999	0	1	1	0	0	1	1	0	0	1	0	1	6	0.3
15,000~19,999	6	4	3	3	3	2	5	4	4	5	3	1	43	2.4
20,000~29,999	5	4	6	7	5	4	4	11	5	13	3	3	70	4.0
30,000~39,999	7	4	7	7	7	5	10	10	6	7	6	5	81	4.6
40,000~60,000	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
Total Number of Ships	18	14	17	17	15	13	20	25	15	26	12	10	202	11.4
Ratio (%)	8.9	6.9	8.4	8.4	7.4	6.4	9.9	12.4	7.4	12.9	5.9	5.0	100.0	
Maximum Ship Size (GRT)						**52,987**								
(Tanker)														
0~9,999	6	3	4	1	3	3	4	4	3	1	4	3	39	2.2
10,000~29,999	6	5	4	9	5	4	4	8	6	5	8	6	70	4.0
30,000~49,999	4	3	3	2	4	3	3	6	6	8	4	4	50	2.8
50,000~70,000	5	4	4	4	3	3	3	1	1	1	2	4	35	2.0
Total Number of Ships	21	15	15	16	15	13	14	19	16	15	18	17	194	11.0
Ratio (%)	10.8	7.7	7.7	8.2	7.7	6.7	7.2	9.8	8.2	7.7	9.3	8.8	100.0	
Maximum Ship Size (GRT)	**63,058**	61,724	62,216	61,764	63,058	61,724	61,630		62,859		61,724	62,856		
(Other Ships)														
Barge, Fishing, Tug, Naval etc	43	29	30	32	32	32	31	32	21	9	27	23	341	19.3
Grand Total of Ships	160	131	139	148	155	144	151	168	129	140	155	148	1,768	100.0
Seasonal Ratio %	9.0	7.4	7.9	8.4	8.8	8.1	8.5	9.5	7.3	7.9	8.8	8.4	100.0	

Source: Prepared by Study Team based on KPA's statistics data

According to the above table, the number of arriving container ships (500) accounted 28.3 % of the total number of arriving ships. General cargo ships and bulk carriers were the next most frequent callers, accounting 19.4 % and 11.4 % respectively.

Following observations can be made based on the above table;

- Largest container ship is the "Delphinus Leader" at 57,391 GRT, followed by "Atlanta (48,148 GRT)" and "Hammonia Pacificum (40,438 GRT)". According to information from "Marine Traffic" on the web site, "Delphinus Leader" is registered as a vehicle carrier and its dead weight tonnage is 21,514 DWT and "Hammonia Pacificum" is

26,435 GRT, not 40,438 GRT. Further the registered "Atlanta" is OOCL "ATLANTA" container ship with 89,097 GRT. "Atlanta" might be a RO/RO vessel because her berthing location is Berth No.1. As a result, it is assumed that a container ship larger than 40,000 GRT did not call at Mombasa Port in 2013.

- Largest general cargo ship is "Usher Sagar" registered in India at 56,152 GRT, but there is no information in "Marine Traffic" on the web site. The "Jolly Quarzo" is a larger ship at 50,722 GRT. She is registered as a vehicle carrier on "Marine Traffic". Two other ships, namely "Filia Glory (32,839 GRT)" and "Wikanda Naree (32,661 GRT)", are registered as a bulk carrier on "Marine Traffic". This means that some bulk carriers having larger dead weight tonnage are categorized as general cargo ship in KPA's statistic data. However, it is difficult to identify ships as bulk or general cargo because the majority of bulk ships are equipped with ship gears. Furthermore, container ships with ship gears are originally general cargo ships into which container cargoes can be loaded as cargoes for developing countries.

In consideration of the above findings, the maximum sizes of arriving ships by cargo type in 2013 are categorized in Table 4.1.10.

Table 4.1.10 Maximum Ships of Arrival by Cargo Type in 2013

Ship type	Name	Dead Weight Tonnage	Remark
Container Ship	MSC America	45,668 DWT	Loaded container: about 2,700 TEU
General Cargo/Bulk Ship	Filia Glory	58,000 DWT	Loaded tonnage: about 50,000 t/
PCTV	B Ladybug	72,408 GRT	Vehicle Carrier
Tanker	FS Endeavor	109,994 DWT	Loaded tonnage: about 100,000 t

Source: Prepared by Study Team based on KPA's statistics data

For reference typical vessels calling in August and September, 2014 are shown in Table 4.1.11 and Table 4.1.12.

Table 4.1.11 Typical Container Ships Calling in 2014

Calling Date	Vessel Name	DWT	LOA (m)	TEU handled
09/Sep/2014	HANSA AMERICA	47,068	240	3,100
29/Aug/2014	MARTHA SCHULTE	46,925	240	3,100
29/Aug/2014	CALANDRA	41,411	213	1,535

Source: KPA's statistic data

Table 4.1.12 Typical Conventional Ships Calling in 2014

Calling Date	Vessel Name	LOA (m)	Draft (m)	Cargo handled (ton)
07/Sep/2014	JS SANAGA	200	11.5	49,500
31/Aug/2014	ELEOUSSA	190	9.5	43,100
30/Aug/2014	DIAMOND SEA	190	9.5	41,380

Source: KPA's statistic data

Table 4.1.13 shows the number of ships worked in Mombasa Port from 2009 to 2014. According to the table, it is clear that the number of ships calling Mombasa Port shows a tendency to increase in the last 5 years although there are some discrepancies between the number of ships worked and number of cargo ships called shown in Table 4.1.7.

Table 4.1.13 Number of Ships Worked in Mombasa Port

Unit: number of ships

Year	2010	2011	2012	2013	2014
Ship worked	1,133	1,169	1,193	1,332	1,378

Source: Annual Review and Bulletin of Statistics 2014 by KPA

4.1.4 Present conditions of port facilities

(1) Introduction

The Port of Mombasa includes Kilindini Harbor, Port Reitz, the Old port (Mombasa Harbor) and Port Tudor. The main port, Kilindini Harbour and Port Reitz denoted as the Port of Mombasa, lies on the west coast of Mombasa Island and at the mainland at Kipevu. Port Tudor and the Old Port are at the east coast of Mombasa Island and are used by smaller vessels such as dhows and coasters.

The first concrete wharf structures for Berths 1 and 2 at the Port of Mombasa were built between 1926 and 1927 during the British administration. Over the years up to 2013 the Port of Mombasa had been steadily developed with the construction of additional berthing structures.

The Port of Mombasa is located within a creek, on the west of Mombasa Island and on the mainland at Kipevu. The geographic position of the port is approximately 4' 00' S and 39" 40' E. A map of the region is shown in Figure 4.1.3.

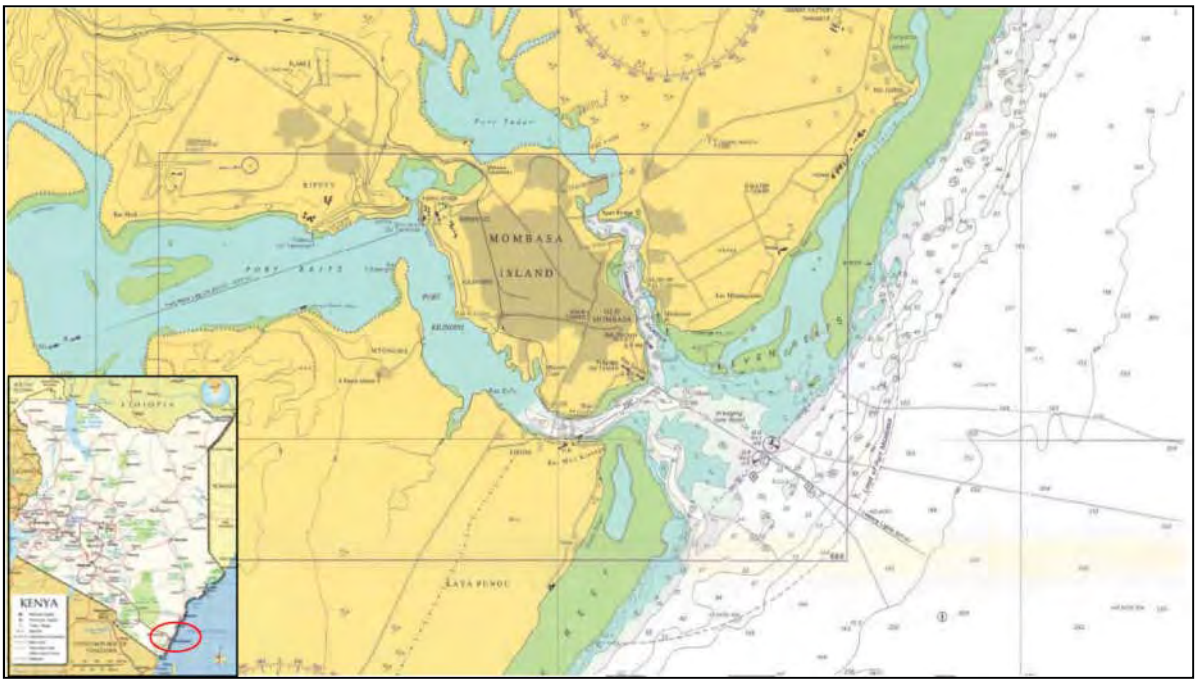


Figure 4.1.3 Location Map of Mombasa Port
Source: Admiralty Chart 616

(2) Nautical Access

a) Channel

The Entrance Channel into Kilindini is 305 m wide and was dredged to 13.7 m CD in 1982. Access to the Port of Mombasa can be gained through an approximately 12 km long buoyed access channel direct from the open sea.

Due to the restrictions imposed by the S bends and the charted depth of the channel, the maximum allowable length of vessels that can enter the Port at present was 259 m long, with a draft of 13.25 m and carrying 80,000 tons of crude/product. The pilots board the vessels about 2-3 miles out and at the time of boarding the ships need to be making about 7 to 10 knots. There is a northerly set which runs throughout the year, and it becomes strong with the onset of the south-west monsoon. If vessels go too slowly they will be pushed too far north in the channel. Having negotiated the bend, vessels have to slow down for the Likoni ferries, which run constantly across the channel.

Under such circumstances, KPA decided to dredge the entrance channel and the channel within the port to a depth of -15.0 m CD for the development of the Second Container Terminal in Port Reitz. Then, capital and maintenance dredging was carried out and completed between April 2011 and April 2012. Dredging was completed before commencement of construction works of Phase 1 of the Second Container Terminal. Figure 2.4.2 shows the areas where maintenance and capital dredging was carried out. The dredging was carried out up to the Phase 3 development area of the Second Container Terminal. The turning basin in front of Berth 21 (under construction) was secured with a diameter of 500 m. A trailing suction hopper dredger, a backhoe dredger and a cutter suction pump dredger were deployed for dredging works. Most dredged material was disposed of at the designated areas while some was utilized for reclamation fill. Prior to the dredging works the maximum allowable length of vessel entering the port was restricted to 259 m. Currently there are no defined LOA restrictions, however, the Port has previously handled a 293.5 m vessel.

Simulations were carried out in Japan to determine the maximum size of containerships that can safely navigate the bends, assuming there is sufficient water depths. The maximum was found to be a 4,500 TEU capacity vessel 294 m long, but in strong winds it was difficult in the simulation runs to maintain the vessel's track within the channel. At its narrowest point the channel is less than 300 m wide. The conclusion from the simulation was that this size of vessel could only be brought in at slack water (2 hours before high water of at low water) and with wind speeds less than 15 m/sec.

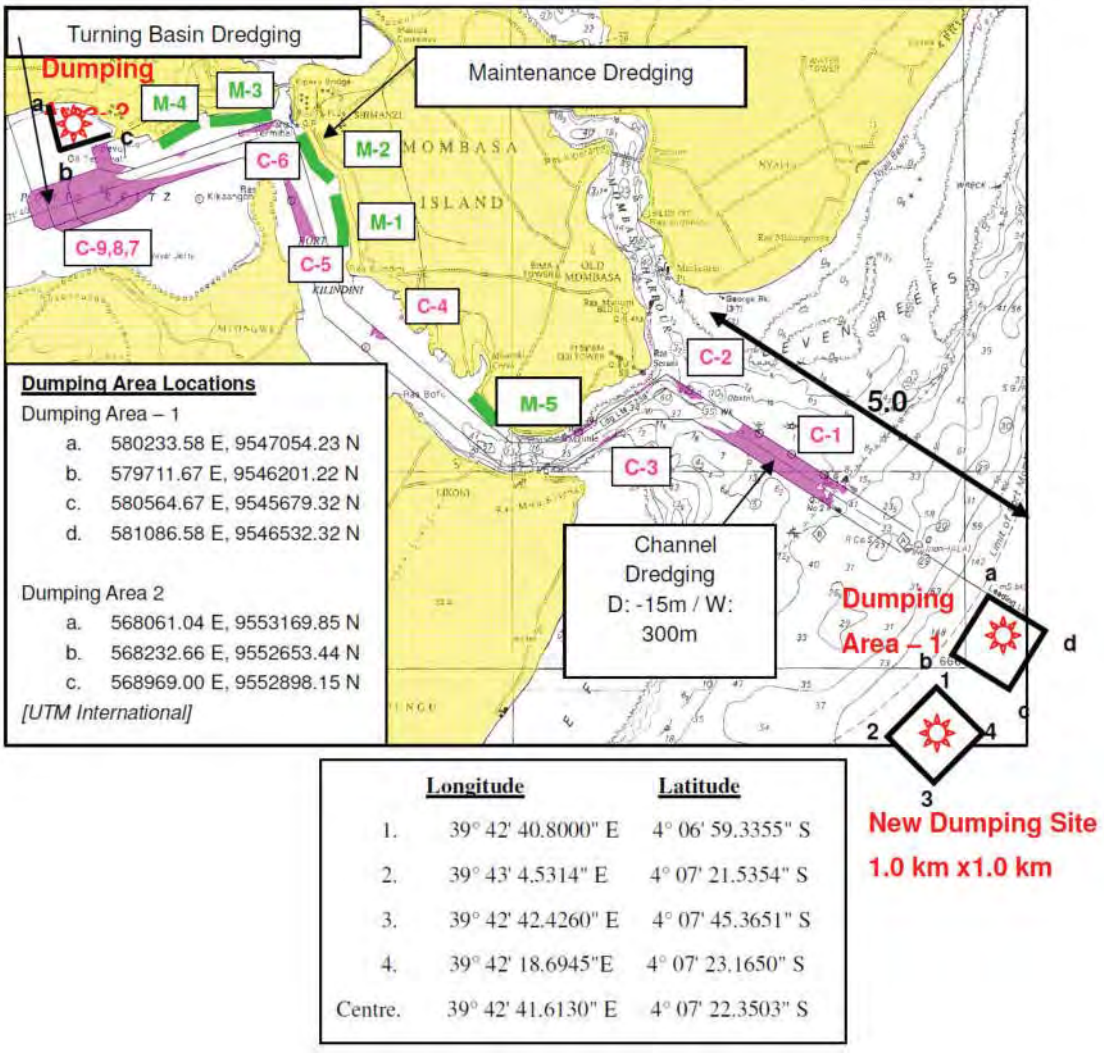


Figure 4.1.4 Dredging Area Locations
Source: Completion Report of Dredging and Hydrographic Works at the Port of Mombasa May 2012

b) Anchorage

The Port of Mombasa has two anchorages with nine mooring buoys. There are four mooring buoys in Port Reitz, southwest of Kipevu Oil Terminal (KOT), K 1 to K4. These buoys are used by smaller vessels and tankers with chemicals, LPG or white products. The other 5 buoys, M1 to M5, a relocated in Port Kilindini west of the channel line. Table 4.1.14 summarizes the capacity of the anchorages.

Table 4.1.14 Anchorages for Mombasa Port

Buoy	Maximum length LOA (m)	Available depth below CD (m)
K1	176.6	7.00
K2	213.3	7.00
K3	240.0	7.92
K4	167.6	9.14
M1	304.7	13.41
M2	182.0	13.41
M3	228.5	13.41
M4	213.3	13.41
M5	350.0	9.45

Source: KPA

(3) Berths

a) Mbaraki Wharf

Mbaraki Wharf, built in 1970, comprises two berths with a total length of 306 m and with a water depth alongside of -10.5 m CD, it handles dry bulk and liquid bulk cargo. The berths are connected to land by five access bridges and equipped with manifolds for the import and export of bulk liquids. Bulk cement is handled by a pneumatic loading system and is stored in three silos directly behind the berths. All the other materials are discharged using ships' grabs into hoppers which load trucks of 7-ton payload capacity due to the tight curves between the wharf and the access bridges. The bridges and wharf structure is supported by 508 mm vertical and raked tubular steel piles. The wharf superstructure is made of precast concrete units connected by in-situ concrete fill and completed by an in-situ concrete deck. Railway transport for bulk molasses used to be operational, however, the railway became dilapidated and is no longer in use. A layout plan of Mbaraki Wharf is presented in Figure 4.1.5.

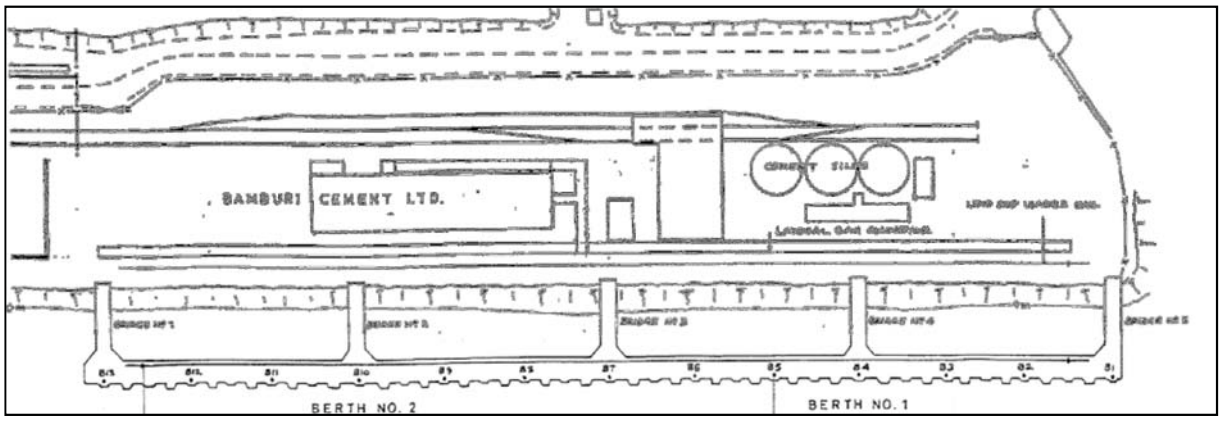


Figure 4.1.5 General Layout Plan of Mbaraki Wharf
Source: Berth Rehabilitation Study Report May 2014

Coal is unloaded | Silo | Pneumatic Unloader

Figure 4.1.6 Mbaraki Wharf
Source: JICA Team

Generally, Mbaraki Wharf is in a critical condition. In particular the corroded bottom reinforcement with cracks on the concrete significantly reduces the load bearing capacity of the structure. Urgent repairs need to be carried out with a high priority.

b) Berths 1 to 5

Berths 1 to 5 were constructed between 1921 and 1929. The total length of Berths 1 to 5 is 875 m and a width of the apron is 17.5 m. The designed depth is 10.5 m below CD. The crown height of the apron is 5.48 m above CD. The quay wall of Berths 1 to 5 comprises a gravity wall, consisting of precast concrete blocks installed on a mass concrete foundation with their outer faces resembling masonry as shown in Figure 4.1.7. The apron behind the coping is about 17.5 m wide and consists of a pavement comprising a 0.23 cm thick concrete deck slab installed onto stone (boulder) layer with a thickness of 0.34 m. Crane rail tracks founded on waybeams, oil pipes, water mains, water hydrants, drainage pipes dewatering into the harbor basin and telephone conduits were laid at variable depths beneath the pavement.

The gravity wall at Berths 1 to 5 in general is in a poor condition. The main damages include broken quay beam, cracks in the concrete block wall, missing or deformed and corroded life ladders, and corroded bollards.

It is known that fixed timber fenders were replaced by floating fenders which were in use until 1995, when the latter were replaced by large tire fenders, which are still in use. However, it is assumed that the tires were not specifically designed to resists loads of berthing vessels and therefore these should be replaced by new fenders.

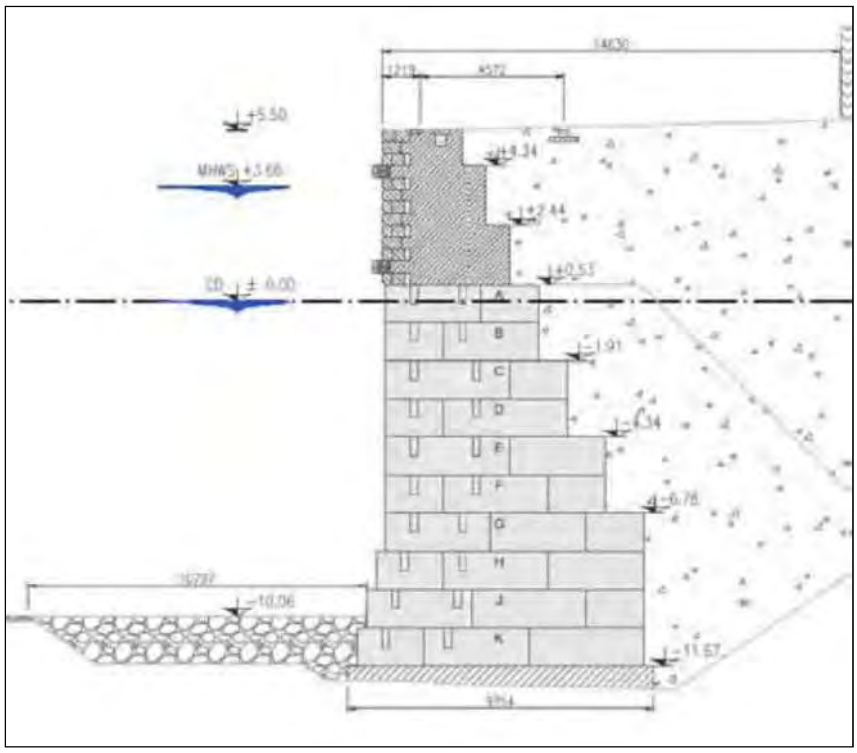


Figure 4.1.7 Typical Cross Section for Berths 1 to 5
Source: Berth Rehabilitation Study Report May 2014

Berth 1 and Berths 2 are mainly used for Ro/Ro and container cargo and occasionally used for passenger cruise ships. The Ro/Ro container operation is carried out by Messina Line at Berth 1 and the Messina Line containers are stacked in the designated area between the wharf transit sheds and those at the back of the port area adjacent to the port road.

Messina's containers stacked behind the warehouse

Pure car carrier is berthing for discharging vehicles

Figure 4.1.8 Berth 1 and Behind Storage Area
Source: JICA Team

Berth 3 is a dedicated berth for handling of dry bulk cargo (mainly sorghum and wheat) and is

equipped with two 300 tons per hour dry bulk pneumatic unloaders and conveyor belt systems up to the silos on the hill behind the port boundary operated by Grain Bulk Handlers Ltd. (GBHL).

Berth 3 (for GBHL)

Unloader

Figure 4.1.9 Berth 3 and Unloader
Source: JICA Team

Berth 4 is a general cargo berth and used for handling of Ro/Ro cargo, containers and steel products. Berth 5 is mainly used for containers but also for general and Ro/Ro cargo to a minor degree.

Berth 4

Berth 5

Figure 4.1.10 Berths 4 and 5
Source: JICA Team

Berth 6 does not exist and there is a drainage outfall between Berth 5 and 7. The land behind is used for stacking containers and imported rolled steel sections.

c) Berth 7 and Berth 8

Berths 7 and 8 were constructed between 1943 and 1944, providing a 379 m long quay and a 20 m wide apron and they are currently used for handling general cargo.

The berths consist of reinforced concrete decks with flat soffits and longitudinal and lateral beams which were originally designed to carry railway and crane loads as shown in Figure 4.1.11. The voids above the decks are either used as cable ducts and covered with steel covers or are filled with gravel and stones below a reinforced concrete slab. The designed water depth is 10.0 m CD and the coping level is at +5.48 m CD. Originally, the berths were fitted with timber fenders which were replaced by hyper cell fenders (manufacturer: Bridgestone) in 2006.

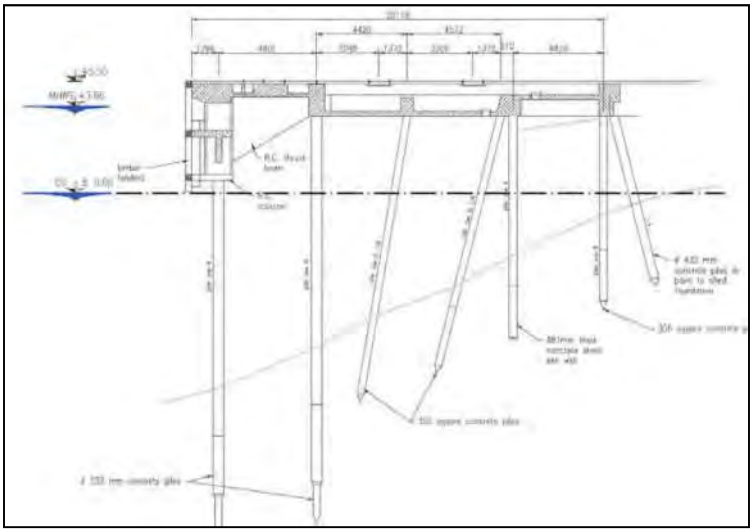


Figure 4.1.11 Typical Cross Section for Berths 7 and 8
Source: Berth Rehabilitation Study Report May 2014

Unloaded bulk fertilizer to be packed at Berth 8

Packed fertilizer to be transported by trucks

Figure 4.1.12 Berth 8
Source: JICA Team

d) Berth 9 and Berth 10

Berths 9 and 10 were constructed between 1957 and 1958, providing a 384 m long quay over a slope supported on concrete crew piles as shown in Figure 2.4.10. The designed water depth is 10.06 m CD and the deck level is at +5.48 m CD. The width between the cope line and the adjacent transit shed is 18 m. The deck itself is however wider and reaches a maximum width of 64 m. The deck structure consists of precast reinforced longitudinal and transversal concrete beams and reinforced concrete slab. The construction commenced in 1956 at the southern tip of Berth 9 proceeding northward. In early 1957 a ground failure at Berth 10 occurred resulting in a major review of the design and construction. The coping line of Berth 10 was subsequently realigned so that both berths form a straight line. It was also concluded to use bored, cased or cast in-situ concrete piles instead of screw piles. Precast, pre-stressed lateral concrete beams and heavy precast longitudinal beams were placed onto the caps of the piles to form the deck of Berth 10 as shown in Figure 4.1.14. Berth 9 and 10 are fitted with the same fender as Berths 7 and 8.

Berths 9 and 10 are mainly used for handling of dry bulk cargo (clinker, fertilizer, soda), Ro/Ro cargo and steel products. At Berth 9 Magadi Soda Ltd. exports soda which is transported by conveyor belts from the Magadi depot to the Shed 9/10, where the soda is bagged. Complementary large amounts of the soda are exported as containerized cargo. At Berth 9 there is one portal crane (manufacturer: Canron) with a lifting capacity of 5t.

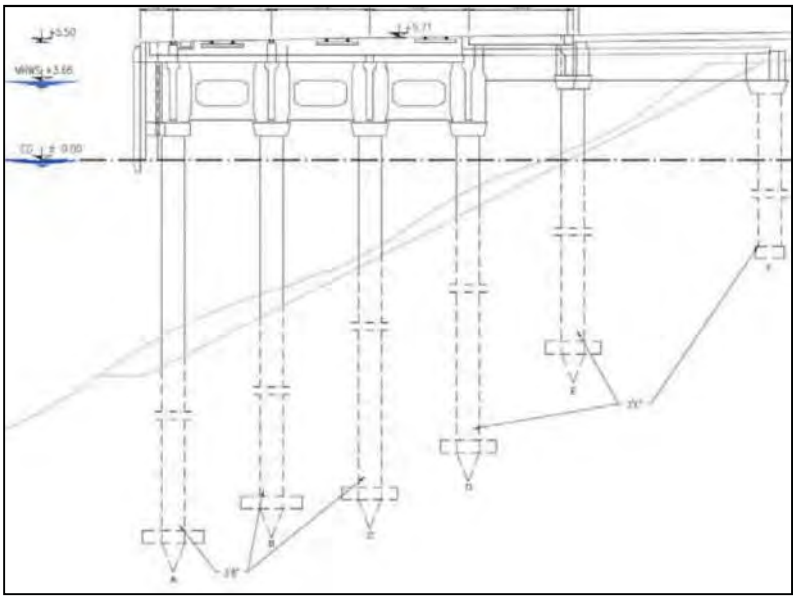


Figure 4.1.13 Cross section through Berths 9 and 10 (original design)
Source: Berth Rehabilitation Study Report May 2014

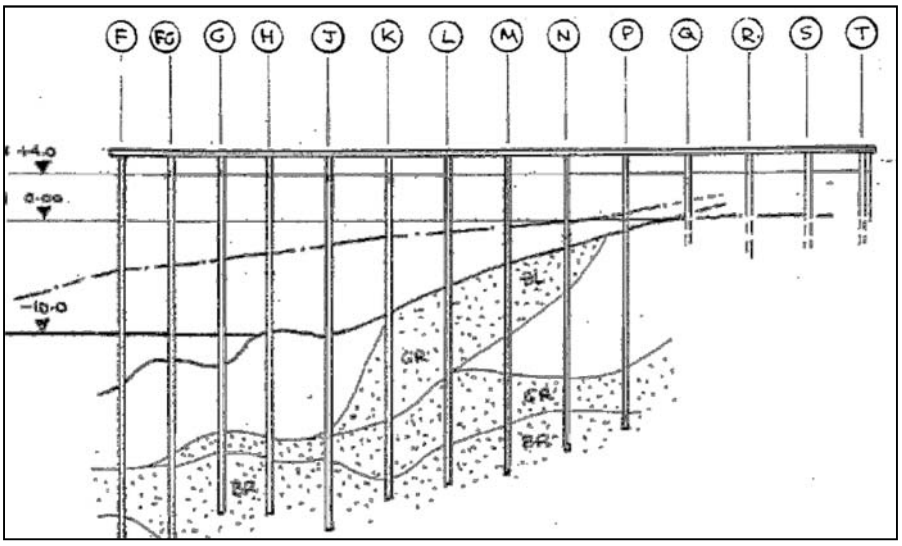


Figure 4.1.14 Cross Section through Berth 10 (as-built)
Source: Berth Rehabilitation Study Report May 2014

Berth 9

Belt Conveyor for Soda Ash

Figure 4.1.15 Berth 9
Source: JICA Team

e) Berths 11 - 14

Berths 11-14 were constructed between 1956 and 1959. The fender system and coping was renewed in 1990. The berths have a total quay length of 723 m. There are slight curvatures on the face line between Berths 11 and 12 and again between Berths 13 and 14. Designed water depth is 10.5 m CD. The deck level is at +5.48 m CD.

Berths 11 to 14 were constructed as open berths with a concrete deck slab with upstand and downstand beams supported on reinforced concrete driven piles as shown in Figure 4.1.16. The final depths of the piles ranges from about –15m CD at the most seaward row to about -9m CD at the most landward row. Due to encountered poor ground conditions the berth structure was widened at the boundary between Berth 13 and 14 and at the western tip of Berth 14 to accommodate the railway track connections. The void between the main reinforced concrete deck slab and the upper concrete slab has been filled with stone material.

Berth 11 and Berth 12 are used for general cargoes, dry bulk and containers and Ro/Ro. All cargoes are handled by ships' gear. The transit shed has been demolished and replaced by concrete paving in order to secure open storage area for container stacking.

Meanwhile, Berths 13 and 14 are used almost entirely for containers, which are loaded and discharged using ship's gear as there are no crane beams and rails for ship to shore gantry cranes.

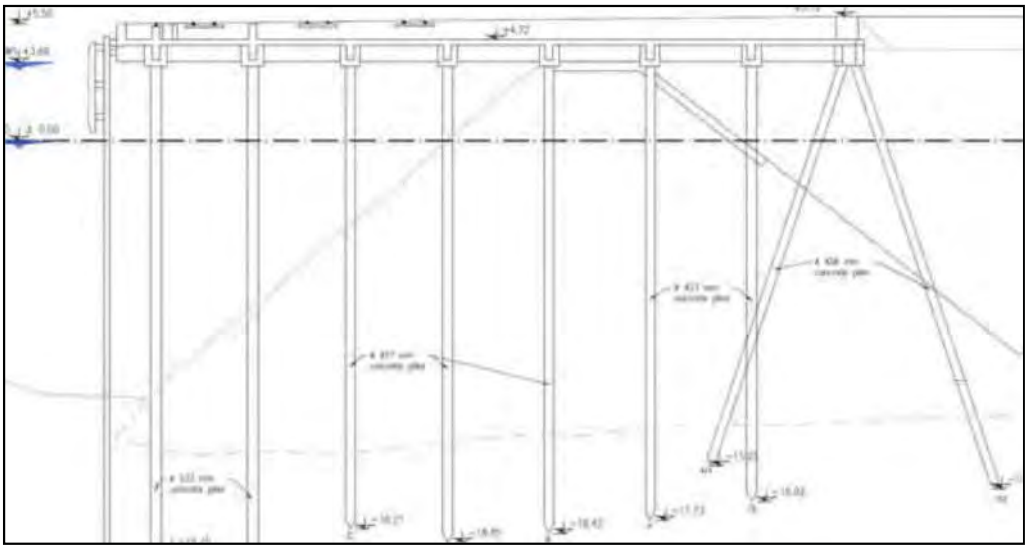
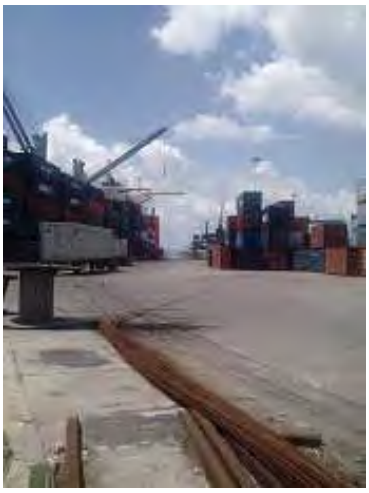


Figure 4.1.16 Typical Cross Section through Berths 11 to 14
Source: Berth Rehabilitation Study Report May 2014



No ship-to-shore gantry cranes are equipped at berth

Overview of Berths 11-14

Figure 4.1.17 Berth 9
Source: JICA Team

Berth 15 has not been built and consists of a small bay with revetment and has a length of about 165 m. the revetment is interrupted by a drainage outlet.

f) Berths 16 - 17

Berths 16 and 17 were built between 1971 and 1975. They have a total quay length of 361 m and 20 m wide deck. The designed water depth is 12.5 m CD with provision for deepening to 12.2m CD. The deck level is +5.486m CD. The deck was constructed with a reinforced concrete slab with a thickness of approximately 0.5 m. Above the deck there is approx. 1.0 m of crushed stones with an approx. 0.2 m thick concrete slab on top as shown in Figure 4.1.18. Three longitudinal reinforced concrete beams were placed on top of the bottom deck above the supporting tubular steel piles. Original fender system comprised steel pile groups with hardwood timber panels.

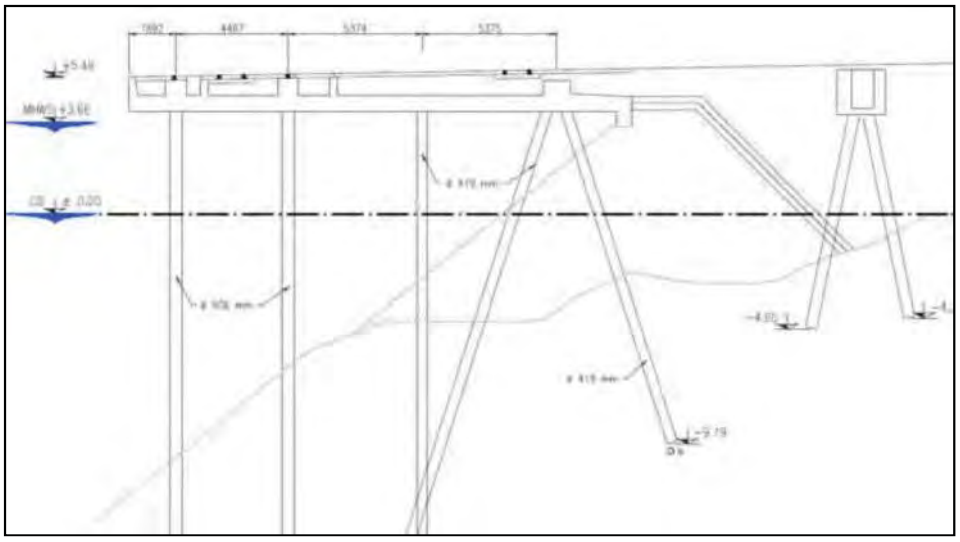


Figure 4.1.18 Cross Section through Berths 16 and 17
Source: Berth Rehabilitation Study Report May 2014

From 1998 to 1999 Berth 16 and 17 were rehabilitated in which a new top reinforced concrete slab with a thickness of approx. 0.3 m was installed and the coping beams were rehabilitated as shown in Figure 4.1.19. The bottom reinforced deck slab was kept in place and was used a as working platform. Fender system was also renewed by replacement of timber panels.

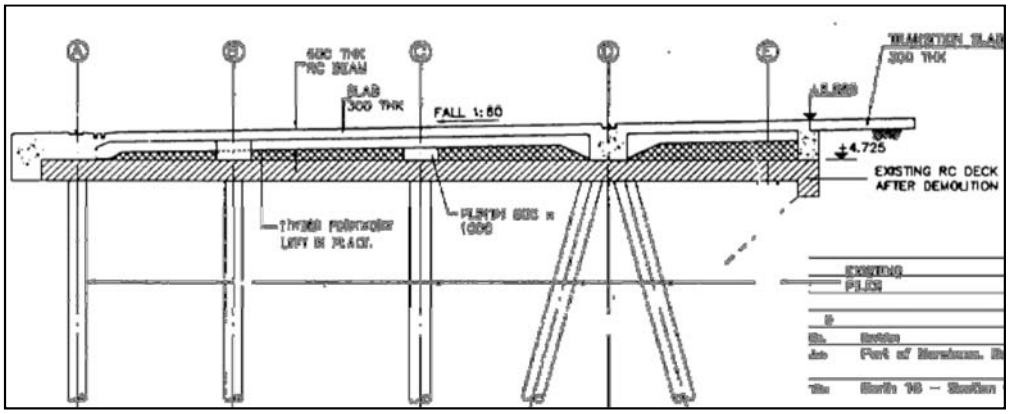


Figure 4.1.19 Superstructure (after rehabilitation) through Berths 16 and 17
Source: Berth Rehabilitation Study Report May 2014

Seven ship-to-shore gantry cranes and 19 rubber tired gantry cranes are being operated for Berths 16 to 19.

g) Berth 18

Berth 18 was constructed in 1977 and has a straight line continuation of Berths 16 and 17 with a length of 239 m. The berthing structure is similar to Berths 16/17 and consists of a reinforced concrete deck slab with a thickness of approx. 0.5 m and 1.0 m of rock fill and a top concrete slab of approx. 0.2 m as shown in Figure 4.1.20 Three longitudinal reinforced concrete beams are located on top of the supporting concrete piles. The fenders were renewed during reconstruction of berths 16 and 17 in 1996

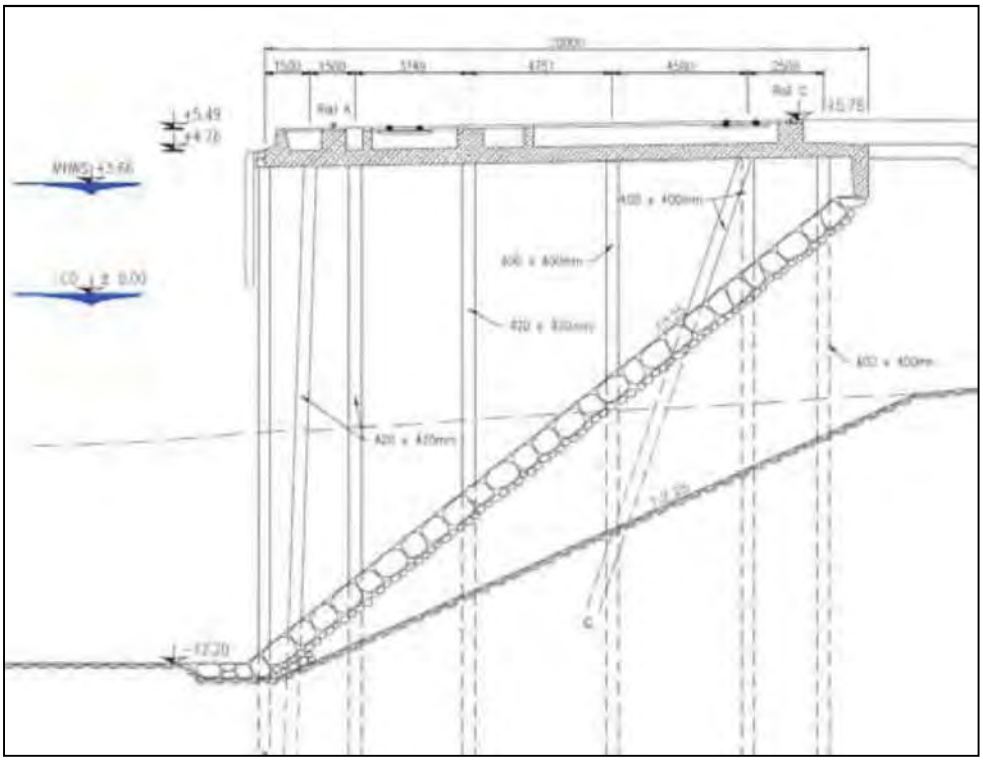


Figure 4.1.20 Cross Section of Berth 18
Source: Berth Rehabilitation Study Report May 2014

h) Berths 19

Berth 19 was constructed in 2013 and has a straight line continuation of Berths 16, 17 and 18 with a length of 240 m including the extended portion. The typical cross section for Berth 19 is presented in Figure 4.1.21. The structure consists of a reinforced concrete deck slab with a thickness of approx. 0.5 m.

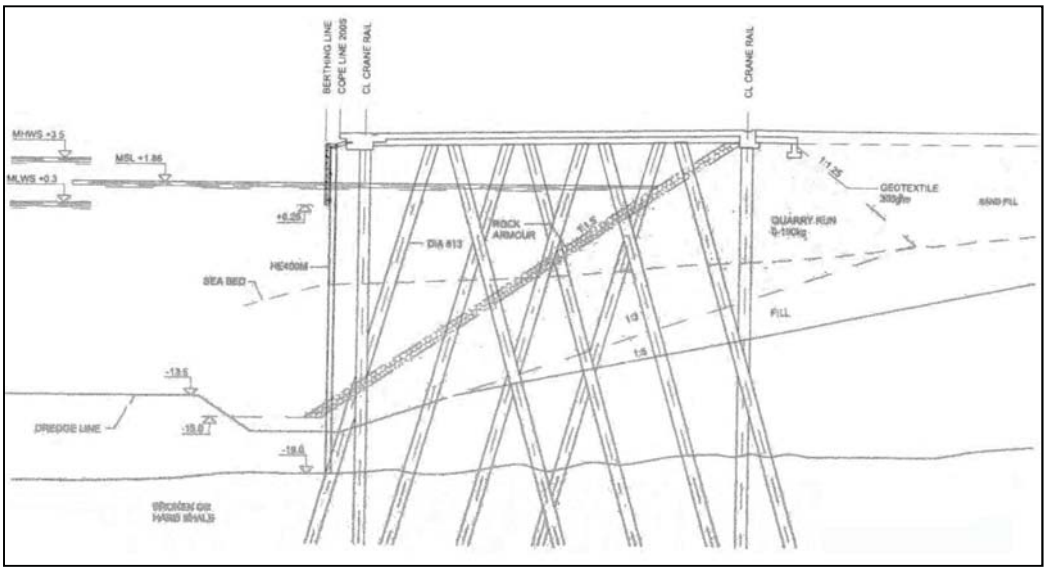


Figure 4.1.21 Cross Section of Berth 19
Source: As Build Drawings for Berth 19 Construction (Provided by KPA)

Berth 19 and Ship-to-shore Gantry Cranes

End of Berth 19

Figure 4.1.22 Berth 19
Source: JICA Team

i) Kipevu Oil Terminal

Kipevu Oil Terminal (KOT) was constructed in 1963. The jetty was rehabilitated in 1990 when the berthing dolphins were constructed. Concrete repairs were carried out in the late 90's. KOT is used for the import of crude oil and refined oil products and was originally designed to accommodate vessels up to 85,000 DWT. However, based on latest port regulations, the maximum ship size to be served at KOT is 110,000 DWT. Designed water depth is 13.41 m CD. The oil jetty has a length of approx. 300 m and comprises a rubble causeway of 192 m length and 100 m steel pile viaduct and jetty head (15 m x 40 m). The jetty contains a 3.3 m road and pipeline trace. At the western end there are two breasting dolphins and at the eastern end of the jetty there is one breasting dolphin. Three mooring dolphins are situated separately to west of the jetty and one mooring dolphin is situated to the east. It is known that new fire protection facilities (sprinkler, hydrants, water pumps, foam and water mains, etc.) were installed in 1987/88 at KOT.

Product Tanker mooring at KOT

Figure 4.1.23 Kipebu Oil Terminal (KOT)
Source: JICA Team

j) Shimanzi Oil Terminal

Shimanzi Oil Jetty was built in 1931. The jetty was rehabilitated in 1990. Concrete repairs were also carried out in the late 1990's. Firefighting facilities were installed in 1987/88. Shimanzi Oil Terminal (SOT) is used for importation of a range of bulk liquid products and partly for export of refined products. The designed water depth is 9.76 m CD. The SOT jetty consists of an access trestle (length approx. 45 m) supported on concrete piles as shown in Figure 4.1.24, a pile head and three breasting dolphins each fitted with floating pneumatic fenders. The breasting dolphins have a base of steel sheet pile and a reinforced concrete capping beam. The fender system comprises 3 unit pneumatic floating fenders and fender pile group.

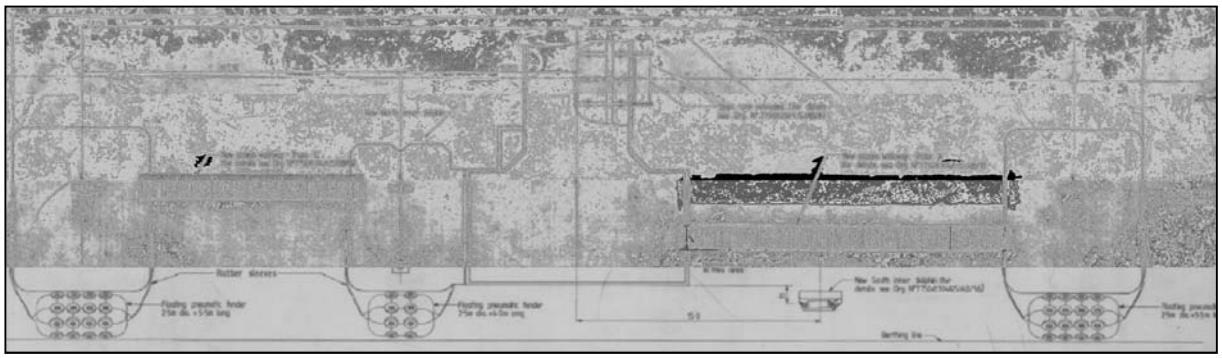


Figure 4.1.24 Layout of Shimanzi Oil Jetty
Source: Berth Rehabilitation Study Report May 2014

k) Northern Lighter Quay

There are two lighter quays (north and south), however neither is presently in use due to their deteriorated condition. The Northern Lighter Quay has partly collapsed and is in its current condition unsafe for usage. The first pier at the area of the Northern Lighter Quay was originally constructed with timber at the beginning of the 20th Century. Later (probably around 1908 – 1910) the pier

structure was replaced by a gravity wall with a length of approx. 170 m (see Figure 4.1.25).

As shown in Figure 4.1.25, the Northern Lighter Quay was fitted with railway tracks for the usage of rail mounted portal cranes in 1988. Due to the critical condition of the quay in 1988 the Northern Lighter Quay became out of service. Due to its current condition it is presumed that the Northern Lighter Quay has not rehabilitated been since then.

Figure 4.1.25 Cross section through the Northern Lighter Quay
Source: Berth Rehabilitation Study Report May 2014

l) Southern Lighter Quay

The Southern Lighter Quay comprises eight stubhead jetties at a distance of 30 m along a coastal revetment. The first jetties were constructed between 1952 and 1954 and comprised steel sheet pile boxes strutted laterally and longitudinally and topped with reinforced concrete beams and a deck slab as shown in Figure 4.1.26. In 1981/82 six of the stubhead jetties were demolished and replaced by new jetties founded on tubular steel piles as shown in Figure 4.1.27. The shoreline behind the jetties is protected by a revetment comprising armor rocks with a diameter up to 30 – 40 cm and a concrete head on top.

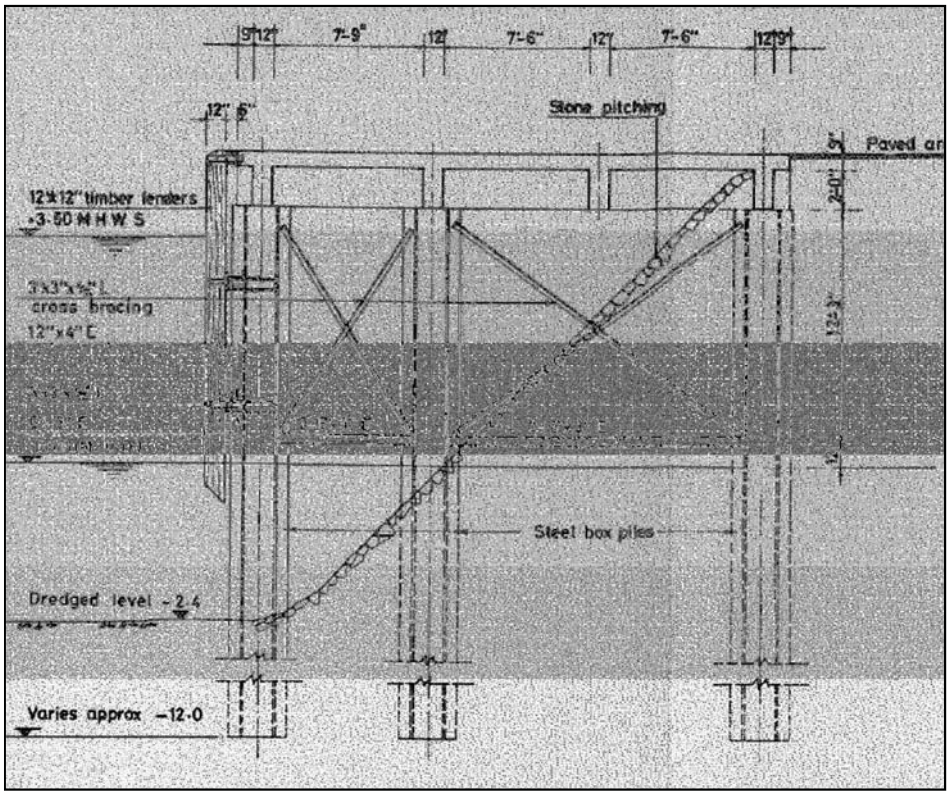


Figure 4.1.26 Cross Section through Jetty at Southern Lighter Quay (Construction Period 1952 – 1954)

Source: Berth Rehabilitation Study Report May 2014

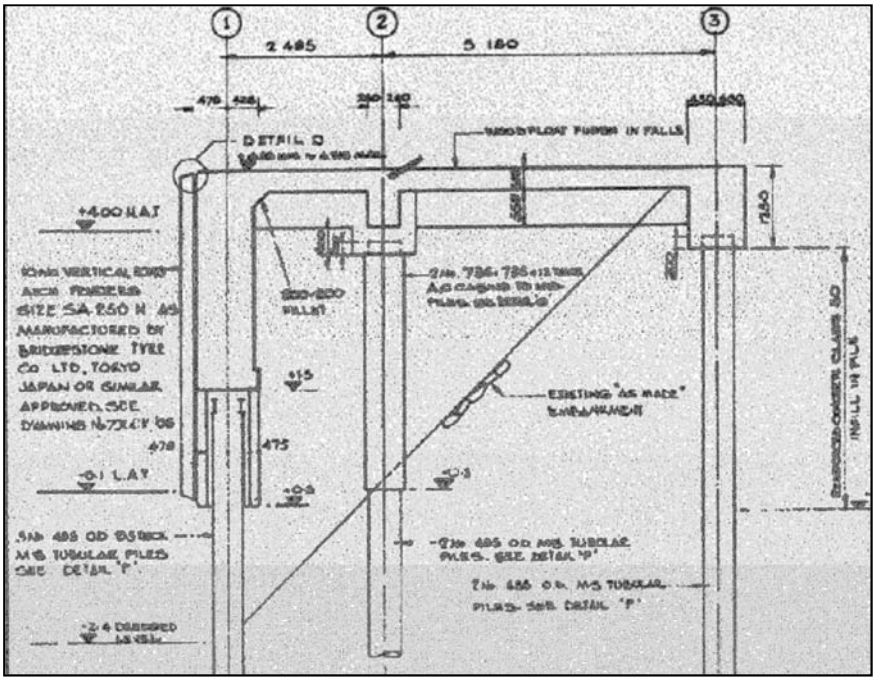


Figure 4.1.27 Cross section through Jetty at Southern Lighter Quay (Construction Period 1981/82)

Source: Berth Rehabilitation Study Report May 2014

m) Summary of Existing Berths

The existing port facilities of Mombasa Port are summarized in Table 4.1.15.

Table 4.1.15 Summary of Existing Port Facilities of Mombasa Port

Berth	Usage	Cargo Handling Equipment	Length (m)	Design depth - m below CD	Built in
Mbaraki Wharf	Bulk import of coal, clinker, gypsum, iron ore, bauxite, cement Edible oils & molasses Export of bagged cement & fluorspar	Traveling dry bulk loader Pneumatic unloader Pipework	306.3	10.5	1970
Berth 1	Cruise liners, passengers, RoRo		173.1	10.5	1921-1929
Berth 2	Cruise liners, passengers, RoRo		166.4	10.5	1921-1929
Berth 3	Bulk grain	2 x300 tons/hr unloaders plus conveyor system	166.4	10.5	1921-1929
Berth 4	General cargo, containers		190.2	10.5	1921-1929
Berth 5	General cargo, RoRo, steel, containers		178.6	10.5	1921-1929
Berth 7	General cargo, bulk		208.2	10.0	1943-1944
Berth 8	General cargo, bulk		197.5	11.5	1943-1944
Berth 9	General cargo, bulk, steel	Overhead conveyors for soda ash	179.8	11.5	1957-1958
Berth 10	General cargo, bulk		204.2	10.0	1957-1958
Berth 11	General cargo, bulk, RoRo, containers		184.4	10.0	1957-1959
Berth 12	General cargo, containers		182.9	10.0	1957-1959
Berth 13	Containers, general		174.0	10.5	1957-1959
Berth 14	Containers, general	3 RTGs on Berths 14	181.4	10.0	1957-1959
Berth 16	Containers	7 SSG, 19 RTGs & 2 RMGs (rail terminal) on Berths 16-19	177.7	12.5	1975
Berth 17	Containers		182.3	12.5	1975
Berth 18	Containers		239.0	12.5	1977
Berth 19	Containers		240.0	13.5	2013
Kipevu Oil Terminal	Crude oil, oil products		Dolphin berth – max approx 260 m	13.41	1963
Shimanzi Oil Terminal	Oil products, LPG		Dolphin berth – max length approx 150 m	9.76	1931
Northern Lighter Quay	Not used		Approx. 170 m	2.86	1908-1910
Southern Lighter Quay	Not used		30 m	2.40	1952-1954

Source: Summarized by JICA Team from KPA's records

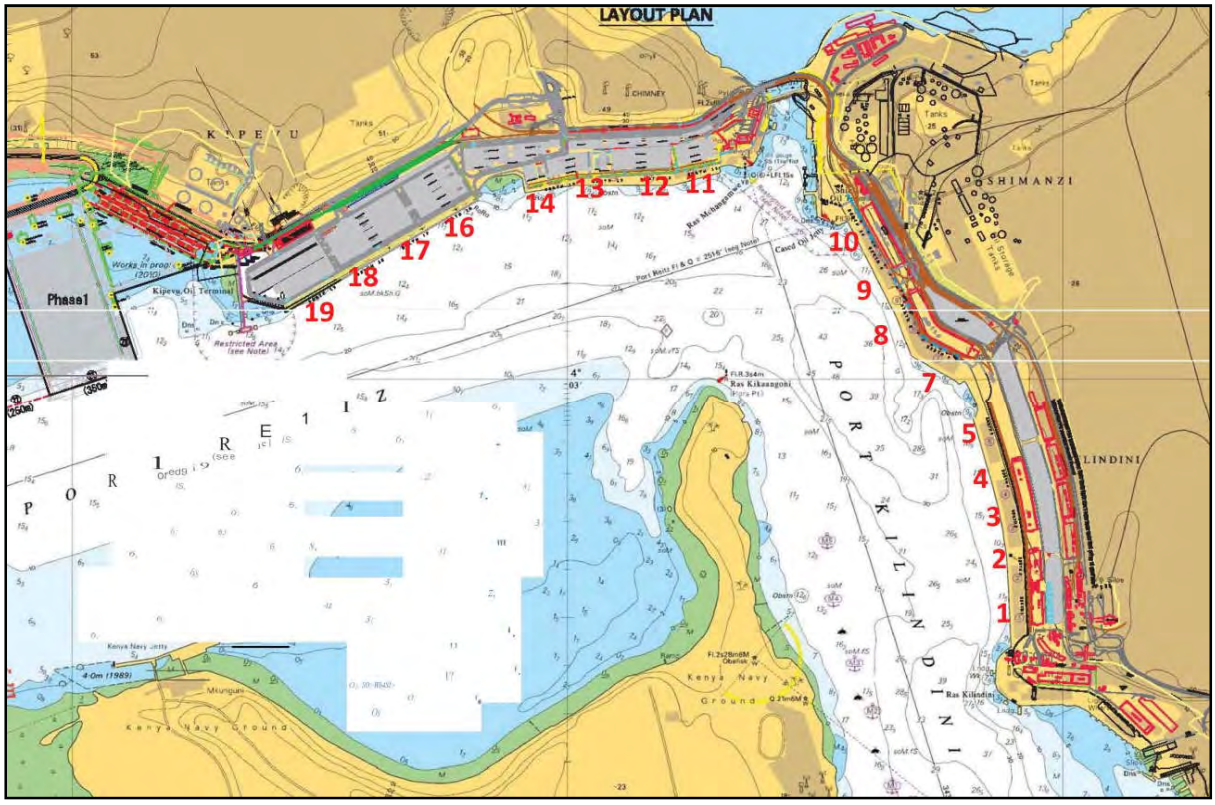


Figure 4.1.28 Location of Existing Mombasa Port Facilities Railway Access

4.1.5 Improvement of existing port facilities

(1) Conversion of berths 11 to 14 to container berths

Berths 11-14 were constructed between 1956 and 1959 to serve as conventional berths. The original fendering systems and scope were renewed in 1990 and the berths have a total length of 723 metres and a width of 22.6 meters. KPA has removed warehouses and paved the yards behind these berths.

Berths 12 to 14 are increasingly being used for container handling although they do not have the requisite equipment such as ship-to-shore gantry cranes. Therefore, only vessels with their own gears use these berths. These berths are also not aligned in a straight line which allows for operation of container gantries. The future plan is to enable the berths to bear the load of modern container handling equipment such as rubber tire gantry cranes (RTG) and ship to shore gantry (SSG) cranes.

The project entails infrastructural modification to berths 11 to 14 to support loadings from modern container handling equipment and procurement of handling equipment. The project is estimated to cost 120 million US dollars.

The benefits of the project include the following:

- Increase container handling capacity
- Reduce cargo dwell time
- Improve ship turnaround time
- Improve port operations

Under such circumstances, “the Consulting Services for Geotechnical Investigation of Berths 11 to 14 at the Port of Mombasa” was executed in 2011 under the finance of the Kenya Ports Authority with an aim at grasping the existing subsoil conditions for the expansion area by conducting geotechnical investigations at nine locations immediately off the face line of Berths 11 to 14. Also, laboratory tests were carried out for samples taken from such boreholes.

Noting that there is such an expansion and modification plan for Berths 11 to 14, it should be remarked that more in-depth study will be necessary for the future usage of Berths 11 to 14 considering the effective cargo allocation to the existing berths and newly developed container berths at the Second Container Terminal as the volume of dry bulk cargo such as wheat and maize is expected to increase in the future as well.

(2) Relocation of Kipevu Oil Terminal

The Kipevu Oil Terminal (KOT) was constructed in 1963 to handle crude oil ships. The operations at the terminal are mainly carried out by private oil companies, Kenya Pipeline and Kenya Petroleum Limited. The Kenya Ports Authority plays a supervisory role and is responsible for upkeep of jetty, safety, security, fire and pollution prevention.

Since Shimanzi Oil Terminal’s (SOT) location is close to other port functions the SOT was supposed to be taken out of use for significant imports of petroleum products when the KOT was constructed.

However, due to increased quantities over the past many years, the SOT has gradually come into full use again and now both the KOT and the SOT are utilized to maximum capacity in peak periods, with vessel queuing and demurrage as a result.

The recent and current development of new container berths towards the East of Mombasa Port has reached and passed the KOT, so that the present location is not safe anymore and furthermore there is not space for the necessary increase of the number of tanker berths, which is a necessary implication of the desire to stop utilizing SOT and to improve berthing and unloading of tankers in Mombasa.

Due to the insufficient current capacity together with the potential safety aspects and space requirements a study was launched by KPA to find a new location for a new KOT and the necessary number of berths to be determined on an operational and logistic basis. The study included a detailed feasibility study and established a suitable location and type of infrastructure as well as viability, cost estimates, and funding option. Further activities require undertaking detailed design study, determine

the financing options and funding, and re-location of the terminal facility.

The project will cost approximately US$ 152 million. The benefits of the project include the following:

- Insure safety in crude oil handling
- Increase efficiency in port operations.
- Improve berth operations in oil handling
- Increase capacity in oil handling
- Improve ship turnaround time

The possible location of proposed new sites was eventually determined by the economic, port planning and logistical aspects of a new KOT together with the upfront capital cost of construction. A number of possible locations were proposed and discussed taking these factors into account, and ultimately ending up with a preferred option as shown in Figure 4.1.29.

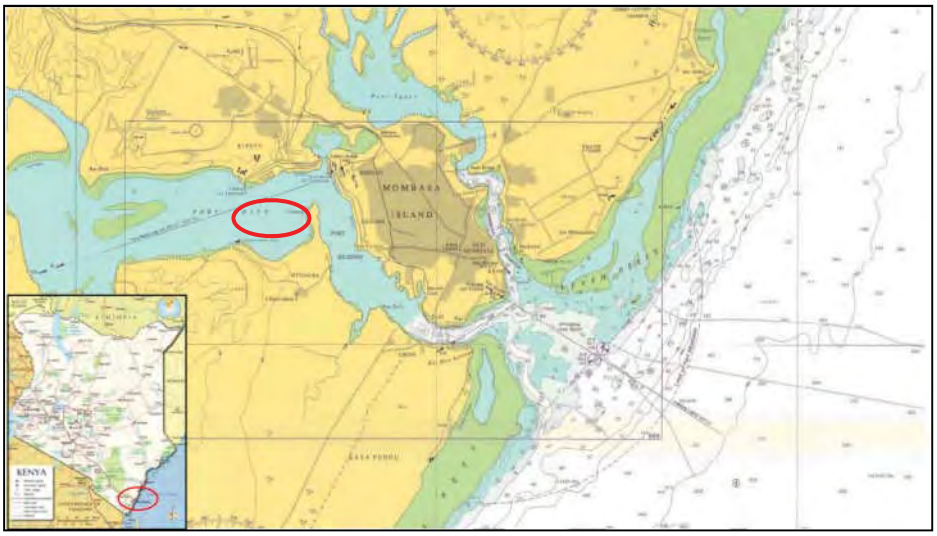


Figure 4.1.29 Location of New KOT
Source: Admiralty Chart 616

The preferred option shows 4 berths at Tsunza East, headland opposite Berth 16

- 4 berths island terminal located adjacent to Tsunza East peninsula
- Off the main channel and orientated for ease of access to the 4 berths
- Substantial dredging volume required
- Sheltered to avoid any obstruction to the future Port operation

Potential variant to be considered for the succeeding detailed feasibility study includes

- Adjustment of the location to ensure best approach for vessels and moving away from the Navy's exclusion zone
- Adjustment of the location to minimize the volume of dredged material

(3) Area G Development

The import of cars, trucks and buses is forecast to continue rising in the future. However, the handling of vehicle imports causes congestion on the open storage areas between Berths 1 and 5 and it is therefore proposed that the western part of Area G should be converted into a vehicle handling compound where the vehicles can be parked immediately after being discharged until they are cleared from the port.

There is also a severe shortage of stacking area for containers and it is therefore proposed that the

eastern part of Area G is converted to a temporary empty container storage facility. These plans are illustrated in Figure 4.1.30.

The vehicle handling space should be paved so that the vehicles are not damaged by uneven ground and stones thrown up by their movement. It should be fenced with a controlled gate and fitted with CCTV so that the vehicles are secured properly. The pavement quality should be suitable for the loads from the imported trucks.

The layout shown in Figure 4.1.30 provides parking for 770 cars and vans, 106 trucks and 11 buses. The area is intended for buffer storage only, and will accommodate most of the vehicles from an average shipment providing that they are cleared quickly. The Ro/Ro vessels carrying the vehicles should use Berths 1 and 2 whenever possible to shorten the travel distance from the ship to the vehicle compound. In the longer term a larger area will be required for vehicle imports; this may be located in the Dongo Kundu area and this study is being carried out under JICA study.

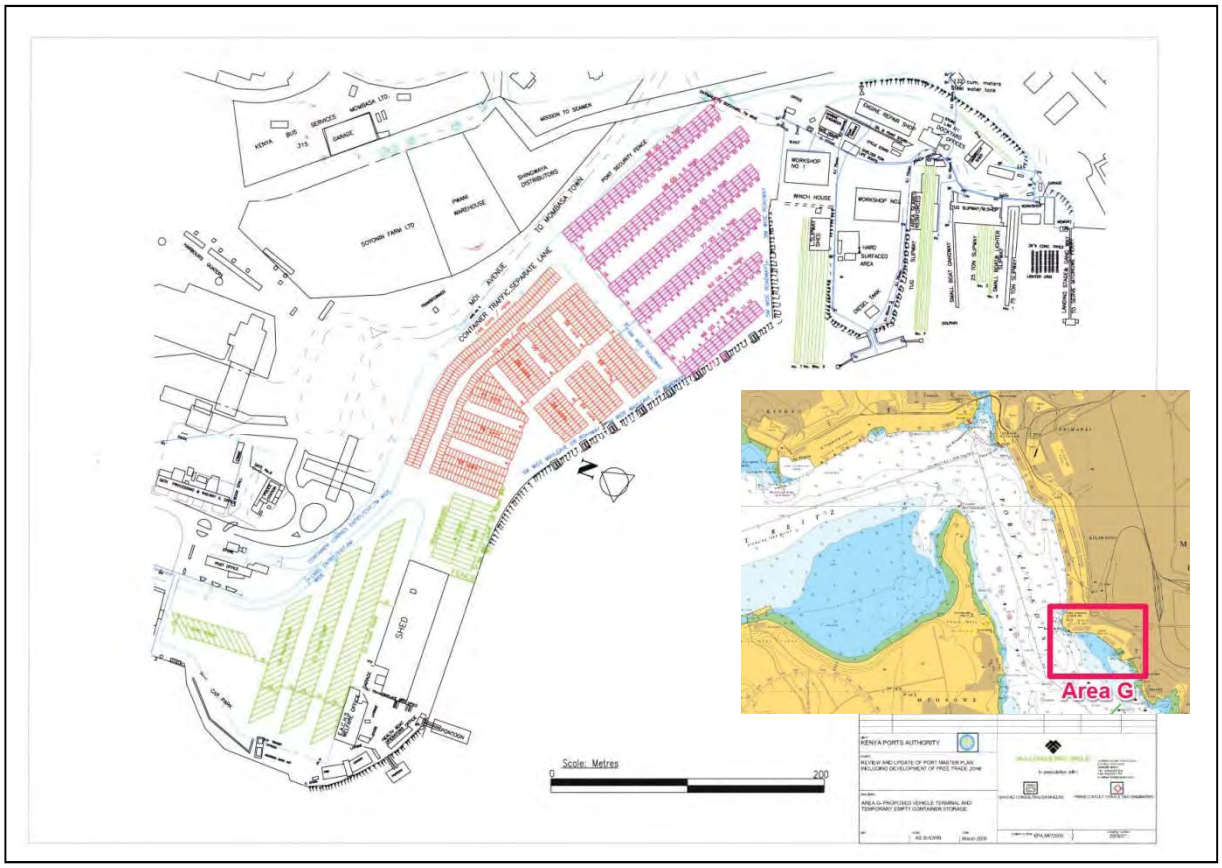


Figure 4.1.30 Plan for Area G Development
Source: Review and Update of Port Master Plan Study of Mombasa Port (2009)

(4) Expansion of Mbaraki Wharf

Mbaraki Wharf is a common user facility, used principally by Bamburi Cement for the import of clinker, iron ore and coal and by East African Molasses for the import of edible oils. Bulk fluorspar is exported via a conveyor and travelling shiploader from a stockpile adjacent to the Bamburi Cement property.

It is proposed to expand Mbaraki Wharf the preferred facility for dirty bulk cargoes such as clinker, coal, iron ore, fertilizers, although the berth does not have the capacity to handle all of these dirty cargoes for the future.

Four proposals for improving its performance have been examined, involving:

- New access bridges.
- Berth deepening to -12.5m CD.
- Extension of the wharf by 220m to create a third berth.

At present only trucks with a carrying capacity of 7 tons can drive on and off the wharf due to the narrow access bridges and lack of turning space. The importing of bulk cargoes over Mbaraki Wharf is very inefficient as the 7 ton trucks have to dump their loads onto the paved area behind the wharf so that the material can be picked up by front end loaders and loaded onto larger articulated trucks for transport inland.

It is therefore proposed that new access bridges should be built next to the existing bridges so that articulated trucks can drive onto the wharf for direct loading as shown in Figure 4.1.31. Berth deepening was also proposed to reach -12.5 m CD to allow the use of larger vessels. Additionally, extension of the wharf by 220 m to the western direction to create a third berth is planned in order to receive increasing bulk cargo demand.

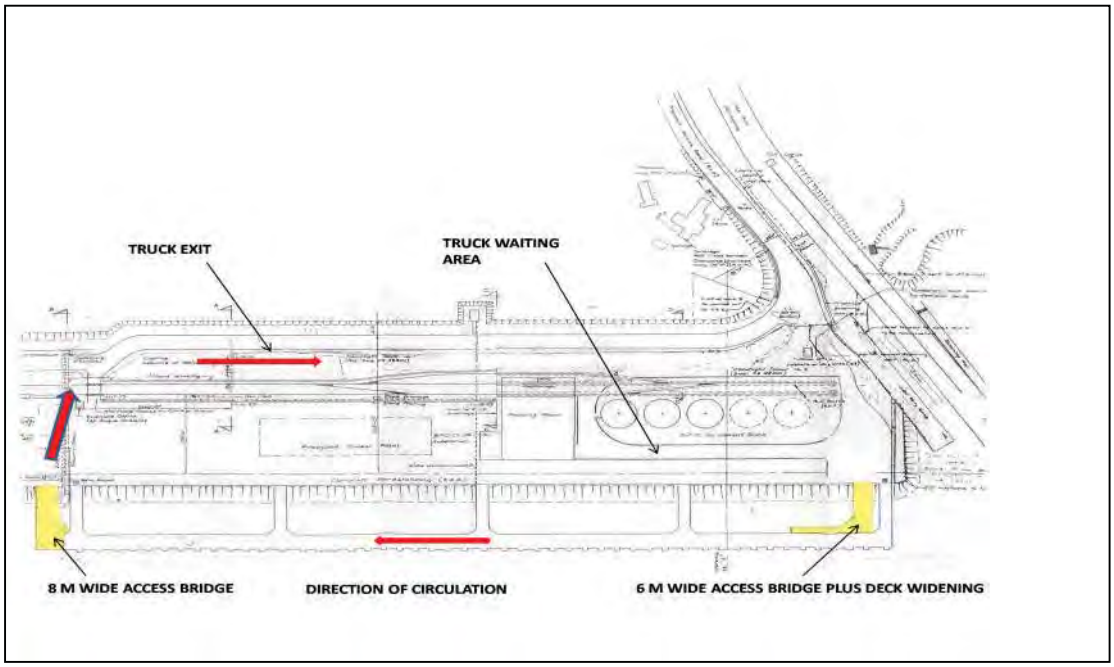


Figure 4.1.31 Plan for Wider Access Bridge
Source: Review and Update of Port Master Plan Study of Mombasa Port (2009)

4.1.6 Operation of inland container depot

At Mombasa Port, inland container depot is widely used for the delivery of inbound containers. It is known as CFS delivery system in Mombasa. In global shipping terms, Container Freight Station (CFS) is defined as: "Sheds where break-bulk cargoes from several different consignors are received, aggregated and stuffed into a container; or where cargoes for several consignees are unpacked from a container for delivery" (UNCTAD: Handbook on the management and operation of dry ports, 1991).

In the context of Mombasa Port, CFS is referred to as: "Common user facility offering services for handling and temporary storage of import/export and laden/empty containers and carried under Customs control" (KPA Draft CFS Policy, 2014)

The practice was introduced in 2007 as a measure to manage cargo overflow at KPA CY due to the increase of inbound containers. In this system, inbound domestic containers (containers bound for Kenyan local destination) are transferred to a privately operated Container Freight Station (CFS) located outside the port area within Mombasa City. The CFSs are designated as a Customs area and fully nominated by KPA.

The containers are supposed to be moved from KPA CY to CFSs by CFS operators within 48 hours after completion of discharge from the vessel. The containers are then stacked in CFS premises, cleared by the consignees and finally leave the CFS.

This system applies only to domestic containers. Transit containers are handled in the normal way by KPA at CY for direct delivery to consignees.

Since domestic containers account for about 70% of total inbound containers discharged at Mombasa Port, congestion of KPA CY was resolved through the introduction of this system.

While the CFS system had a useful role as a stop gap measure for the port, it may represent an additional cost to the logistics chain forcing the containers to move to the extra place for additional handling.

KPA presently shortlisted 12 CFSs out of more than 20 CFS facilities currently operating in Mombasa City area. KRA grants the license considering the container stacking capacity, security condition of the premises. All the CFSs must comply with KPA tariffs and regulations, while setting of free time at each CFS is left to the discretion of each CFS operator.

KPA basically assigns the CFS on a per vessel basis before the vessel's arrival. The assignment of CFS is made on a rotational basis among the CFSs considering the available space at the CFS facilities at the time of vessel arrival. All inbound domestic containers are normally transferred to the assigned CFS. Exceptions are dangerous cargo and consignments whereby the importer has obtained special permission for port clearance at the CFS of importers choice. In order to obtain special permission, the Bills of Lading of the relevant consignment should clearly state that "Cargo in transit to designated CFS (and the name of CFS must be specified)". With this provision, consignees can transfer their containers to their preferred CFS.

Following is a list of KPA nominated CFSs as of December 2014:

Table 4.1.16 List of CFSs as of December 2014

	Name of CFS	Address & Contact
1	Focus CFS	P.O.Box 43092 Changamwe, Mombasa Phone: +254(0)20 217 1576/77/78 e-mail: info@focus.co.ke www.focus.co.ke
2	Mombasa Container Terminal (MCT)	P.O.Box 90253 Changamwe, Mombasa Phone: +254(0)20 232 6854/56/57 e-mail: mct@bollore.com www.bollore-africa-logistics.com
3	Mombasa Inland Container Terminal (MICT)	P.O.Box 81664 Masai Rd, Shinanzi, Mombasa Phone: +254 41 249 0342 e-mail: www.mict.co.ke
4	Mitchell Cotts Freight (Kenya) Ltd.	P.O.Box 42485 Voi St. Shimanzi, Mombasa Phone: +254(0)722 880 688 e-mail: sales@mitchellcotts.co.ke www.mitchellcottskenya.com
5	Consolbase Ltd.	P.O.Box 86391 Refinery Rd, Changamwe, Mombasa Phone: +254 733 494 444 e-mail: info@consolbase.co.ke www.consobase.co.ke
6	Interpel Investments Ltd.	P.O.Box 86823 Kipevu, Mombasa Phone: +254(0)20 258 3997/8/9 e-mail: marketing@interpel.co.ke www.interpel.co.ke
7	Compact Freight Systems Ltd.	P.O.Box 86232 Mombasa Phone:+254(0)716 430 693 e-mail: info@compactcfs.co.ke www.compactcfs.co.ke
8	Awanad Logistics & CFS	P.O.Box 2868 Mombasa Phone: +254(0)20 233 1187 e-mail: info@awanad.co.ke www.awanad.co.ke
9	Makupa Transit Shed	P.O.Box 90302, Dar es Salaam Rd., Mombasa Phone: +254 41 222 4952 e-mail: info@thetalgroup.com www.thetalgroup.com
10	Portside Freight Terminals Ltd.	P.O.Box 99686-80107 Shimanzi, Mombasa Phone: +254(0)20 203 9642 e-mai: info@portsidefreight.com www.portsidefreight.com
11	Autoports Freight Terminals Ltd.	P.O.Box 84834 Kilindini, Mombasa Phone: +254 41 231 8040 e-mail info@autoportsfreight.com www.autoportsfreight.com
12	Multiple Inland Container Depot (MICD)	P.O.Box 2734 Kinarani, Mombasa Phone: +254(0)20 231 7782 e-mail: info@micdkl.com www.micdkl.com

4.2 Natural conditions

4.2.1 Outline

The items collected for the natural conditions include meteorological conditions (temperatures, precipitation and winds), oceanographic conditions (tides, currents and waves), topographic conditions (land, seabed), and geological conditions. In addition, bathymetric/seismic profiling surveys, a topographic survey and geotechnical investigations were carried out at the areas of the future port development. The result of such natural condition surveys will be effectively utilized for the development plans of Mombasa Port.

4.2.2 Meteorological condition

Mombasa belongs to the tropical monsoon climate. The climate is hot and humid all the year round. The meteorological conditions of Mombasa are characterized by the northeast monsoon from December to February and the southwest monsoon from April to October.

(1) Temperatures

According to the temperatures recorded in the past 21 years, the average annual temperature is 26 degrees centigrade. The highest mean monthly maximum temperature occurs in February and March with 31 degrees centigrade. The lowest mean monthly minimum temperature occurs from July to August with 21 degrees centigrade. Since the temperatures are warm throughout the year, the seasonal gaps between temperatures are small.

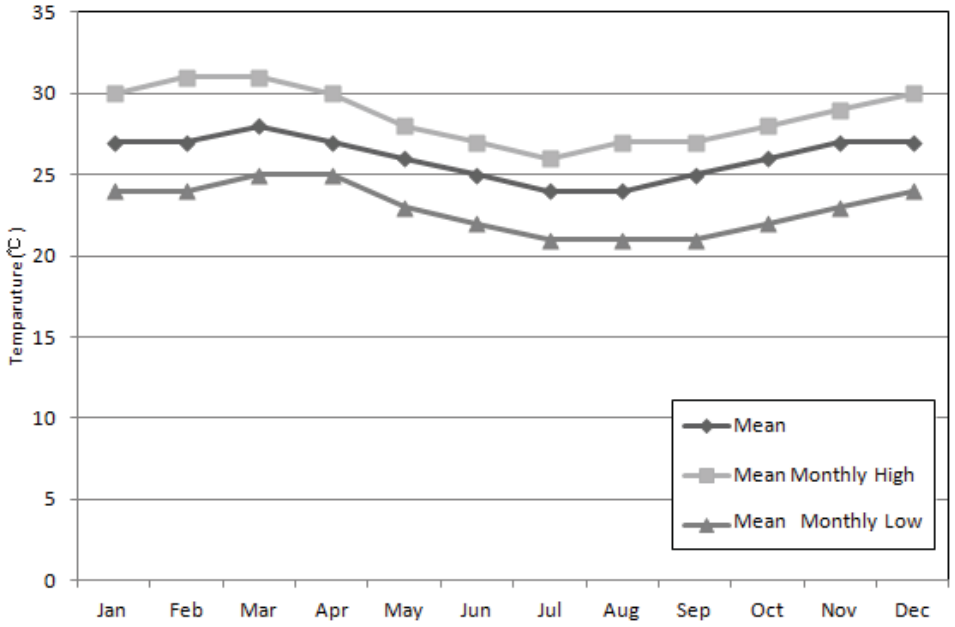


Figure 4.2.1 Monthly Maximum and Minimum Temperature
Source: Weatherbase Web Site

(2) Precipitation

According to the rainfalls recorded in the past 10 years from 2004 to 2013 at the MOI International Airport meteorological station, the maximum mean monthly rainfall occurs in May, 214 mm / month, and minimum in February, 9.9 mm / month. The maximum mean monthly rainfall in the past 10 years occurred in May, 2014 with 499.2 mm / month.

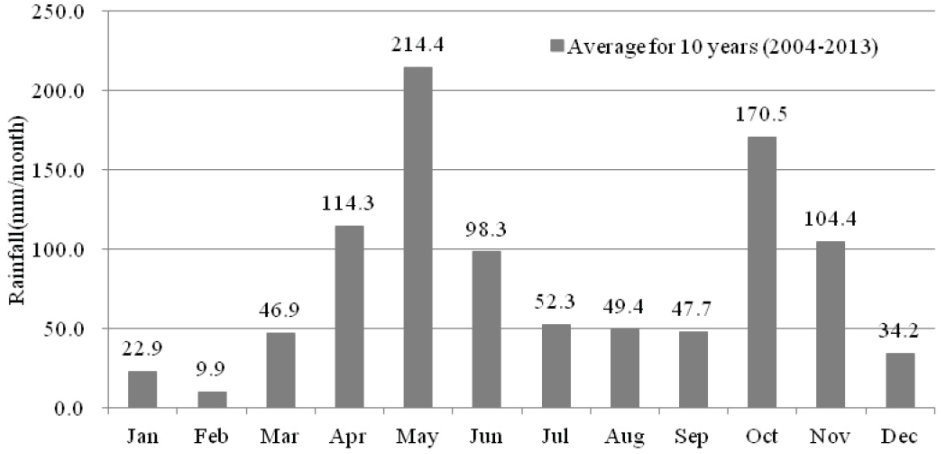


Figure 4.2.2 Monthly Rainfall
Source: Moi International Airport

(3) Wind

The northeast monsoon blows from December to February in the dry season, and the southwest monsoon from April to October in the rainy season. During the northeast monsoon, the winds are predominantly from east and northeast (The maximum wind velocity: 7.7 m/s). During the southwest monsoon, the predominantly winds blow from south (The maximum wind velocity: 9.0 m/s).

The maximum wind velocity recorded in the past 10 years from 1995 to 2005 was 22.5 m/s from the direction of east and northeast which occurred in the month of June and August. The characteristics of winds are summarized below;

Table 4.2.1 Wind Velocity

December - February

Wind Direction	Frequency of Wind Direction (%)	Max Wind Velocity (m/s)	Min Wind Velocity (m/s)
E	50	7.7	5.0
NE	29	4.0	3.0
N	21	2.0	1.0

April - October

Wind Direction	Frequency of Wind Direction (%)	Max Wind Velocity (m/s)	Min Wind Velocity (m/s)
S	75	9.0	5.0
NW	25	5.0	4.0

Source: Tide Table and Port Information 2014

4.2.3 Oceanographic condition

(1) Tide

Tides at Mombasa Port are semidiurnal. According to "Tide Table and Port Information 2014" issued by KPA, the tidal levels at Mombasa Port are shown in Table 4.2.2. Tidal range is 4 m from a high level of 4.1m to a lowest level of -0.1 m. The tidal level occasionally falls below Chart Datum Level.

Table 4.2.2 Tidal Level in Mombasa Port

HAT	+4.1m
MHWS	+3.5m
MSL	+1.88m
CDL	0m
LAT	-0.1m

Source: Tide Table and Port Information 2014

The tide gauge station managed by the Kenya Marine and Fisheries Research Institute (KMFRI) is located at Liwatoni jetty. The tide gauge station managed by KPA in the KPA Headquarter jetty and Harbor Master Office is not operational anymore.

Figure 4.2.3 Liwatoni Jetty Tide Gauge Station
Source: JICA Team

(2) Currents

Tidal current velocities in Port Reitz are summarized in Table 4.2.3, and their observation points are shown in Figure 4.2.4. The maximum velocity observed is less than 1.5 Knots. Tidal current directions closely follow the geological feature of Port Reitz. The tidal current direction varies for almost 180 degrees between high tide and low tide. The tidal current direction is west during high tides, however, the tidal current direction is the east or the northeast directions during low tides.

Table 4.2.3 Tidal Current Velocity

Position	Current Velocity (Knot)	
	Flood	Ebb
DVH1	0.70	0.73
DVH2	0.58	0.93
DVH3	0.62	1.46

Source: Mombasa Port Expansion Feasibility Study Phase 2

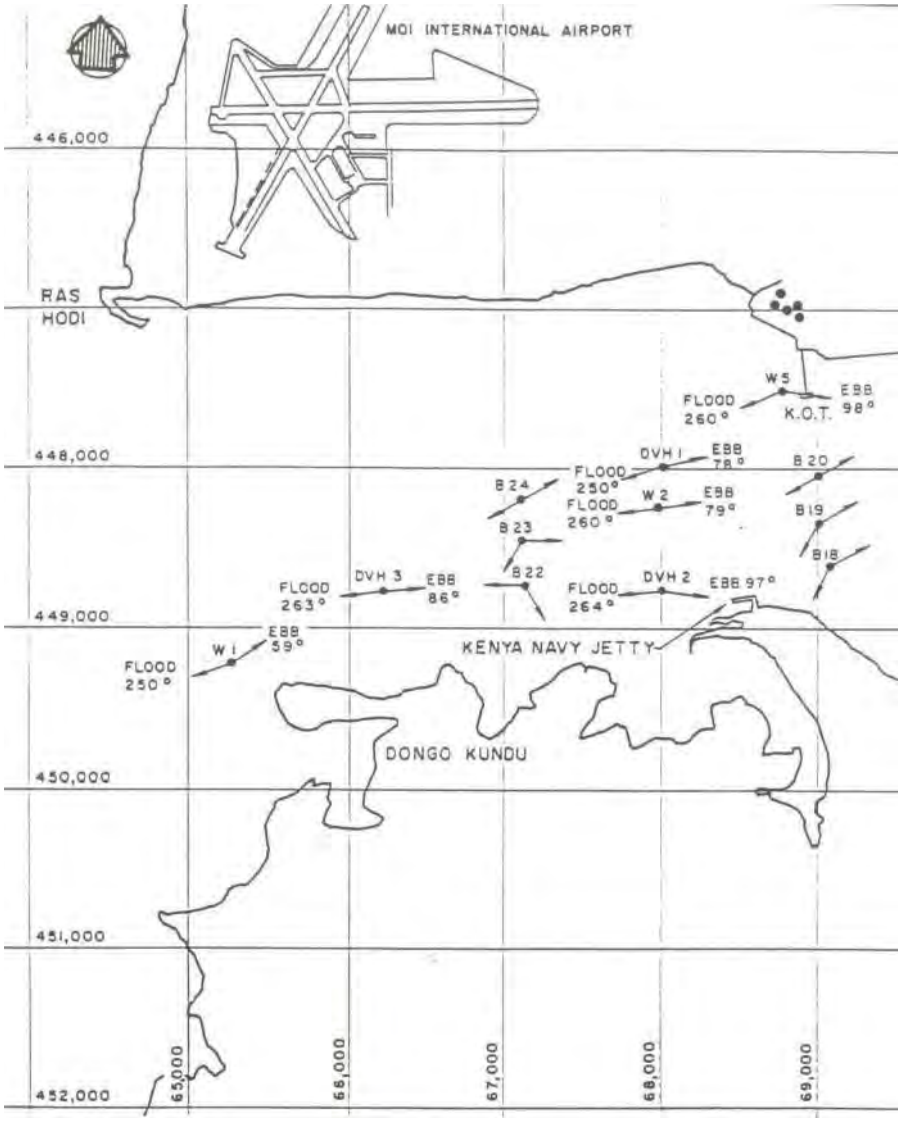


Figure 4.2.4 Location of Tidal Current Observation Station

Source: Mombasa Port Expansion Feasibility Study Phase 2

(3) Waves

Mombasa Port is protected from deepwater waves and swells from the ocean. Waves are generated by winds at the entrance to Mombasa Port (Entrance to Kilindini Harbour Channel). The waves at Port Reitz are minimal due to the short fetch length. The maximum significant wave height in Port Reitz is less than 1 m. (Source: Mombasa Port Expansion Feasibility Study Phase 2)

4.2.4 Topographic condition

(1) Topographic survey

Topographic survey was carried out by the JICA Team as detailed below.

a) Survey area

The survey was conducted at two areas, the northern area (Port Reitz) and the southern area (Dongo Kundu). The total survey area is 148 ha (Northern Area: 11 ha, Southern Area: 137 ha)

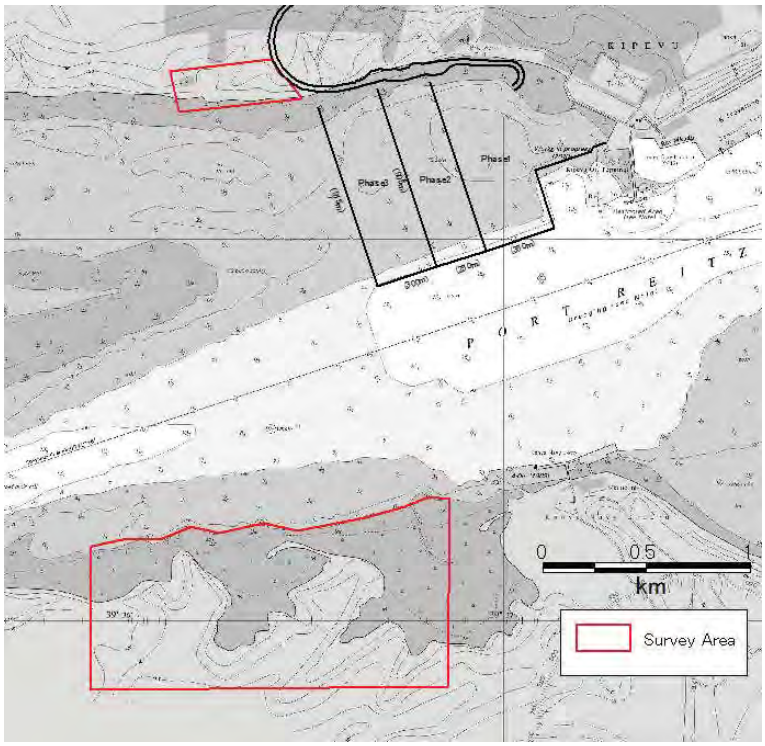


Figure 4.2.5 Surveyed Area for Topographic Survey
Source: JICA Team

b) Survey period

Field works were carried out in the period from November 5th to November 25th, 2014.

c) Methodology

KPA has an on-going the port development project. Therefore, there is substantial survey control network within the port. Existing benchmarks in the construction site (Phase 1) were used to establish additional survey control points through a short traverse.

The intervals of surveyed points were approximately 20 meters. However, in addition, the areas where there are changes of terrain were surveyed in order to illustrate topographic details.

The horizontal and vertical datum used on this survey is shown below;

Table 4.2.4 Horizontal and Vertical Datum

Spheroid and Datum		
Spheroid	:	WGS 84
Datum	:	WGS 84
Semi major axis (a)	:	6 378 137.000 m
Semi minor axis (b)	:	6 356 752.314 m
Inverse flattening (1/f)	:	298.257223563
Eccentricity2 (e2)	:	0.081819190842622
Projection		
Projection	:	Universal Transverse Mercator (UTM)
Zone	:	37 South
Longitude of Central Meridian	:	39° E
Latitude of Origin Projection	:	0° N
False Easting	:	500 000 m
False Northing	:	10000000 m
Scale Factor	:	0.9996
Units	:	International Meters
Convergence	:	World Standard
Unit of Measure	:	International Meters
Vertical Datum		
Chart Datum Level (CDL)		

d) Survey result

The topographic maps are shown in Figure 4.2.7 and Figure 4.2.8. The topographic maps were produced with a scale of 1:1,500. The map represents contour lines drawn at 1.0 meter intervals. The map depicts existing topographical features such as roads, drainages, fences, houses, bench marks. The topographical characteristics and current situation at the survey area are summarized below;

Northern area (Port Reitz)

- The maximum elevation is 31.6m CDL.
- The area has a continuous gentle slope to the shoreline.
- There is a beach that used for fishing activity and also for recreation by residents who live around the survey area.
- Small village on the hill and footpaths to the beach were confirmed.
- Some benchmarks were found in the survey area. However, detailed information of these benchmarks is not known.

Southern area (Dongo Kundu)

- The maximum elevation is 45.0m CDL.
- Mangrove forest has spread at swale formed by sand and mud.

- The land constitutes headlands with gentle slope in some areas and steep slope in others.
- Some houses exist on the hill and there is a footpath to access the houses along the ridge.
- Barbed wire has been installed in the vicinity of Kaya.

Northern Area (Port Reitz)

Southern Area (Dongo Kundu)

Figure 4.2.6 Condition of Survey Area
Source: JICA Team

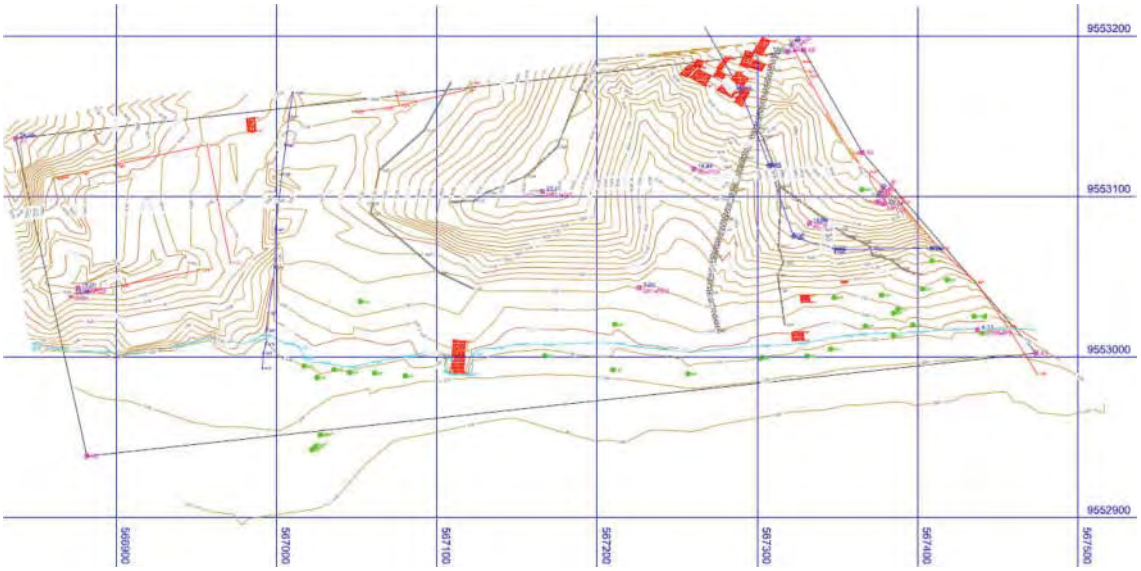


Figure 4.2.7 Topographic Map (Northern Area)
Source: JICA Team

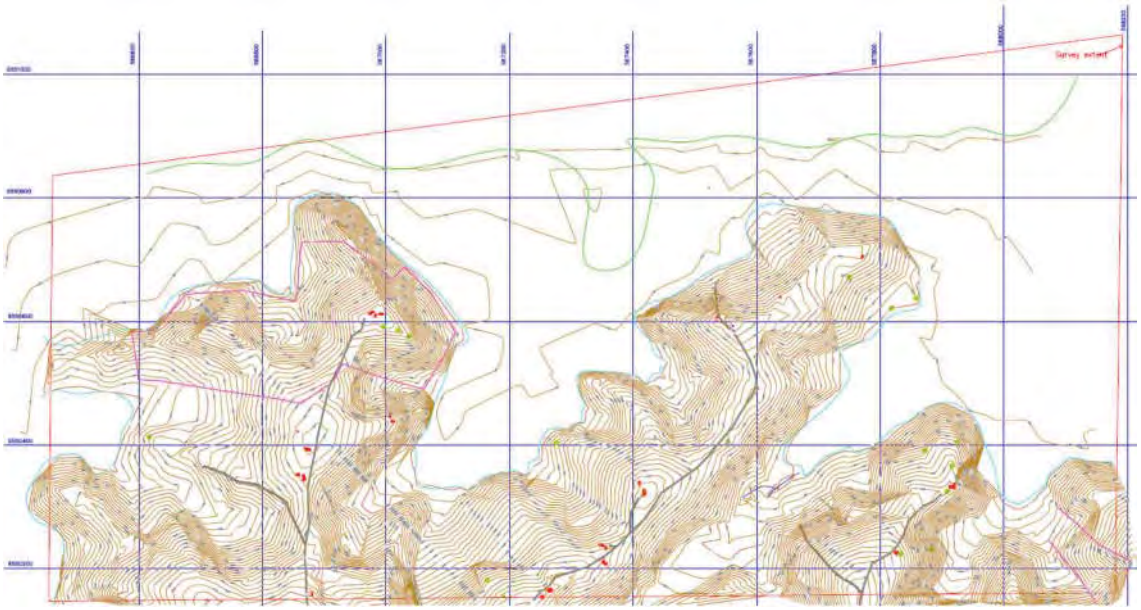


Figure 4.2.8 Topographic Map (Southern Area)
Source: JICA Team

(2) Bathymetry survey

Dredging project (2011 – 2014)

Dredging works were carried out in 2011 and 2012 in KPA's own fund. The dredging works were composed of capital dredging of the channel and turning basins for the Second Container Terminal and maintenance dredging in front of the existing berths. The SAPROF study in 2006 suggested the depth of berths and channel for the Second Container Terminal would be -15 m. The depth of the existing channel in Port Reitz is ensured with -15m as a result of dredging works (Figure 4.2.9). As a relevant survey of the dredging project, a bathymetric survey was carried out in 2008 at the whole Mombasa Port area. The survey area is shown in Figure 4.2.10.

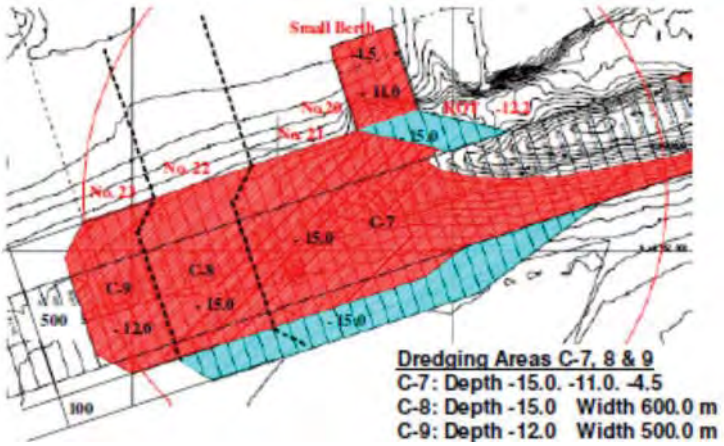


Figure 4.2.9 Depth of the Channel
Source: Dredging and Hydrographic Works at Port of Mombasa Completion Report

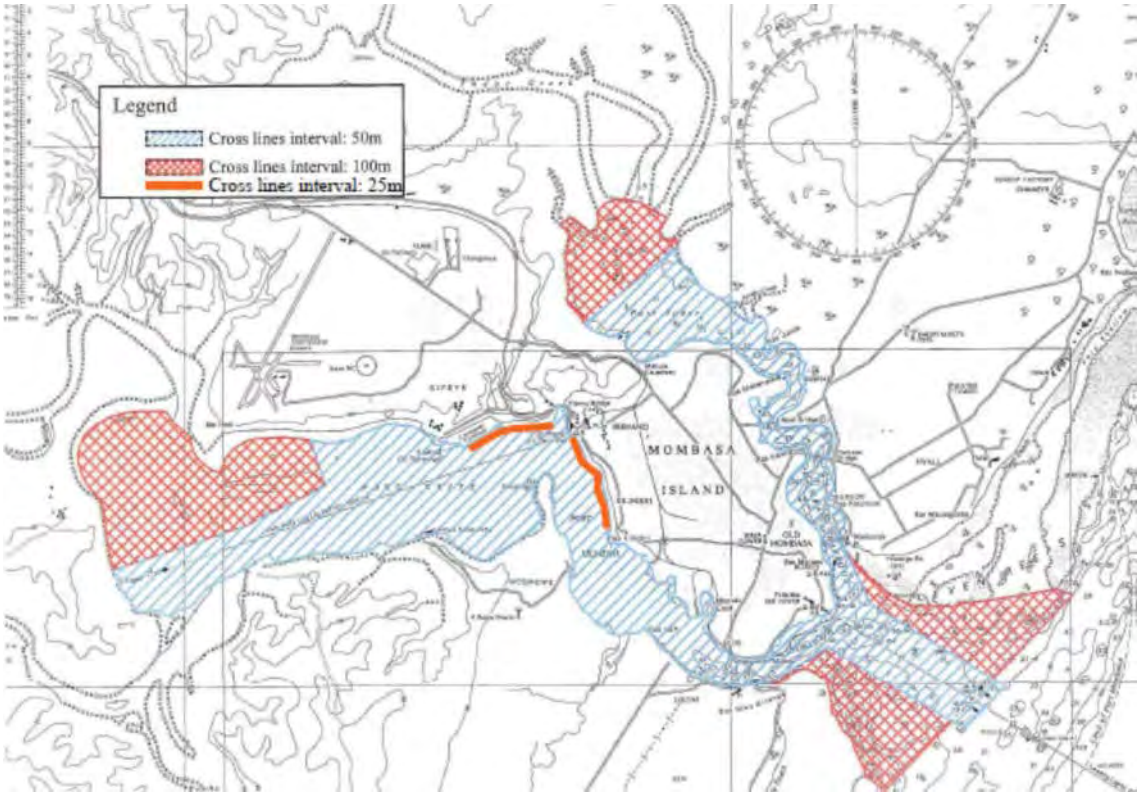


Figure 4.2.10 Bathymetric Survey Area (2008)
Source: KPA

Bathymetric and seismic profiling surveys were carried out by JICA Team as detailed below.

a) Survey area

The survey area covered the area for Phase 2 and Phase 3 for the Second Container Terminal and possible area for succeeding port development. Surveyed area is 109 ha. Figure 4.2.11 presents the survey area. Meanwhile, a bathymetric survey was conducted in May 2014 in Project on Master Plan for Development of Mombasa Special Economic Zone.

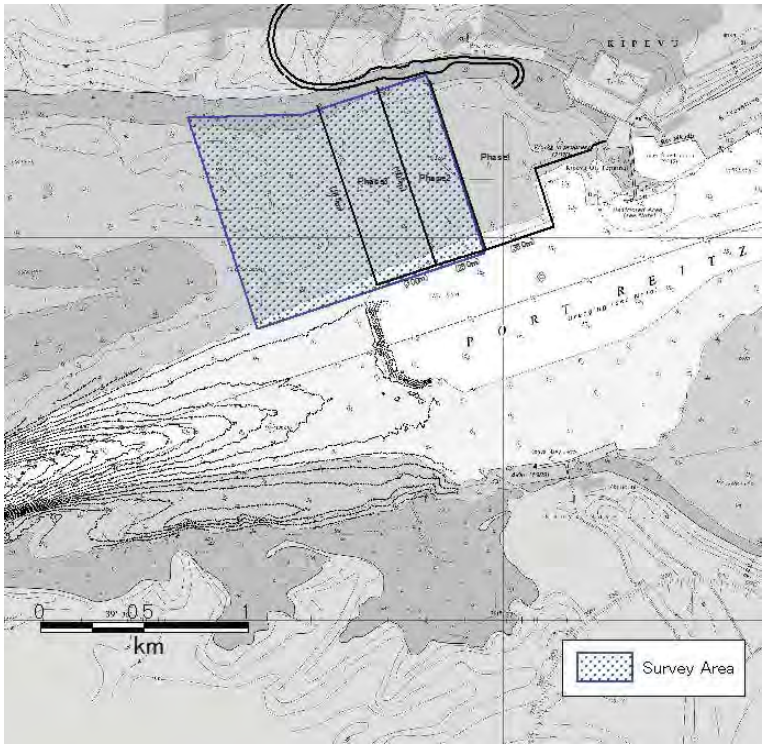


Figure 4.2.11 Bathymetric Survey Area
Source: JICA Team

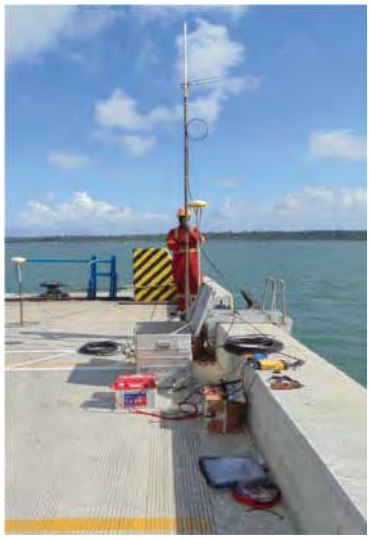
b) Survey period

Field works were carried out in the period from October 24th to November 5th, 2014.

c) Methodology

The methodology of the survey is summarized below;

- Survey interval: 25m (Cross section 100m)
- Frequency of sounder: 200khz, 24khz
- Single beam echo sounder was used for sounding.
- DGPS was used to survey positions of a survey boat.
- Tide observations were carried out during the sounding period at the intervals of 10 minutes.


DGPS Base Station


Tide observation is progressing

Survey Boat

Figure 4.2.12 Survey Situation (Bathymetric Survey)
Source: JICA Team

(3) Result of Survey

a) Result of bathymetric survey

A bathymetric survey was carried out at a line spacing of 25 m with a crossing of 100 m. The survey in the shallow area where there is mangroves was carried out during high tides by a small boat. In addition, a topographic survey was conducted in the shallow area where the boat was not accessible.

Tidal data were observed at the two tide poles installed at the KPA Jetty and Berth No.19. Every 10 minute tide observation was kept during the sounding. A minor difference of 5 centimeters was observed between both tide poles. Thus, an average of both the recorded tides was applied to reduction of raw bathymetry data to chart datum. Based on the results of the survey, bathymetric maps with a scale of 1:1,500 with 1 m interval contour were produced as shown in Figure 4.2.13.

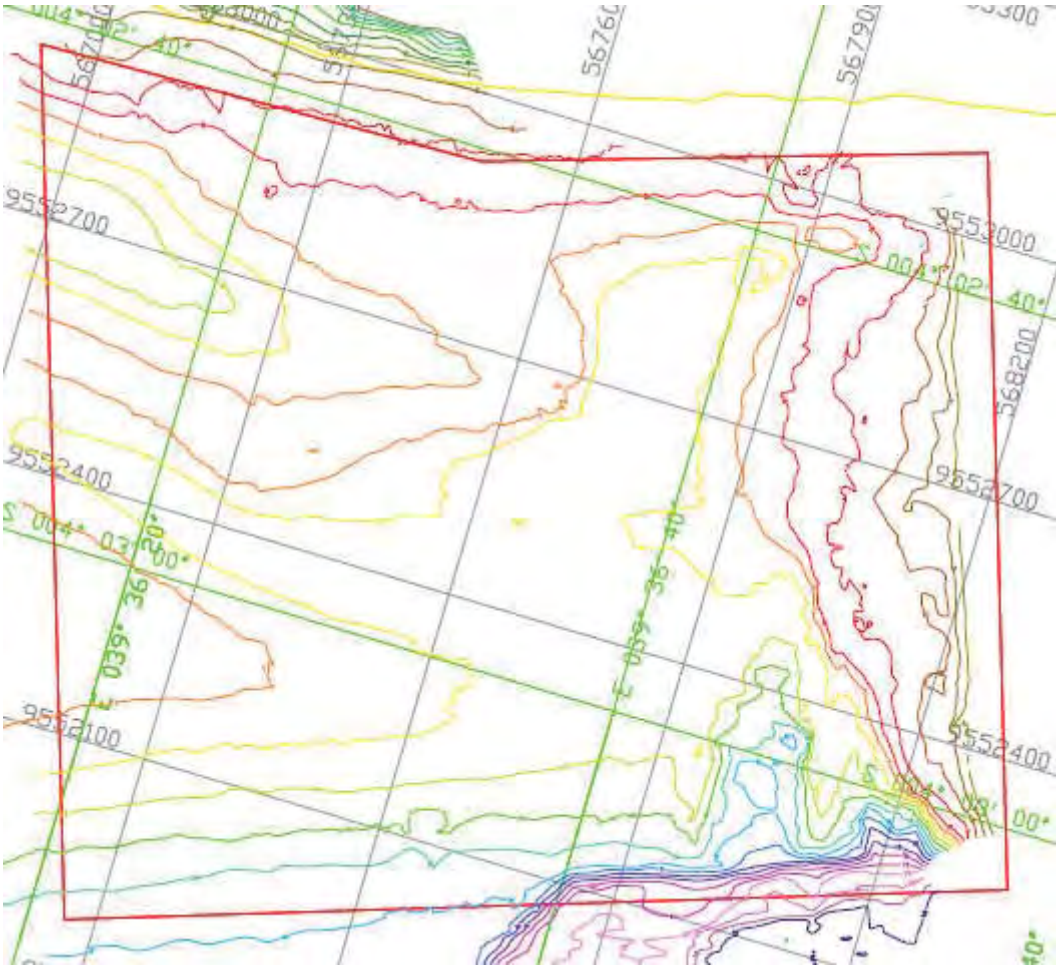


Figure 4.2.13 Bathymetric Map
Source: JICA Team

Figure 4.2.14 shows seabed elevations. Most of the survey area is shallow with the depths ranging from -1m CDL to -3 m CDL. The southern area of the survey area has been maintained with a depth of -15m by the previous dredging work. To know the changes of water depths over time, the JICA Team made a comparison between water depths from the survey data by the JICA Team and water depths described in the existing data. The existing data used for comparison is a bathymetric survey result which was conducted in 2008 before the dredging work was undertaken. Therefore, the time difference is 6 years. Figure 4.2.15 shows the results of comparison of the water depths. There are no significant changes in the depth of most of the survey area as seen in green on Figure 4.2.15. However, there is a big change on the eastern side of the survey area due to the slope formation from the reclamation of berth No.21 construction site.

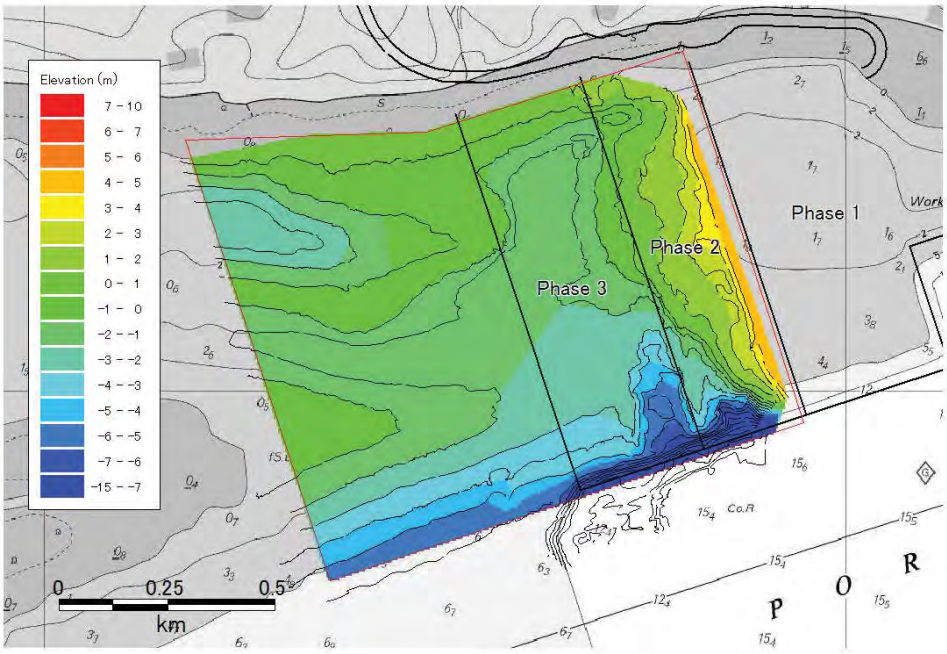


Figure 4.2.14 Elevation of Seabed
Source: JICA Team

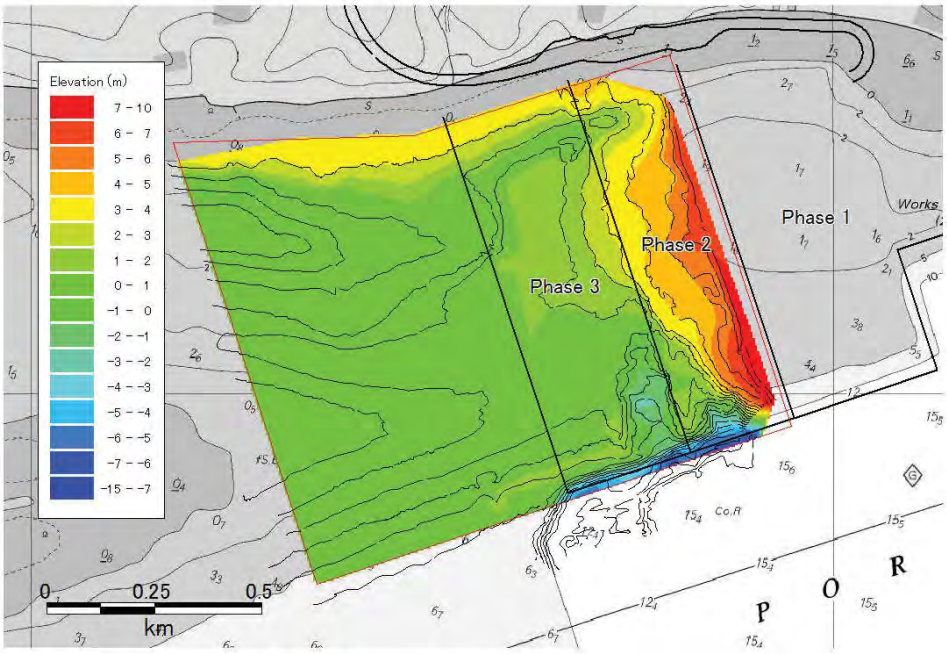


Figure 4.2.15 Changes of Water Depth (2008-2014)
Source: JICA Team

b) Result of seismic survey

Two reflectors namely major and minor reflectors were observed within the survey area. Based on the reflectors and acoustic characteristics observed from the sub-bottom profiler data, there are three

layers of sediments in the survey area. A cross section created is shown in Figure 4.2.16. According to the comparison between the cross section and borehole log, which is mentioned in chapter 4.2.5, it can be said that lowest layer suggested by the major reflector has a high possibility of a base rock layer. Elevations of the base rock layer have frequent ups and downs.

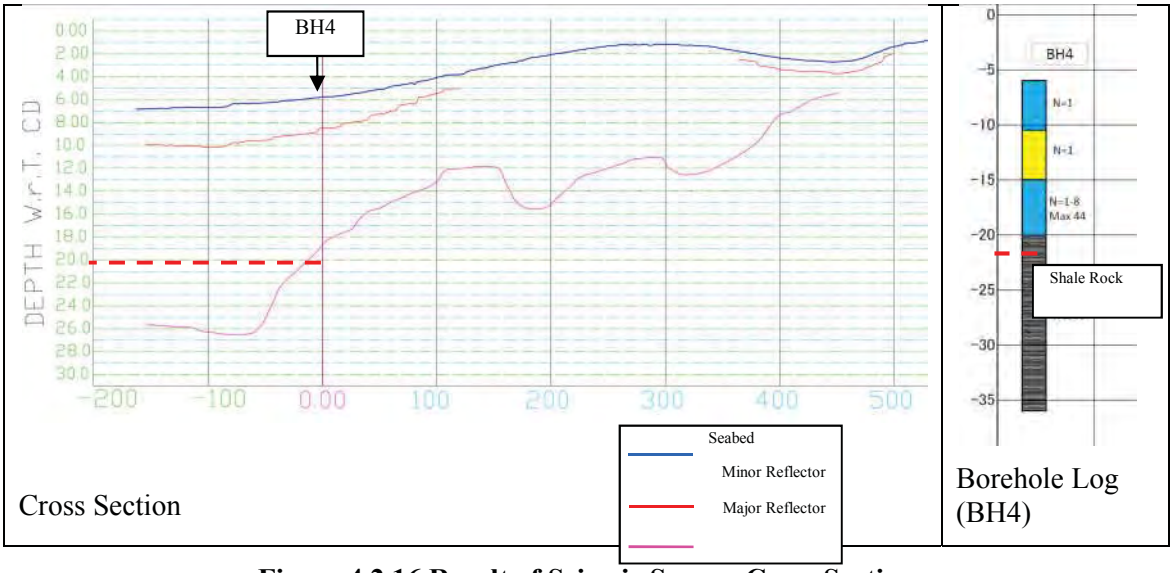


Figure 4.2.16 Result of Seismic Survey Cross Section
Source: JICA Team

4.2.5 Geological condition

The geology of Mombasa Port mainly is characterized by marine sediments in Jurassic and Quaternary. According to the geological map shown in Figure 4.2.17, the geology has mainly the following three types.

- Shale / Jurassic
- Kilindini Sands / Quaternary
- Undefined / Quaternary

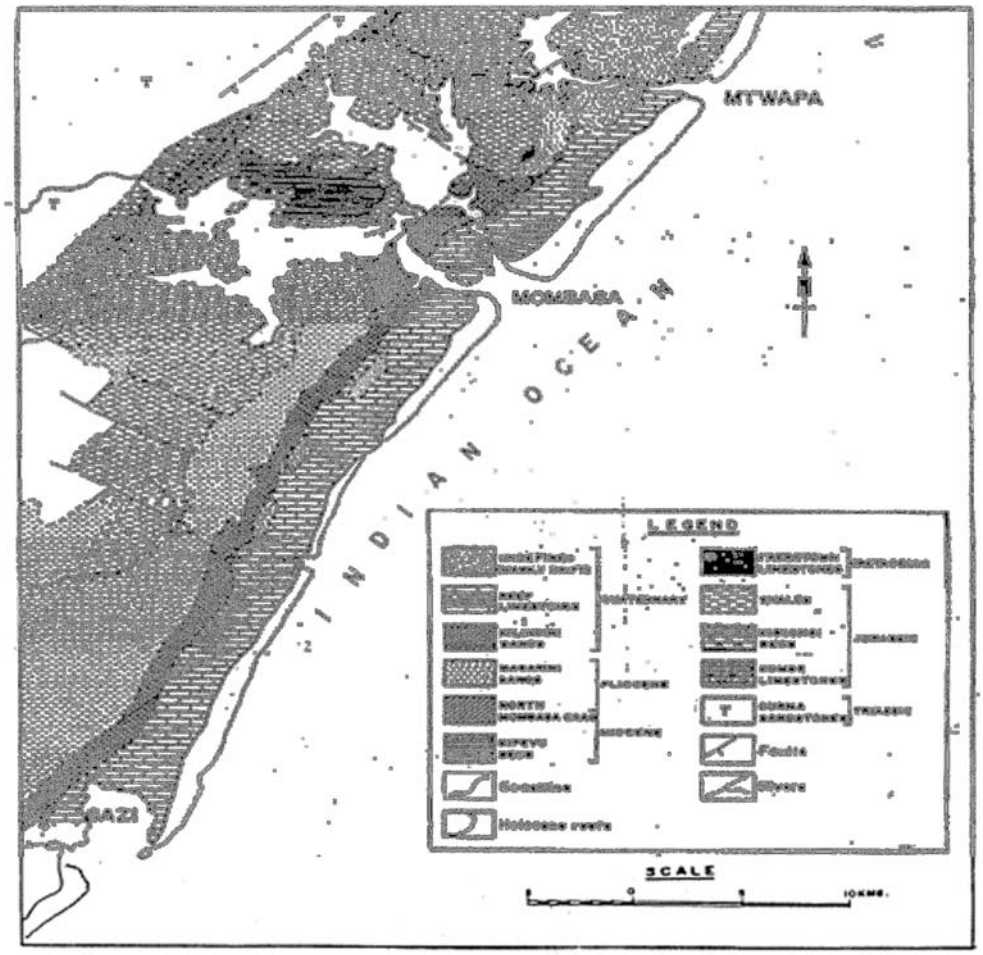


Figure 4.2.17 Geological Map of Mombasa Area
Source: Caswell, 1956

(1) Soil condition of Port Reitz

The soil investigations were carried out at a total of 49 boreholes as shown in Figure 4.2.18 in the Mombasa Port Development Project (Phase 1). The survey results can be summarized as follow;

Figure 4.2.19 shows a soil profile of subsoil confirmed along the quay line of the new berths. The following three types of the deposited layer were confirmed.

- Very Soft Marine Clay, N=0
- Decomposed Rock, N<50
- Weathered Rock, N>50

Marine clay which has deposited at elevation from -1m to -36 m is very soft silty clay layer with N-values of zero. The maximum thickness confirmed is 27m at BH1.

Decomposed rock consists of shale disintegrated into clay and sand with N-values less than 50. This layer represents the base formation of the survey site. The thickness ranges from 0 m to 10 m.

Weathered Rock features hard formations with N-values more than 50. This formation was confirmed at an elevation of around - 40 m. The maximum thickness was only 2 m.

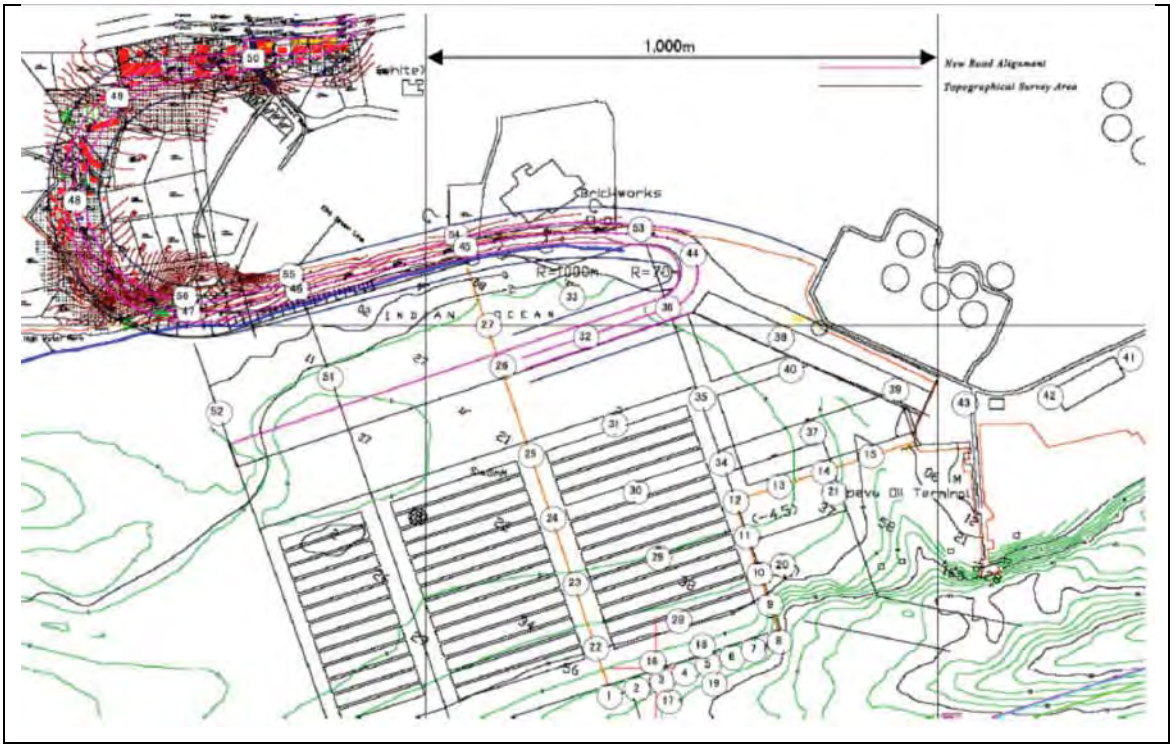


Figure 4.2.18 Borehole Location (Phase 1)
Source: Mombasa Port Development Project Detailed Design Report

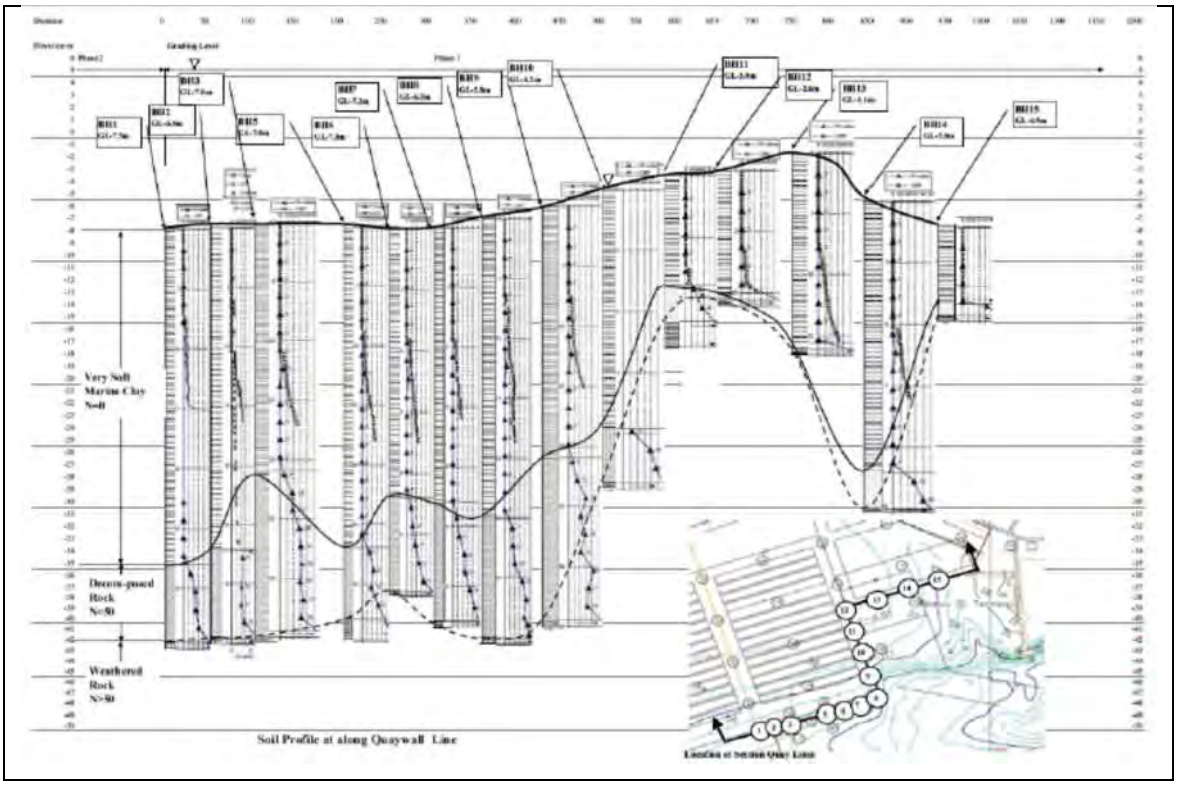


Figure 4.2.19 Soil Profile (Phase 1)
Source: Mombasa Port Development Project Detailed Design Report

(2) Soil condition of Dongo Kundu

Soil investigations were performed at 4 offshore and at 10 onshore boreholes at the Dongo Kundu area in 1989. Borehole locations are shown in Figure 4.2.20. Coordinates of the boreholes are not indicated in the report. Approximate positions of the boreholes are shown in Figure 4.2.20.

The results of the survey are summarized as follows. Quaternary deposits are accumulated with a thickness from 1m to 38 m, overlying Jurassic shale. The upland area consists of shale covered by fine and medium silt sands. Near the shoreline area consist of clayey materials of various thicknesses overlying the shale. Very soft clayey materials can be easily dredged but are not suitable for use as reclamation material. The stratification of Dongo Kundu is mentioned later.

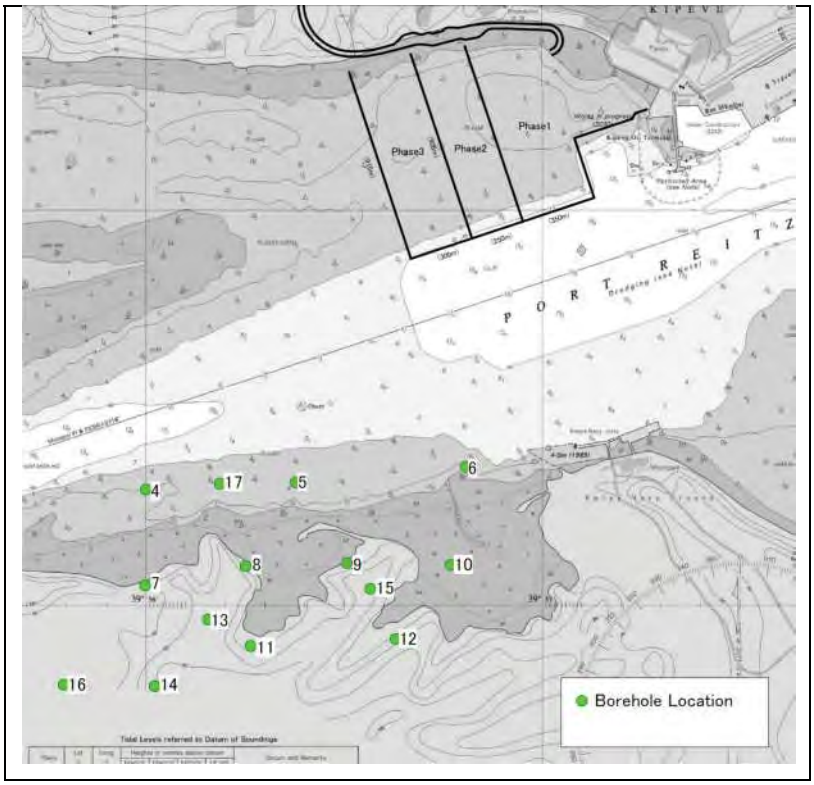


Figure 4.2.20 Borehole Location (1989)
Source: Mombasa Port Expansion Feasibility Study Phase 2

(3) Geotechnical investigation by JICA Team

a) Survey area

The soil investigations were performed offshore at 5 points and onshore at 1 point. Figure 4.2.21 presents borehole locations. Overview of each boring position is as follows

- BH2A,BH4,BH1: On a extension line of berth No.21
- BH2: Center of the channel
- BH3: Port facilities construction candidate sites at Dongo Kundu
- BH5: Upland part of Dongo Kundu

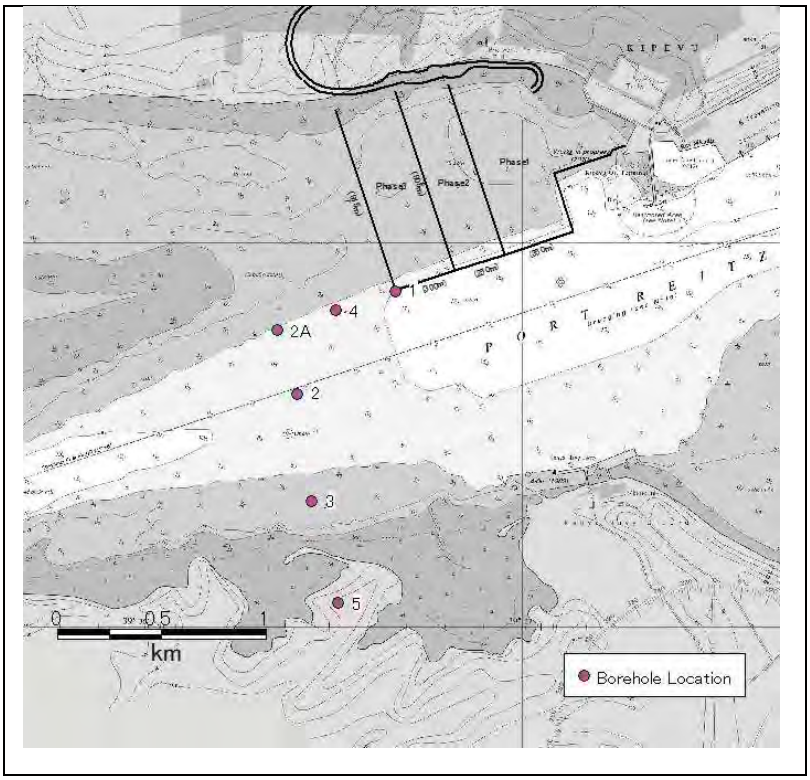


Figure 4.2.21 Borehole Location
Source: JICA Team

b) Survey period

Field works were carried out from October 27th to December 10th, 2014.

c) Methodology

Drilling

Percussion and rotary drilling rigs were used to conduct drilling onshore and offshore as seen in Figure 4.2.22. For offshore boring, a drilling rig was installed on a pontoon. Temporary casing pipes were used to protect the borehole during penetration. A total of 6 boreholes were drilled at the site ranging between 29m GL to 58m GL below seabed in offshore drilling and 28 m GL depth on land.

Standard penetration test (SPT)

Standard penetration tests were carried out with an interval of 1.5 m in the boreholes during penetration. SPTs were carried out in accordance with BS 1377. The total number of blows required to cause the sampler to penetrate 4 x 75mm was recorded as N-values. When the blow count reaches 50, the test is stopped and the results are recorded as refusal.

Sampling

Undisturbed and disturbed samples were carried out. Core samples were obtained for rock formation.


Drilling Rig (Onshore)


Drilling Rig (Offshore)


Jack Up Barge (Pontoon)


Soil Sample

Core Sample

Figure 4.2.22 Survey Situation (Boring)
Source: JICA Team

d) Results of survey

Quantity of survey

The total quantities performed through the soil investigation are shown in Table 4.2.5. Drilling depths in Table 4.2.5 are presented as depths of from the seabed or ground surface.

Table 4.2.5 Total Quantity of Field Survey

Borehole No.	Boring Depth (m)	Coring Depth(m)	Undisturbed Sample	Disturbed Sample	
				by SPT	by Bulk
1	Sea bed to 7.50	7.50 to 29.0	NIL	5	5
2	Sea bed to 36.00	36.00 to 58.0	2	22	24
2A	Sea bed to 17.00	17.00 to 31.90	NIL	12	12
3	Sea bed to 35.00	35.00 to 45.00	2	23	23
4	Sea bed to 15.50	15.50 to 30.00	2	10	10
5	G.L to 1.0	1.0 to 28.0	NIL	1	1

Source: JICA Team

Soil profile

Soil profiles are drawn based on soil investigation results and existing data in order to grasp geological conditions in Port Reitz and Dongo Kundu. Four soil profiles (CS01 –CS04) are shown in Figure 4.2.24 – Figure 4.2.27 and their locations are shown in Figure 4.2.23. The summary of the soil profile is described below

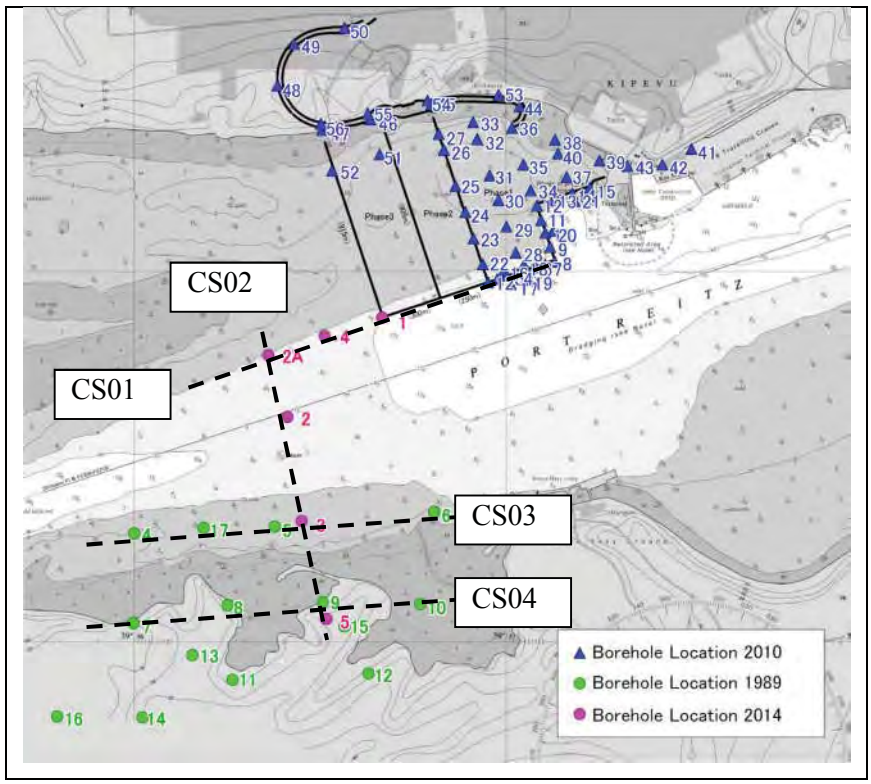


Figure 4.2.23 Location of Soil Profile
Source: JICA Team

CS01

The soil profile CS01 is drawn based on soil investigation results (BH2A, BH4 and BH1) and previous soil investigations, which were conducted on the quay line of berth No.21 during the Phase 1 project in 2010. Stratification at the candidate area for the port expansion after Phase 3 can be roughly confirmed by CS01. Characteristics of Stratification at CS01 are summarized as below.

- Soft cohesive soil C1 layer which was mainly composed of Clay is thickly deposited below

the sea bed.

- The N-values of C1 layer range from 1 to 26 and mostly less than 10. Hard deposits in C1 layer were partially confirmed at BH4 with N value 44
- Since C1 layer is soft, when reclamation work is planned, consolidation settlement should be taken into consideration.
- S1 (Sand) layer which is soft with N value 1 is deposited between C1 layer
- S2 (sand) layer is not continuous to horizontal direction. N value ranges from 16 to 45
- Bedrock is Sh (Shale) layer with N-value of more than 50. However, the weathering rock with N-values less than 50 is seen in the soil investigation result in 2010.
- The top of Sh layer has formed gentle slope. However, according to the existing soil investigation results, it is estimated that the elevation of surface of Sh layer has frequent ups and downs.

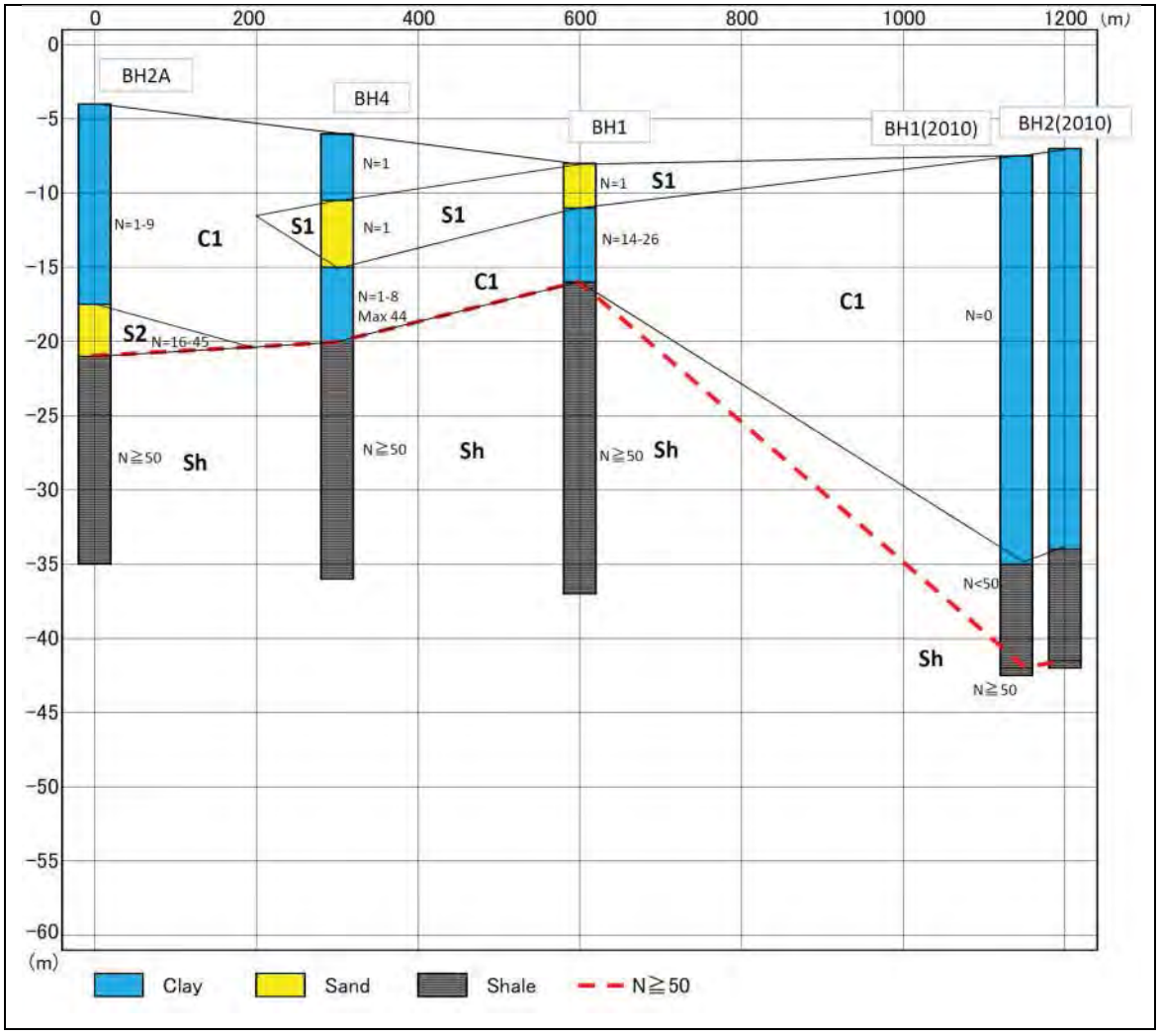


Figure 4.2.24 Soil Profile CS01 (BH2A, BH4, BH1, BH1-2010, BH2-2010)
Source: JICA Team

CS02

The soil profile CS02 is drawn based on soil investigation results (BH2A, BH2, BH3 and BH5). Comparison of stratification among Port Reitz, center of channel and Dongo Kundu can be done by CS02. Characteristics of stratification at CS02 are summarized below.

- Soft cohesive soil C1 layer which was mainly composed of clay is thickly deposited below the sea bed.
- The N-values of C1 layer range from 1 to 26 and mostly less than 10.
- S2 (sand) layer is not continuous to horizontal direction. N values range from 16 to 45
- Under the C1 layer, Si1 (Silt) layer is deposited. Si1 layer consists of slightly harder deposits than C1 layer with N-value ranging from 6 to 47.
- Bedrock is composed by Sh layer, SS (Sand Stone) layer and Ms (Mad Stone) layer with N-values of more than 50.
- Sand layer by weathering was confirmed between the bedrock at upland borehole (BH5)
- The bearing stratum is Sh layer which has N values more than 50. However, Si layer and C2 layer distributed at BH2 and BH3 can also be regarded as the bearing stratum as N-values recorded more than 50.
- The bearing stratum at the Dongo Kundu side (BH3) has been encountered in a deeper point of depth than the Port Reitz side (BH2A). The top of bedrock at BH2A was encountered at the elevation of -21m. On the other hand, it was encountered at -41m at BH2.

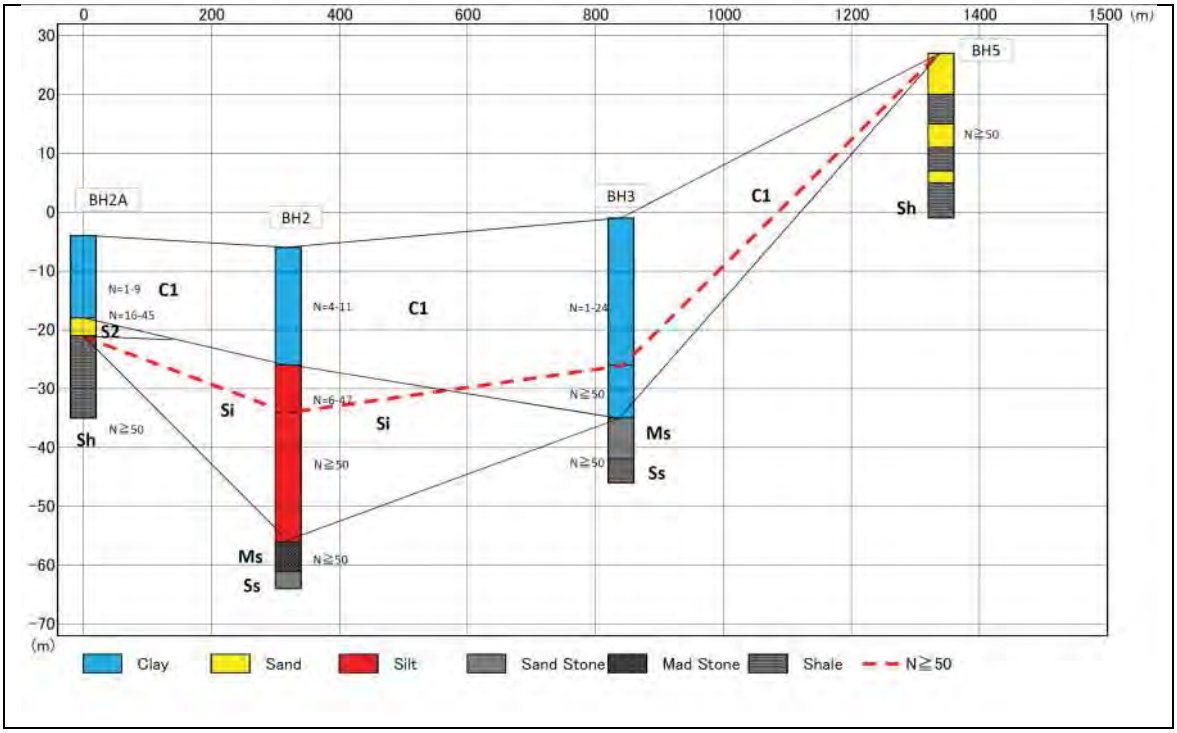


Figure 4.2.25 Soil Profile CS02 (BH2A, BH2, BH3, BH5)
Source: JICA Team

CS03

The soil profile CS03 is drawn based on soil investigation results (BH3) and existing data, which are conducted in 1989 in Dongo Kundu. Stratification at the candidate area for port expansion in Dongo Kundu can be roughly confirmed by CS03. Coordinates of borehole is not certain, therefore Figure 4.2.26 shows approximate distance between boreholes. Characteristics of Stratification at CS03 are summarized as below.

- Soft cohesive soil C1 layer which was mainly composed of Clay is thickly deposited below the sea bed.
- The N-values of C1 layer ranges from 1 to 54 and mostly less than 10. Hard deposits in C1 layer was partially confirmed at BH5 (1989) and BH6 (1989) with N value more than 50.
- The S1 layer with N-value 0 is deposited overlaying C1 layer. The S1 layer is not continuous

to horizontal direction.

- The G (Gravel) layer having N-values more than 50 is not continuous to horizontal direction.
- At BH3, there is the layer with N-values more than 50 under the C1 layer.
- Bedrock is Sh layer having N-value of more than 50.
- The bearing stratum is the top of Sh layer, G layer and Ss layer at BH3.

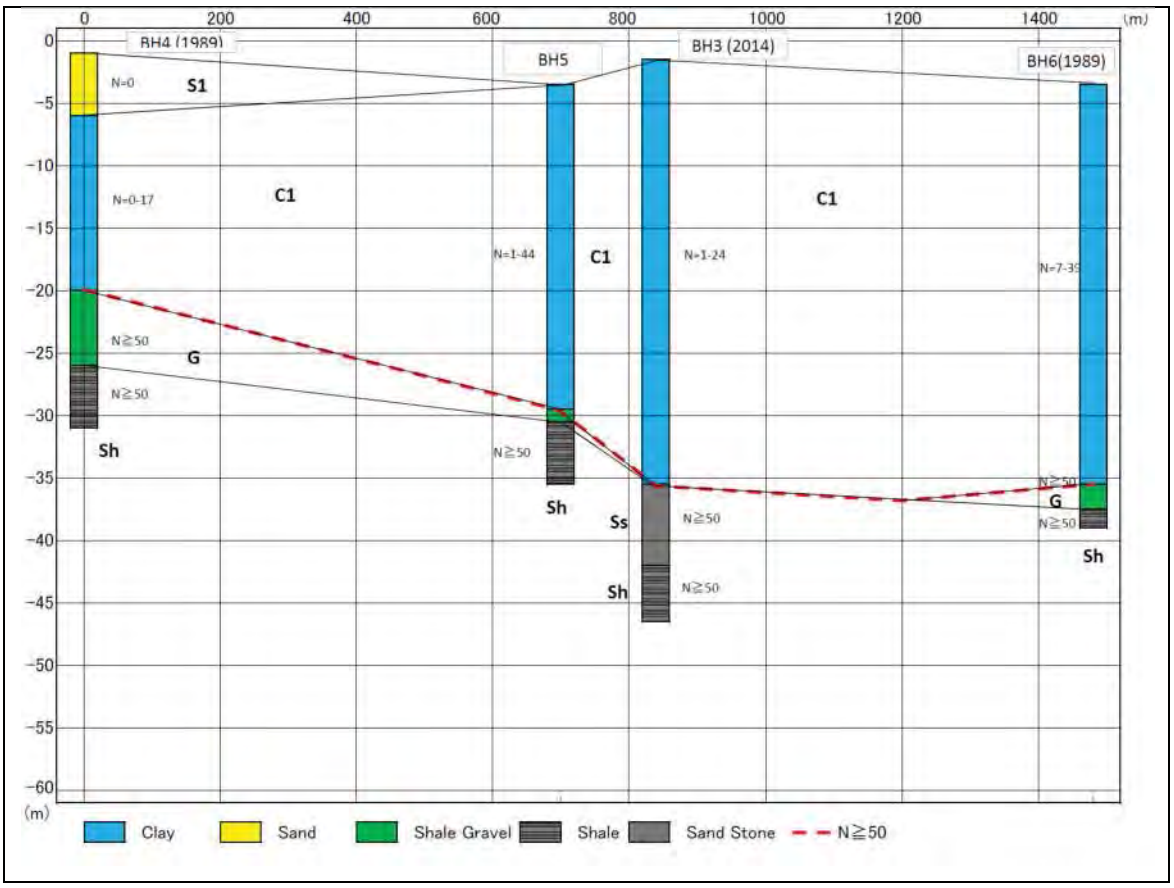


Figure 4.2.26 Soil Profile CS03 (BH4-1989, BH5-1989, BH3, BH6-1989)
Source: JICA Team

CS04

The soil profile CS04 is drawn based on the existing data, which were collected in 1989 in Dongo Kundu. Stratification at the swale and on-land in Dongo Kundu can be roughly confirmed by CS04. Characteristics of Stratification at CS04 are summarized as below.

- The S1 layer is distributed with N-value ranging from 0 to 15 as first layer.
- At Bh7, C1 (Clay) layer is deposited with N-value from 11 to 29 as first layer.
- N-value of G layer is 24. The G layer is not continuous to horizontal direction.
- Bedrock and the bearing stratum is Sh layer having N-value more than 50.

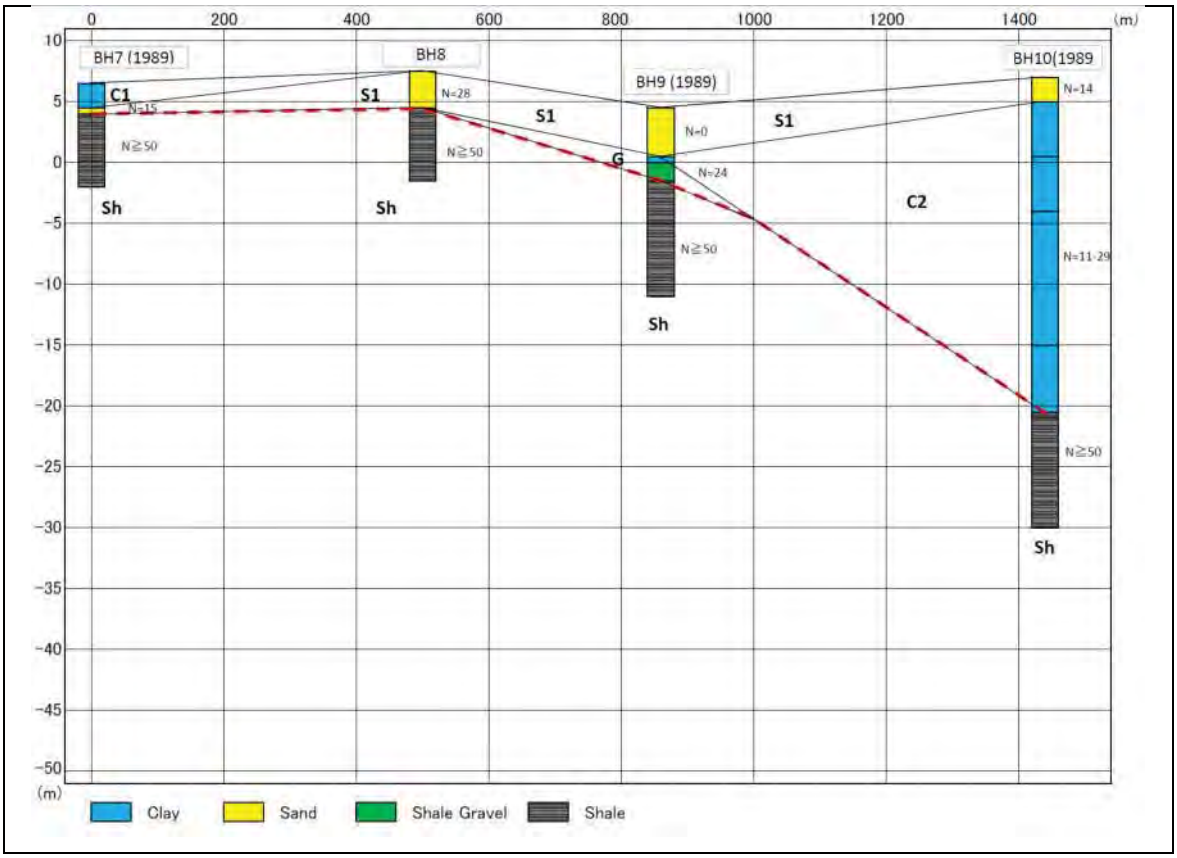


Figure 4.2.27 Soil Profile CS04 (BH7-1989, BH8-1989, BH9-1989, BH10-1989)
Source: JICA Team

Laboratory Tests

Following laboratory tests were conducted using disturbed and undisturbed samples.

- Grain Size Analysis
- Atterberg Limits
- Specific Gravity
- Moisture Content
- Soil Unit Weight
- Consolidation Test
- Unconfined Compression Tests

Quantity of laboratory tests performed is summarized in Table 4.2.6

Table 4.2.6 Quantity of Laboratory Tests

Borehole No.	Grain Size Analysis	Atterberg Limits	Specific Gravity	Moisture Content	Soil Unit Weight	Consolidation Test	Unconfined Compression Tests
1	4	3	2	3	3	-	-
2	9	3	9	9	9	1	-
2A	7	4	9	9	9	-	-
3	10	5	11	11	9	2	4
4	8	5	10	10	10	-	-
5	1	1	1	1	-	-	1

Source: JICA Team

Grain Size Analysis

Grain size distribution curve for each borehole is shown in Figure 4.2.28. Characteristic of grain size distribution are summarized below.

- BH1: Grain size distribution curve shows a steep slope in the vicinity of fine sand (0.1 – 0.25 mm), therefore it is mainly formed from fine sand. Coarse sand increases towards under layers. Grain size varies greatly among the depth.
- BH2: It is formed from uniform silt.
- BH2A: It is formed from fine sand and silt. Coarse sand increases toward to under layers. In the sample of under layer, B17 (Depth 12 - 13.5m) and B21 (15 - 16.5m), grain size distribution curve shows gentle slope and grain size is distributed widely.
- BH3: It is formed from uniform silt.
- BH4: Coarse sand increases towards under layers. Grain size varies greatly among the depth.
- BH5: It is mainly formed from fine sand.

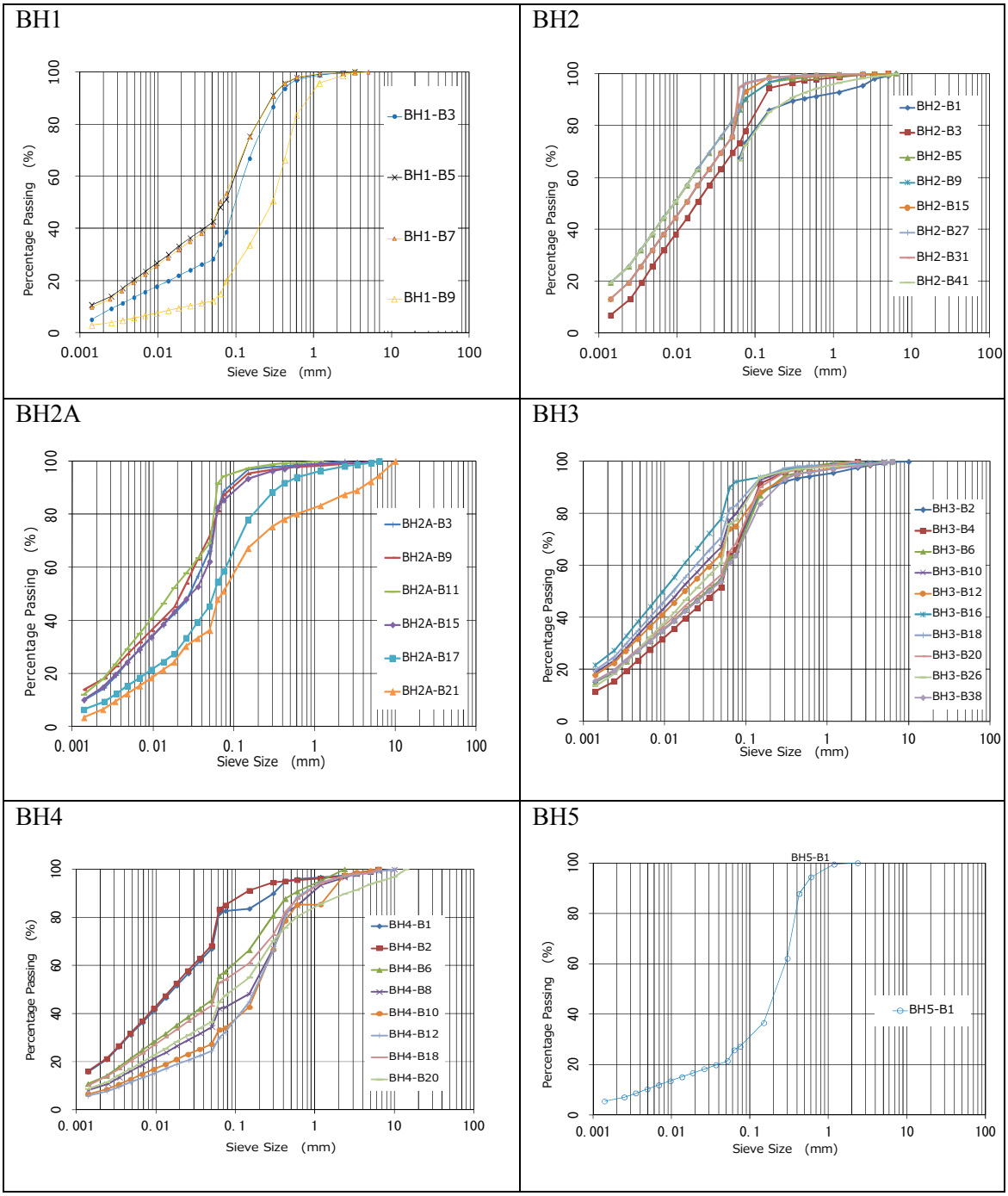


Figure 4.2.28 Grain Size Distribution Curve
Source: JICA Team

Atterberg Limits

Figure 4.2.29 shows the plastic chart based on result of tests. Consistencies for the samples are summarized below.

- Most of samples are classified into clay with low liquid limit or silt with high liquid limit.
- Liquid limit ranges from 27 to 58.
- Plastic index ranges from 11 to 28.
- The samples at BH1 are classified into silt with low liquid limit.
- The samples at BH2 and BH3 are classified into silt with high liquid limit.

- The samples at BH4 are classified into clay with widely distributed liquid limit.
- The samples at BH2A are classified into clay with high liquid limit.

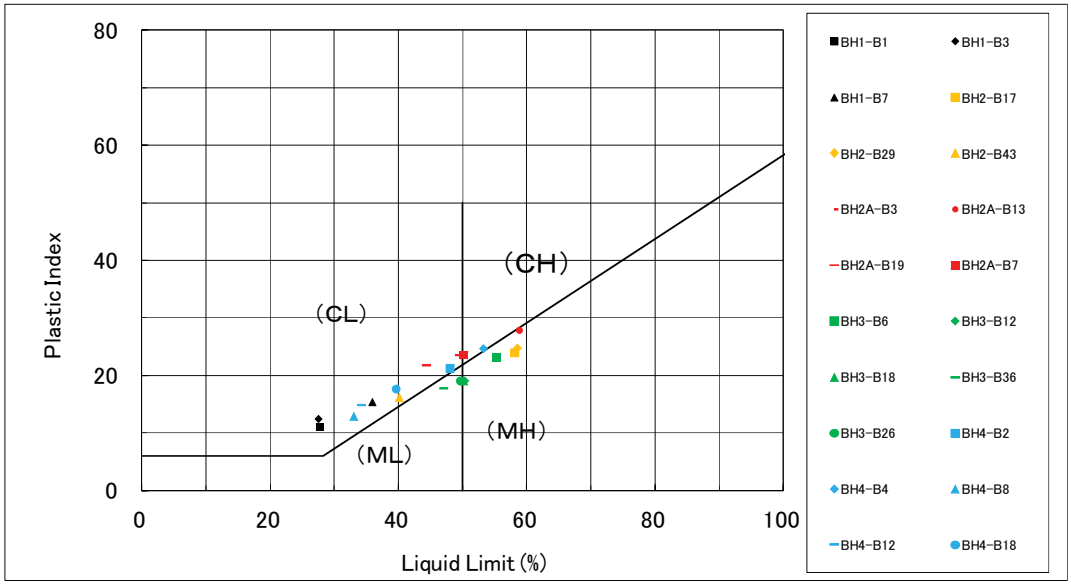


Figure 4.2.29 Plastic Chart
Source: JICA Team

Specific Gravity

Table 4.2.7 shows specific gravity for each borehole. Specific Gravity ranges from 2.42 to 2.71 g/cm3.

Table 4.2.7 Specific Gravity

Borehole No.	Specific Gravity (g/cm3)		
	Max.	Min.	Ave.
1	2.65	2.64	2.65
2	2.55	2.42	2.49
2A	2.71	2.66	2.70
3	2.70	2.65	2.67
4	2.70	2.63	2.67
5	2.62	2.62	2.62

Source: JICA Team

Moisture Content

Table 4.2.8 shows moisture content for each borehole. The samples with high fine particle show high moisture content tendency. Sample of BH2 has silt with moisture contents more than 100%. Therefore, mixing of humus soil is expected.

Table 4.2.8 Moisture Content

Borehole No.	Moisture Content (%)		
	Max.	Min.	Ave.
1	41.00	27.30	31.90
2	157.90	59.90	89.03
2A	64.10	38.90	56.23
3	77.20	39.50	57.21
4	58.10	29.80	48.69
5	14.10	14.10	14.10

Source: JICA Team

Soil Unit Weight

Table 4.2.9 shows soil unit weight for each borehole. Soil unit weight ranges from 0.72 to 1.24 g/cm3.

Table 4.2.9 Soli Unit Weight

Borehole No.	Soil Unit Weight (g/cm3)		
	Max.	Min.	Ave.
1	1.12	1.24	1.16
2	0.72	0.76	0.74
2A	1.14	1.21	1.17
3	1.13	1.20	1.16
4	1.08	1.18	1.14
5	―	―	―

Source: JICA Team

Consolidation Test

The result of consolidation test is shown in Table 4.2.10 and Figure 4.2.30. The sample of BH2 has high compressibility characteristics because compression index is high at 0.701. Furthermore, there is possibility that the consolidation settlement will occur because the consolidation yield stress is low (113kpa). Regarding the sample of BH3, it has low compressibility characteristics and low possibility of consolidation settlement.

Table 4.2.10 Consolidation Test

Borehole No.	Consolidation Yield Stress Pc (kPa)	Compression Index Cc
BH2	113	0.701
BH3	264	0.292
BH3	152	0.243

Source: JICA Team

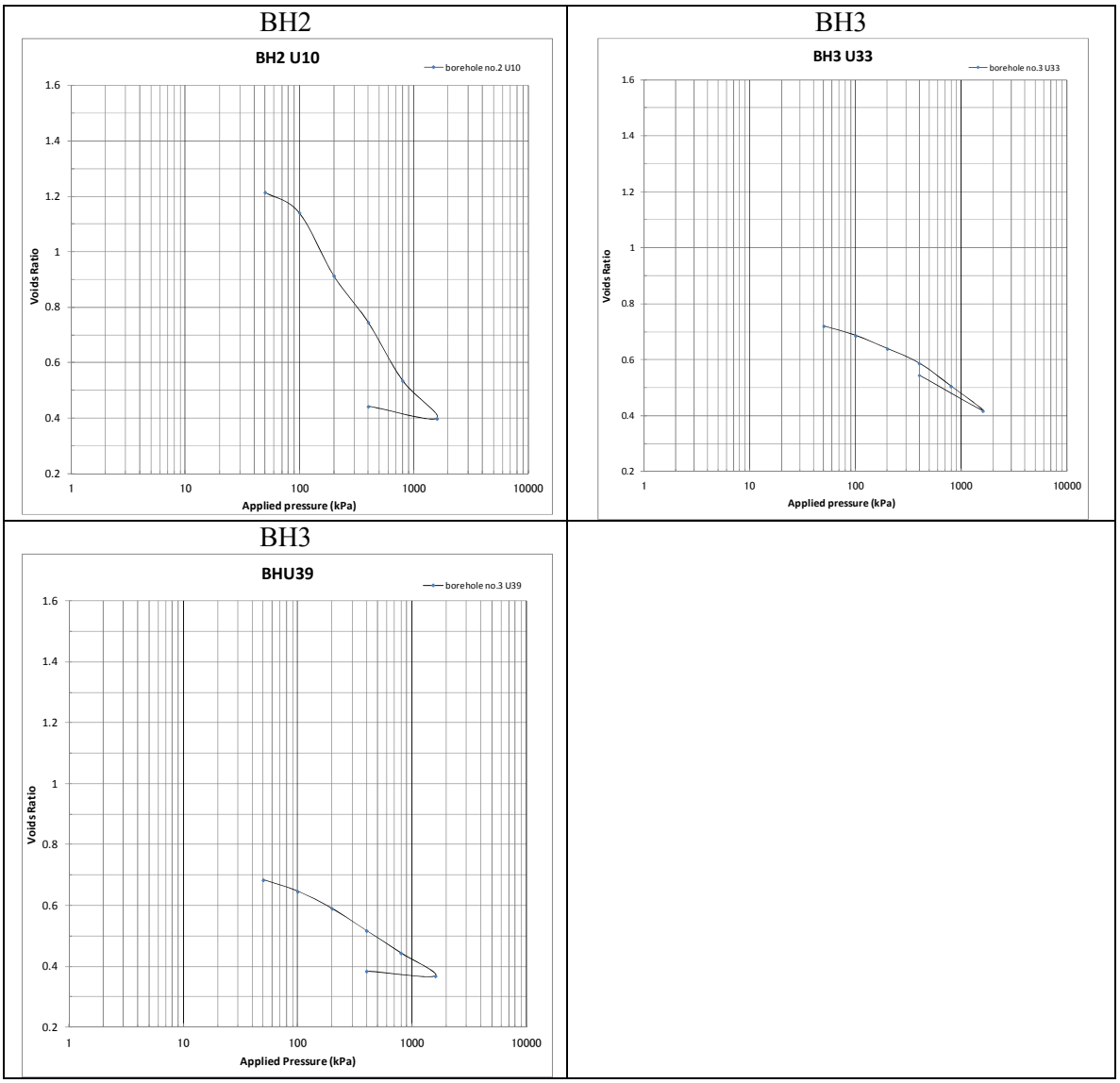


Figure 4.2.30 Consolidation Test
Source: JICA Team

Unconfined Compression Tests

The result of unconfined compression tests are shown in Table 4.2.11 Unconfined compression strength is used for rock mass classification. Rock mass with unconfined compression strength of more than 25 MN/m2 (i.e. 25,000KN/m2) is classified into hard rock, while it is classified as soft rock when it is less than 25 MN/m2. (Source: ISRM 1977 Suggested methods for the quantitative description of discontinuities in rock masses) According to the above classification method, BH3 is classified as soft rock and BH5 is classified as hard rock.

Table 4.2.11 Unconfined Compression Test Result

Borehole No.	Depth (m)	Unconfined compression strength (KN/m2)	Rock mass classification
BH3	34.50-34.70	3,400	Soft Rock
BH3	36.00-36.80	2,800	Soft Rock
BH3	36.80-37.25	2,800	Soft Rock
BH3	37.50-37.90	3,300	Soft Rock
BH5	26.50-26.90	37,400	Hard Rock

Source: JICA Team

4.3 Environmental and social considerations

4.3.1 Scope of environmental and social considerations study

This Project is conducted in line with JICA Guidelines for Environmental and Social Considerations (April, 2010) and categorized as Category B. The scope of environmental and social consideration study is shown below according to the RD between KPA and JICA signed in May 2014.

- To collect and analyze data and information related to the environmental and social considerations in the vicinity of the port
- To conduct the study on environmental and social considerations analysis for Dongo Kundu Port Facility and Mombasa Port Master Plan
- To support KPA in holding stakeholder meeting

The main output from the study is to identify the potential environmental and social issues and develop the TOR to predict the major adverse impacts in EIA (Environmental and Impact Assessment) for further study in the future.

The overall study flow is shown in the figure below.

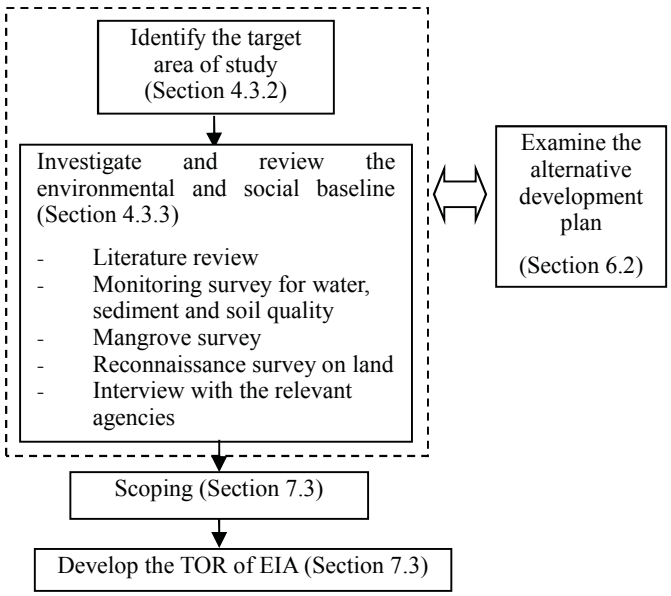


Figure 4.3.1 Overall Flow of Environmental and Social Study
Source: JICA Team

4.3.2 Target area of the Environmental and Social Considerations Study

The target of the environmental and social considerations study is the prioritized project derived from the port development plan, which is the northern area (a part of Port Reitz) next to berth No. 23 and the southern area (a part of Dongo Kundu) (hereafter referred to as "the Study Area") (see Figure 4.3.2 and Figure 4.3.3).

Figure 4.3.2 Dongo Kundu Area
Source: JICA Team

Figure 4.3.3 Port Reitz Area
Source: JICA Team

4.3.3 Environmental and social baseline

(1) Key Findings

The baseline information on environmental and social conditions in the vicinity of Project area is collected by a review of relevant literature, reconnaissance survey including the Mangrove survey and sampling survey of water, sediment and soil quality. It is noted that the following environmental and social aspects are especially considered as sensitive, natural and cultural resources which might be threatened by the development.

- Abundant biodiversity in the coastal and intertidal area including the Mangrove forest
- Around 36 ha of Mangrove forest falling into the port development area at maximum
- Port Reitz creek, as the important fishing area for local artisanal fisheries and traders.
- Kaya, a sacred forest and cultural resources in the coastal Kenya, which is largely intact and rich in endemic biodiversity; Three Kayas are identified in the Study Area.
- Possibility of underwater and terrestrial archeological remains

The other key findings are the existence of settlers and local socioeconomic activities in the target area as summarized below.

- Around 19 HHs with 84 people are located in the southern Study Area while around total 480 HHs of informal settlers are confirmed in the entire area of Dongo Kundu.
- The socioeconomic status of most informal settlers is considered vulnerable because of their poverty, low education and limited livelihood opportunities.
- Port Reitz creek and the shoreline are used by local communities for activities such as artisanal fishing, small-scale beekeeping, local transportation between Port Reitz and Dongo Kundu by small boat and so forth.

(2) Related Projects

Since there are some on-going and past projects/studies in the vicinity of the target area, the relevant projects' output and activities were reviewed so that the lessons learned from those projects are noted in the future development.

In association with the construction of the 2nd container terminal and Mombasa Port Master Plan (2004, revised in 2009), Environmental Impact Assessment (EIA) for the container terminal modernization project at the northern side of Port Reitz was approved by National Environmental Management Authority (NEMA) in 2007 and its license was extended in 2011. The port development project also prepared the Resettlement Action Plan (RAP) (2001) as well as Mangrove re-plantation method statement and Archeological Impact Assessment report (National Museums of Kenya, 2011). Also concerning the new container terminal, the waterfront area of Port Reitz attracts a part of alignment of SGR, Southern Bypass Road and access road. The SGR project currently deals with the involuntary resettlement issue for over 100 households (HHs) there.In the Dongo Kundu area, on the other hand, the Strategic Environmental Assessment (SEA) was conducted for the Master Plan for the development of Mombasa SEZ by MOIED and approved by NEMA in March, 2015. The approval condition requires the PPP owner to undertake the EIAs for specific projects and prepare integrated management plans for conservation of Mangrove, intertidal ecosystem and wildlife, wetlands and riparian reserve. One of the main issues which emerged from the SEA was the need to develop a comprehensive RAP in Dongo Kundu. Thus, KPA, the land owner of the Dongo Kundu site, has engaged a national expert team for preparation of RAP.

(3) Pollution control

a) Monitoring survey for water, sediment and soil quality

In order to monitor the baseline of water/sediment/soil quality, the sampling survey was conducted in the Survey Area (see Figure 4.3.4). As shown in Table 4.3.1, the surface/bottom water and sediment core samples were taken at three locations and surface soil at one location and analyzed on site or in the laboratory. The analysis method and result are described in Table 4.3.2 and Table 4.3.3 - Table 4.3.5. The results revealed high BOD and low DO among others due to eutrophication of the creek

though the environmental standard for marine water is not stipulated in Kenya. The result of the sediment and soil quality analysis, on the other hand, indicated that the heavy metal and oil and grease level were quite lower than the reference standard and no PAH and PCB were detected.

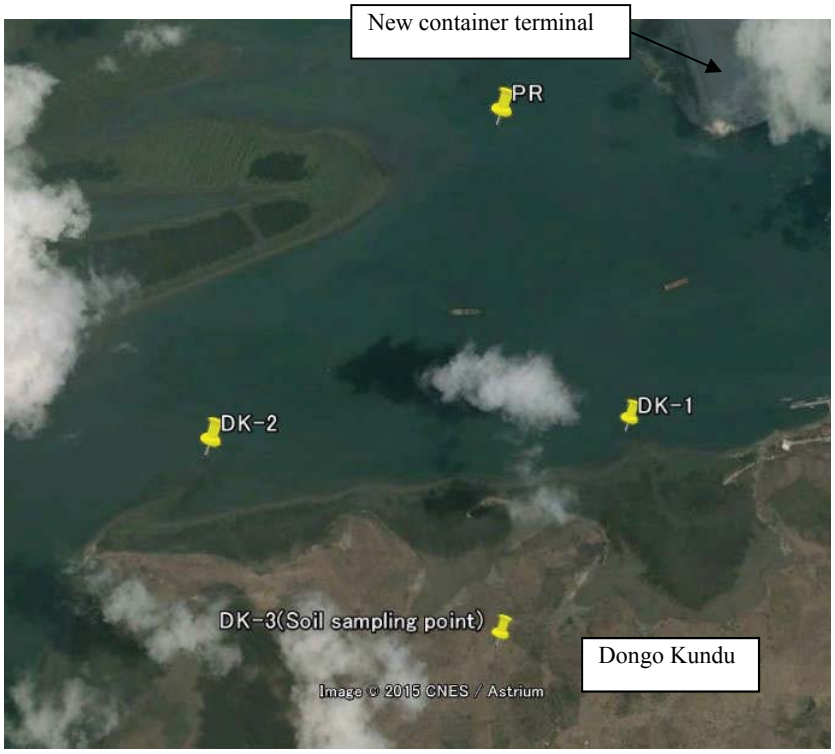


Figure 4.3.4 Sampling Point for Monitoring Survey for Water, Sediment and Soil Quality
Source: Google earth

Table 4.3.1 Information on Sampling Survey

Sampling point	Sample	Sampling Date
DK-1	Surface water (0.5 – 1.0 m from the surface), Bottom water (1m – 1.5 m from the bottom), Sediment(0 -1.0 m from the sea bottom)	At low tide on 25 November
DK-2	ditto	ditto
PR	ditto	ditto
DK-3	Surface soil	4 April 2015

Source: JICA Team

Table 4.3.2 Analysis Method for Water Quality Survey

Parameter	Analysis Method
Water quality	
Turbidity	APHA 2130B (Nephelometric Method)
Visibility	Secchi disc method
Temperature	Hand held YSI Professional Plus meter
Salinity*	Hand held YSI Professional Plus meter
pH	Hand held YSI Professional Plus meter
TSS	USGS- 3765-85 (Solids, residue suspended evaporation 105° C)
BOD (mg/L)	AOAC 973.44 (Incubation Method)
DO	AOAC 973.45 (Titrimetric method)
TN(Total Nitrogen)	AOAC 973.48 (Kjeldahl Method)
TP(Total Phosphorus)	APHA 4500-P F (Automater Ascorbic Acid Reduction Method)
Total coliforms	ISO 4832 (Horizontal method for the enumeration of coliforms- Colony count technique)
Faecal coliform	APHA 9222D (Faecal Coliform Membrane Filter Procedure)
Escherichia coli.	ISO 16649-2（Horizontal method/ Colony-count）
Sediment /soil quality	
Oil and grease	APHA 5520E (Extraction Method for Sludge Samples)
PAH	APHA 6440B (Liquid-Liquid Extraction Chromatographic Method)
Metals (Cd, Pb, Zn, Cr, Cu, Ni, Ag, Hg, As)	AOAC 990.08 (Metals in Solid Wastes by ICP)
PCB	APHA 6630B (Liquid-Liquid Extraction Gas Chromatography Method)

Source: JICA Team

Table 4.3.3 Result of Water Quality Survey

Parameter		DK-1		DK-2		PR	
		Surface	Bottom	Surface	Bottom	Surface	Bottom
Turbidity	(NTU)	4	7	4	4	6	4
Visibility	(m)	99	-	92	-	63	-
Temperature	(°C)	34.2	31.2	32.8	31.1	31.5	32
Salinity*	(PSU)	35.2	35.6	35.7	35.6	34.9	34.9
pH	-	7.69	7.9	7.88	7.95	7.72	7.69
TSS	(mg/L)	28	31	40	31	39	47
BOD (mg/L)	(mg/L)	46	46	22	42	46	47
DO	(mg/L)	4	4.1	3.1	3.2	3.9	3.8
TN	(mg/L)	22.1	14.71	36.8	29.43	7.4	14.71
TP	(mg/L)	1.67	1.11	2.78	2.22	0.55	1.11
Total coliforms	(Cfu/ml)	Nil	2	Nil	Nil	Nil	1
Faecal coliform	(Cfu/ 50ml)	Nil	Nil	Nil	Nil	Nil	Nil
Escherichia coli.	(Cfu/ml)	Nil	Nil	Nil	Nil	Nil	Nil

* Calculated from electrical conductivity and temperature
Note) The COD was also analyzed, but the result was rejected due to the unreliability of accuracy of analysis result.
Source: JICA Team

Table 4.3.4 Result of Sediment Quality Survey

Parameter		DK-1	DK-2	PR	Reference data		
					Past studies in port Reitz *	Canadian Sediment Quality Guidelines (ISQG)	Canadian Sediment Quality Guidelines (PEL)
Cd		<0.01	<0.01	<0.01	1.38-12.74	0.7	4.2
Pb		10.45	9.78	<0.04	8.25-89.06	30.2	112
Zn		31.63	10.32	19.4	-	124	271
Cr		2.1	2.4	2.7	291-1445	523	160
Cu		4.52	<0.01	<0.01	-	18.7	108
Ni		<0.01	<0.01	<0.01	-		
Ag		<0.01	<0.01	<0.01	-		
Hg		<0.001	<0.001	<0.001	0.06-0.19	0.13	0.7
As		0.02	0.04	0.03	-	7.24	41.6
Oil& Grease		0.95	0.05	0.06	-	-	-
PCB		ND (<0.01)	ND (<0.01)	ND (<0.01)	-	-	-
PAHs	Napthalene	<0.01	<0.01	<0.01	-	0.034	0.391
	Acenaphthylene	<0.01	<0.01	<0.01	-	0.00587	0.128
	Acenaphthene	<0.01	<0.01	<0.01	-	0.00671	0.0889
	Fluorene	<0.01	<0.01	<0.01	-	0.021	0.144
	Phenanthrene	<0.01	<0.01	<0.01	-	0.087	0.544
	Anthracene	<0.01	<0.01	<0.01	-	0.047	0.245
	Fluorathene	<0.01	<0.01	<0.01	-	0.113	1.494
	Pyrene	<0.01	<0.01	<0.01	-	0.153	1.398
	Benzo(a)anthracene	<0.01	<0.01	<0.01	-	0.0748	0.693
	Chrysene	<0.01	<0.01	<0.01	-	0.108	0.846
	Benzo(b)fluoranthene	<0.01	<0.01	<0.01	-	-	-
	Benzo(k)Fluoranthene	<0.01	<0.01	<0.01	-	-	-
	Benzo(a)Pyrene	<0.01	<0.01	<0.01	-	0.0888	0.763

Unit of Oil& Grease: % wt ww
Unit of other parameters: mg/kg of dry sediment
* Adala et al., 2007, 2009
Note) The Canadian Sediment Quality Guidelines are referred to because they are one of the representative standards which are widely-used to evaluate the sediment quality.
Source: JICA Team

Table 4.3.5 Result of Soil Quality Survey

Parameter		DK-3	Canadian soil quality guidelines for the protection of environmental and human health	
			Agricultural use	Commercial use
Heavy metals	Cd	1.23	1.4	22
	Pb	1.06	70	260
	Zn	59.06	200	360
	Cr	58.69	64	87
	Cu	39.9	63	91
	Ni	31.6	50	50
	Ag	<0.01	20	40
	Hg	0.85	2.6	24
	As	<0.005	12	12
PCB	PCB	<0.01	0.5	33
PAHs	Napthalene	<0.01	-	-
	Acenaphthylene	<0.01	-	-
	Acenaphthene	<0.01	-	-
	Fluorene	<0.01	-	-
	Phenanthrene	<0.01	-	-
	Anthracene	<0.01	0.3	-
	Fluorathene	<0.01	-	-
	Pyrene	<0.01	-	-
	Benzo(a)anthracene	<0.01	-	-
	Chrysene	<0.01	-	-
	Benzo(b)fluoranthene	<0.01	-	-
	Benzo(k)Fluoranthene	<0.01	-	-
	Benzo(a)Pyrene	<0.01	-	-

Unit: mg/kg
Source: JICA Team

b) Past monitoring data in Port Reitz

Port construction and operation involves various kinds of activities which can deteriorate air and water quality as well as produce noise and vibration. In addition to the EIA study, some monitoring surveys near the Study Area in Port Reitz were conducted to identify baseline parameters prior to construction work of new container terminal (see Table 4.3.6).

Table 4.3.6 Summary of Monitoring Data of the Past Survey in Port Reitz

Item	Sampling location/Time/ Item	Summary of result
Water quality	- 7 points near the construction site in the creek and 3 points near the planned dumping site in offshore area - 30 days from July to August in 2012 - Turbidity, TSS	- There is very low turbidity in the deep oceans. Turbidity varied with varying weather conditions. - Dissolved oxygen varied daily depending on the activities of the ocean.
Air quality	- 5 points near the active construction areas and near sensitive receptors - July and December 2012 - 24 hour continuously measurements of Particulate matter, Sulphur dioxides (SO2), Nitrogen oxides (NO), Carbon dioxide/ monoxide, and Hydrogen sulphide (H2S)	- CO: 0.0 – 750µg/m3, NO_2: <2.63 – 3.7µg/m^3, SO_2: <1.15 – 1.8µg/m^3, H_2S: < 0.1, PM_{10}: 15 – 49µg/m^3, - No risk to public health and below the ambient air quality tolerance limits.
Noise and vibration	- 5 points near the active construction areas and near sensitive receptors - 24 hours in July and December 2012	- LA eq : 64.9 – 71.5 dB (day time), 65.6 – 68.3 dB (night time) - The baseline values at daytime were well below the provided limits (75dB). - Baseline night average values surpassed the provided limits (65dB) but very slightly. The highest readings were recorded at the point which is close to the main road due to the heavy trucks traffic

Source: Toyo Construction Co., Ltd, Environmental Monitoring Baseline Survey Report for Construction of Civil Works and Buildings under Mombasa Port Development Project, 2012

(4) Natural environment baseline

a) Mangrove survey

Since the coastal line of the project area in Dongo Kundu is covered by the Mangrove forest which is vital to the diverse ecosystem, the survey to evaluate the status of the Mangrove forest was conducted by the local subcontractor. At first it was found that the Study Area covers around 35. ha of Mangrove which has the belt like distribution in the shoreline(Figure 4.3.5). Secondly, in order to evaluate the Mangrove structure, the survey plot was selected to be perpendicular to the shoreline and a total of three 10 m x 10 m plots within the selected transects were determined as shown in Figure 4.3.5. All the trees inside the plots were identified and counted. Vegetation parameters included stand density (stems/ha), tree height (m) and stem diameter (cm). Natural regeneration pattern was assessed using linear regeneration techniques; in which juveniles with Dbh (Diameter at breast height) less than 2.5 cm were categorized based on their size classes (RCI: less than 40 cm in height, RCII: between 40 and 150 cm in height, RCIII: greater than 1.5 m in height). Forest condition was estimated using the number of stumps and dead trees in each plot.

The survey result revealed that there are five mangrove tree species; *Avicennia marina*, *Bruguiera gymnorrhiza*, *Ceriops tagal*, *Rhizophora mucronata*, *Sonneratia alba*) (Table 4.3.7). Among them, *R. mucronata* is the principal species. *A. marina* is in most cases coppiced. *B. gymnorrhiza* is also only found among the juveniles. The mangrove species found in the Study Area show some form of zonation with stunted *C. tagal* occurring furthest landward followed by *R. mucronata* and finally a mix of *S. alba* and large *A. marina* trees closest to the water line. The fifth species *B. gymnorrhiza* was only present among the natural regeneration under *R. mucronata* canopies.

R. mucronata, *C. tagal* and *A. marina* are the most common mangrove tree species in Kenya found in virtually all forest patches. *S. alba* is equally common though restricted to a very thin band closest to the water line thus limiting their abundance. *B. gymnorrhiza*, is a shade loving species and seldom occur in pure stands. All the species encountered in this area appear under the IUCN Red list as being of Least Concern. Nevertheless the species is also found in virtually all the forest patches documented

in Kenya.

The propagules (seeds) of all these species are normally readily available and with proper timing, reforestation in appropriate areas could be successfully achieved. Though mangrove clearing in the project area will automatically lead to loss of cover, this can/shoud be thus compensated through well strategized replantation activities.

On the other hand, low stem densities indicated the deterioration of the Mangrove forest due to exploitation for firewood, charcoal making and construction materials. Most of the forest area is therefore composed of young trees from natural regeneration after the clearance of forests while *S. alba* which is normally closer to the water line is relatively less negatively affected as compared to the landward zone. The past study revealing the average 2,694 per hectare of mangrove stock density also found that mangrove forest has been exploited for any merchantable wood resulting that a 22% loss of mangrove over 25 years which is equivalent to almost 1% annual loss(SEA survey for Mombasa SEA Master Plan, 2014).

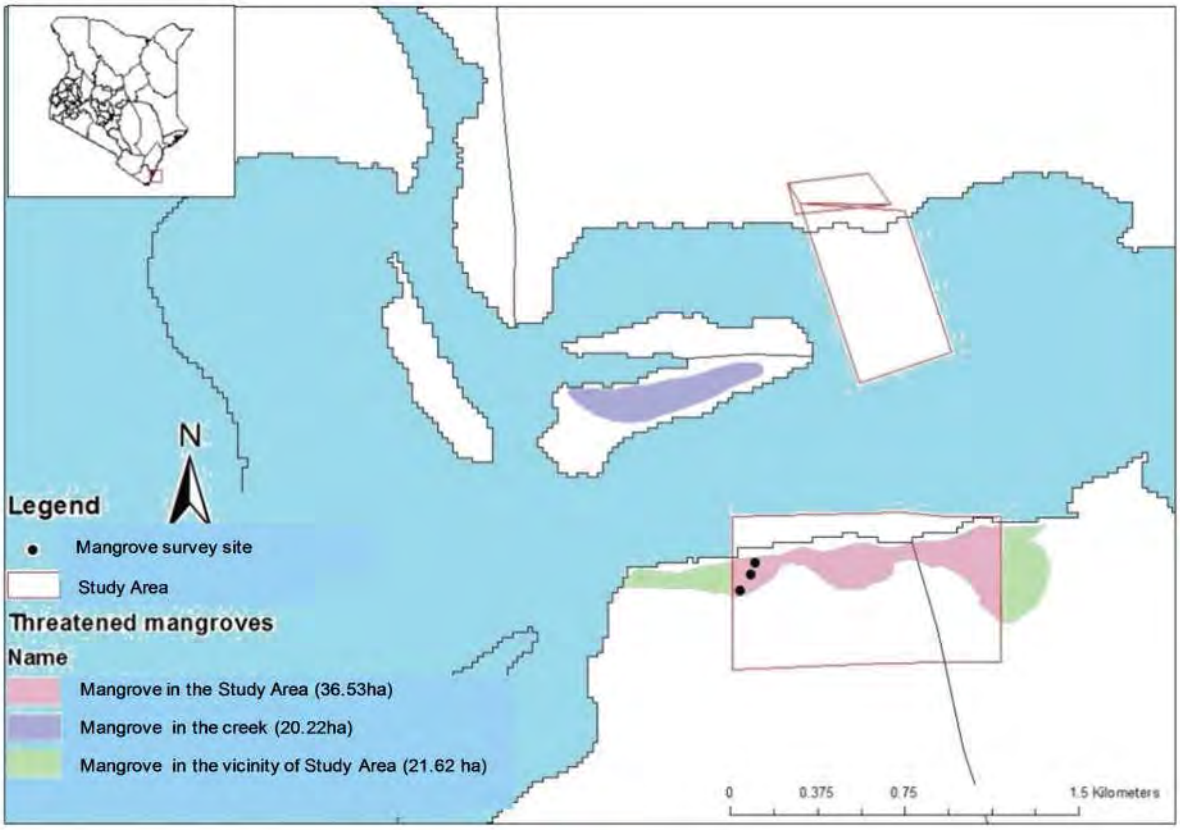


Figure 4.3.5 Mangrove Area in the Vicinity of Project Area and Mangrove Survey Sites
Source: JICA Team

Table 4.3.7 Structural Attributes and Natural Regeneration Characteristics of Mangrove

Tree species	Structural Attribute				Regeneration Characteristics		
	Number of trees*1	Tree density (no/ha)	Average height (Min - Max) (m)	Basal area(m^2/ha)* 3	Density of juvenile (no/ha)*4		
					RCI	RCII	RCIII
A. marina	1	33	8.0	0.97	0	0	0
C. tagal	1	33	1.5	0.021	17500	95000	10000
R. mucronata	28	933	2.3 (1.5 – 5.5)	1.05	0	6767	16500
S. alba	14	467	4.9 (3.5 – 6.5)	4.26	0	0	0
B. gymnorrhiza	0	0	NA*2	0	15000	5000	0
Total (all species)	44	1567	3.3 (1.5 – 8.0)	6.3	32500	106767	26500

*1: Only trees of more than 2. 5 cm in Dbh were counted.
*2 NA: Not found in the survey plots of 0.3 ha (three 10m x 10 m plots)
*3 Basal area: Combined area of the cross-sections of tree trunks per unit area
*4 RCI: less than 40 cm in height, RCII: between 40 and 150 cm in height, RCIII: greater than 1.5 m in height
Source: JICA Team

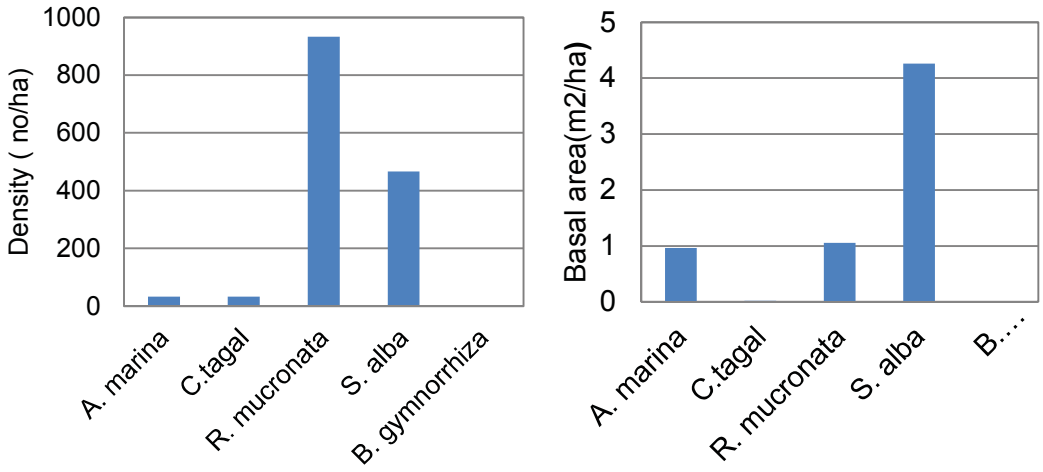


Figure 4.3.6 Mangrove Species and Structure (Density and Basal Area)
Source: JICA Team

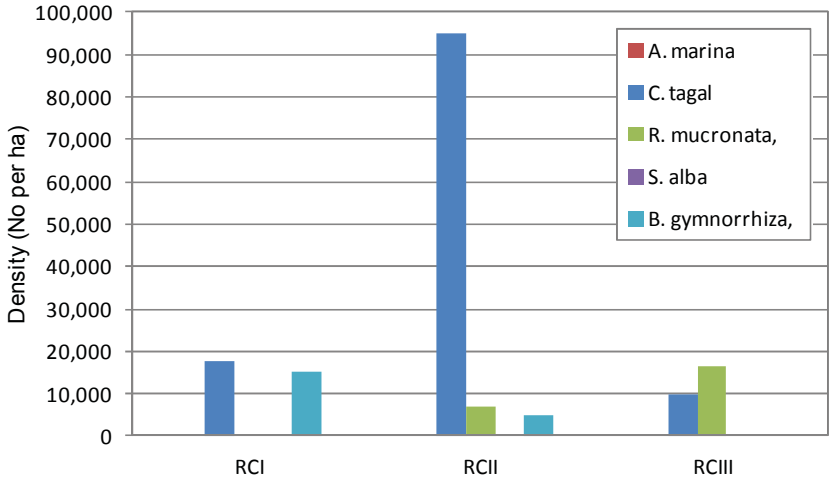


Figure 4.3.7 Natural Regeneration Characteristics of Mangrove (juvenile)
Source: JICA Team
Note: Only trees less than 2.5 cm in Dbh were counted.
RCI: less than 40 cm in height, RCII: between 40 and 150 cm in height, RCIII: greater than 1.5 m in height

Figure 4.3.8 Deteriorated Mangrove
Source: JICA Team

b) Protected area

Mombasa Marine National Park and Reserve along the coast is comprised of the sea waters, mangroves, sea grasses, and sea weeds and attracts many tourists. However, the Study Area which is far from the open sea area is not located in the protected area gazetted either as National Park and/or National Reserve in Kenya.

c) Flora and fauna

Flora and fauna diversity were investigated in some past studies and those main findings are summarized in Table 4.3.8.

Table 4.3.8 Summary of Flora and Fauna Data of the Past Survey

Item		Findings
Submerged Flora in Port Reitz creek	Seagrass	- Data from previous surveys (Globallast 2005, KPA Container modernization 2007, KPA Dredge 2009) indicated that the floor of the western end of the creek generally does not have submerged vegetation (sea grasses and rooted seaweeds). The only area that had sea grass is at the lower eastern end of the Harbour (Environmental Sensitivity Map, KenSea; Tychsen 2006). The only area that had sea grass is at the lower eastern end of the Harbour (near the Navy Quay).
	Seaweed	- The seaweed survey was conducted in the past other study (Adala et al, 2007) and it suggested that several epiphytic seaweed communities including the species Ulva, Caulerpa, Colpomenia, Hydroclathrus, Pocockiella, Jania, Amphiroa, Codium, Gracilaria, Padina, Stypopodium, Enteromorpha, Galidiella, Sphacelaria, Psedovalonia, and Calcerous algae can potentially exist. Also included in the epiphytic communities are epibints (faunal) – hydroids, sponges, ascidians and several mangrove epiphytes (e.g., Balanus, Amphitrite & Ostrea sp on Rhozophora trunks and prop roots) .
Terrestrial flora in Port Reitz		- The area does not have original vegetation formations and it has been largely replaced by few secondary wooded trees, scrub forest, and grasslands and cultivated land. The past study described that a total 370 flora species was visually recorded at Port Reitz north banks and implied that alpha diversity at Port Reitz banks is lower than one at Dongo-Kundu area (KPA, EIA of the Proposed Container Terminal Modernization Project, 2006). The terrestrial ecosystem monitoring observed total 86 species of plants and it found the only one species; Balaniteswilsoniana was noted to be rare/ vulnerable as the conservation status. (Toyo Construction Co., Ltd, 2012).
Terrestrial flora in Dongo Kundu		- The main vegetation along the coast line is the Mangrove which was already investigated by the Mangrove Survey. The farmland areas are either with perennial cash crops (coconut trees, cashew nut tree, mango tree, among others) and ground cover dominated by herbaceous species, or carried annual subsistence crops (maize, cassava, cow pea, banana, etc) that had been weeded. - The terrestrial system was also surveyed to assess the status of Kaya forests and general terrestrial biodiversity within the area for Mombasa SEZ. It was observed that some Kayas are threatened by intrusion of invasive species such as Prosopsis juliflora (SEA survey for Mombasa SEA Master Plan, 2014).
Aquatic Fauna in Port Reitz Creek	Zooplanktons	- Upto 150 different taxa are known to occur in Port waters. Cyclopoida and Calanoida are the most abundant, followed by planktonic stages of mollusca, appendicularia and copepod nauplii (KMFRI, Globallast survey, 2005). The species composition and invasive profiling of planktonic data is still on-going under IMO's Globallast program, and the current species composition and abundance may need to be reconfirmed.
	Sediment fauna	- The macrobenthic community is represented by about 20 different taxa from Port Reitz. In terms of dominance, Nassarius coronatus and Oliva bulbosa, are ubiquitous though several unidentified Nereidae and Epitoniidae sp are also dominant (P. Gwada, in Adala et al, 2009). Around the existing berths where pylons exists, oysters and barnacles were represented. Further details about the epiphytic benthos and mangrove benthos also can be referred in the past studies (e.g. Gwada, 2007).
Terrestrial fauna in Port Reitz	Birds	- About 56 bird species were observed whose conservation status of the IUCN Red List was Least Concern (LC). (Toyo Construction Co., Ltd, Environmental Monitoring Baseline Survey, 2012)
	Other animals (Amphibians, reptiles, small mammals and invertebrates, and Crustaceans)	- 4 species of reptiles listed as Least Concern (LC), 3 small mammals as LC, 8 invertebrate as LC and one snake (LC) under IUCN Red List were observed. (Toyo Construction Co., Ltd, Environmental Monitoring Baseline Survey, 2012)
Terrestrial fauna in Dongo Kundu	Birds	- A total of 42 species of birds with 1 species covered by Near Threatened (IUCN Red List) and three species covered by AEWA. (MOIED, SEA survey for Mombasa SEA Master Plan, 2014)
	Insect Pollinator (Butterflies and Bees)	- In total, 66 butterfly species without any conservation status under the IUCN were recorded from the areas surveyed in Dongo Kundu. (ditto)
	Mammal	- The vervet monkey, elephant-shrew, and hedgehog were crested porcupine were observed and are accorded as Least Concern Category in the IUCN Red List. (ditto)
	Reptiles and Amphibians	- Several species of reptiles (snakes, lizards, geckos) and amphibians (including frogs and toads) were encountered during the field survey. Black mamba, African Clawed Frog, African Common Toad, Day gecko were categorized in Least Concern of IUCN Red List. (ditto)

Item	Findings
Mangrove ecosystems	- Crab species is a major and conspicuous crustacean group in mangrove habitats. Mangrove also serves as the habitats for various socio-economic activities such as a supply of timber for heating and constructing, honey production, sacred sites for Kaya.
Invasive species	- Data from the Mombasa port survey indicates that the Mombasa Port area has about three confirmed invasive species associated with shipping introductions and about dozen cryptogenic species.

Source: JICA Team

The other natural conditions including the meteorological conditions, oceanographic conditions, topographic conditions and geological conditions are explained in Section 4.3 (Natural conditions around Mombasa port).

(5) Social baseline

a) Administrative boundary and local leader ship

The Project area falls within two locations; Port Reitz and Mtongwe in Mombasa County. The main form of leadership is the formal Government structures. The Chief and his assistants represent the Government authority at the location and sub-location levels respectively. They are assisted by village headmen/women whom they have appointed from amongst respected people in the villages or estates to administer these smaller units and handle petty matters on their behalf. The chiefs report to the District Officers who further report to the Sub-County Commissioners. County Governments are in place with the Governors as the heads with administrative responsibilities over the Counties while the County Commissioners are also present to coordinate National Government activities within the Counties.

On the other hand, some form of traditional leadership arrangements also exist particularly in the peri-urban areas. Communities in Dongo Kundu are culturally led by Kaya elders.

b) Community groups

At Dongo Kundu, there are two youth groups that are involved in mangrove conservation. The youth groups have organized management structures headed by a chairman, vice chairman, secretary, treasurer and other office bearers. The youth groups also engage in bee-keeping as a subsidiary livelihood.

At Port Reitz, the community at Kwa Skembo and Hodi B villages is targeted to be displaced by the SGR project. The community has established a committee to negotiate compensation with the Kenya Railways and the National Lands Commission on their behalf. A public meeting with the community revealed that almost all households at Kwa Skembo and Hodi B villages are affected by the SGR project and have been consulted by the project proponent. Consequently, the Village Resettlement Committee has become a very powerful gatekeeper that censures all activities including any meetings by the residents.

c) Land and settlers

While one village composed of people without title to the land will be relocated by the SGR project in Port Reitz side, the development area for port facilities does not cover the land with people because it is on the sea. Dongo Kundu area, on the other hand, is owned by KPA. Total of 458 households was confirmed by KPA Survey (Aug, 2008) and around 480 households with 2,570 people were counted by the SEA survey for Mombasa SEZ Master Plan (July-Oct, 2014) in the entire Dongo Kundu area. Among them, 19 HH with 84 people are located in the Study Area in Dongo Kundu. The SEA study also found that the structure of household sizes is diverse (19% of households are made of polygamous families), while the average household size in the entire Dongo Kundu area is 5.5.

d) Main occupations and livelihood

The Study Area and its vicinity cover both urban and peri-urban areas with the main occupations being

small scale business, peasant farming, artisan, casual labour, formal employment and artisanal fishing. Small scale business include kiosks that sell food stuffs, small restaurants, shop-keeping, fish mongers, sale of building material such as mangrove poles, sale of household items, water vending and groceries.

Especially, Dongo Kundu is a typical subsistence economy where close to 80% of households relies on agriculture forming maize cassava, pulses, sweet potato, etc. Per capital monthly income is Ksh 2,564 (average) and Ksh 1,089 (median) against a poverty line of Ksh 1,562. Poverty gap is 64% (MOIED, SEA for Master Plan for the development of Mombasa SEZ, 2014).

e) Fisheries

About 500 artisanal fishers and 150 fish traders/fishmongers operate in the surrounding area where the fishers mainly use traditional fishing crafts and simple fishing gears. There are six landing sites under the management of the Mwangala Beach Management Unit in the vicinity of the project area in Dongo Kundu. These include;

- Mwangala,
- Dongo Kundu,
- Mkunguni
- Mwakuzimu,
- Magoda
- Teja

In the Port Reitz side there are the three key landing sites: Tsunza, Mkupe and Kitanga Juu. The Kwa Skembo site is part of Kitanga Juu BMU and under the planned site of the second container terminal.

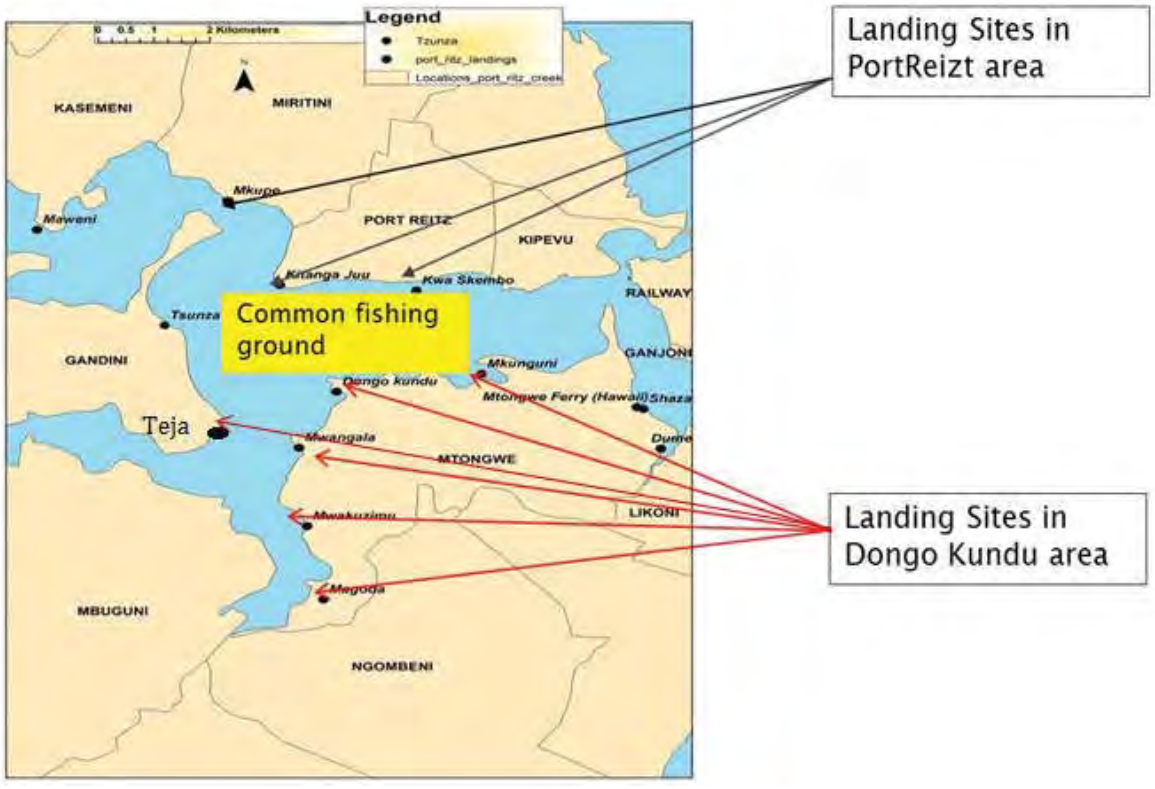


Figure 4.3.9 Location of Fishing Landing Site

From 2010-2013, total fishery landings in Mtongwe area varied between 64 and 144 Mt per year (GoK, 2010-2013). In the Port Reitz area the fish catches in the last 4 years varied between 331 to 158 MT per year with estimated value above 27M KES. Increased landings are recorded in Mtongwe area while in Port Reitz the catches show a declining trend. Crustacea fishery (mainly prawns, lobsters and

crabs) is very important in the creek contributing the highest landings estimated at 88MT annually with a value of 14 million to 21 million Kenyan shillings. The creek fishery is estimated to account for between 30-40% of the county fish production and is the most productive creek for artisanal prawn fishery (Fisheries Department statistics).

f) Social infrastructures and services

Social infrastructures and services which are available in the Study Area are summarized in the below Table.

Table 4.3.9 Social Infrastructures and Services in the Area

Item	Findings
Religions	- Both mosques and churches are available in both Kipevu-Port Reitz and Dongo Kundu areas. - There is one mosque at Dongo Kundu and another at Mwangala. In addition, there are four churches at Dongo Kundu and others at Mwangala.
Access to health	- Port Reitz area: The Port Reitz District hospital, a government hospital, which is located in the Kilindini Sub-County area, some private clinics and pharmacies and a number of traditional healers are available. There is also the School of Clinical Medicine (a Medical Training College) just adjacent to the Port Reitz District Hospital. - Dongo Kundu area: Medical services are available at the Mbuta Health Center supported by the Mombasa County Government.
Education	- Port Reitz area: There is Mwangala Primary School close to the Study Area. This school has about 700 pupils who attend classes 1 to 8. In addition, a number of private nursery and primary schools exist in the neighborhood. - Dongo Kundu area: Mwangala Primary school is the only primary school in the entire Dongo Kundu area.
Water supply	- Generally, 80% of the population in Mombasa has access to piped water. However, the residents of Dongo Kundu depend on the well for domestic water which unfortunately are saline and natural spring within Kaya Mrongondoni and Tembo spring. - The coastal area is characterized by lack of fresh water. According to reports from the Mombasa Water and Sewerage Company (2006), the water supply to Mombasa currently stands at about 72,000m^3/day against a demand of 160,000m^3/day.
Electricity	- The Study Area in Port Reitz is served with electricity with the main electricity line running parallel to the main roads. In addition, the affected households depend on charcoal, fuelwood and kerosene to meet their energy needs. - Dongo Kundu Study Area does not have electricity but there are power lines running close by.
Tele-communication	- Both Port Reitz and Kwa Skembo area is well covered by mobile phone networks particularly airtel, safaricom and orange. - The same situation obtains in Dongo Kundu but the mobile network suffers from poor reception due to absence of reliable booster stations.
Public transportation	- The Port Reitz Study Area is served by public transport. Public transport is supported by the existence of the main tarmac roads. - The Dongo Kundu area does not have public transport but is served by motorcycles.
Sanitation	- Wastewater treatment has not been given adequate attention in Mombasa. Presently, only 30% of the population in the Island and 15% of the population in the Mainland West is connected to the sewer. Over 65% of the coastal population is served by pit latrines, around 6% have a water closet and a mere 2% have a flush toilet. Over 25% have no provision for domestic wastewater whatsoever. (Republic of Kenya, 2000).

Source: JICA Team

g) Vulnerability

The Dongo Kundu area has vulnerable and marginalized people. The vulnerable and marginalized group in the Study Area includes a number of female headed households. These female headed households have a huge negative poverty gap as they are living below the national poverty line of Ksh. 2,610 per month. The categorization of the female headed households under the Vulnerable and Marginalized Group (VMGs) is based on the definition by the Constitution of Kenya 2010. According to the Constitution of Kenya 2010, the VMGs include the economically disadvantaged, low-income children, the elderly, the homeless, the widows, female headed households, people with human immunodeficiency virus (HIV), and those with other chronic health conditions, including severe mental illness. The VMGs also include households that often encounter barriers to accessing

healthcare services. The vulnerability of these individuals is enhanced by age, sex, and factors such as income, insurance coverage, and absence of a usual source of care.

There is a high dependency burden in the Dongo Kundu with the households supporting their relatives' orphaned children including their grandchildren and children that have been abandoned by a parent who was a bread winner. It is normal practice that where the children remain with one parent who is not capable of supporting them, the wider family moves in to support the children. They also take care of their aged parents and relatives who are unable to take care of themselves. The children from poor families and those who are supported by other relatives also fall under the VMGs.

h) Kayas

There are some Kaya in and around the project area. The Kaya is originally considered as a unique indigenous forest that is found along the coast. The Kaya forests are highly bio-diverse and have high cultural significance to the communities, who consider them as sacred and have used them for traditional religious and spiritual ceremonies for centuries (Blackett, 1994 and Government of Kenya, 2009). These cultural sites are used to perform some cultural rites which are important especially to the original inhabitants of the area. The other benefits of these cultural sites include tourism attraction, honey harvesting and attraction of rain.

Total of three Kayas located in the Study Area were confirmed in the reconnaissance survey with the assistance of village leaders. The Kayas, Kaya Jiwe la Kutuza, and Kalakalani, which are composed of some rocks and Kaya Mikadini are shown in Figure 4.3.10. The local community categorized Kaya into two types: Mzimu and Kaya. Kaya Tembo, Kaya Sigi and Kaya Mrongodoni outside the Study Area are recognized as Mzimu which is more sacred. No Mzimu are found in the Study Area.

The present development plan keeps the bigger Kaya (Kaya Jiwe la Kutuza) intact, but interferes with Kaya Kalakalani and Kaya Mikadini. According to the interview with the village leader and NMK, the development of Kaya is possible if the relocation of Kaya is agreed to by local communities; owner and user of Kaya as well as Kaya elders and NMK. Accordingly, extensive consultations will need to be carried out.

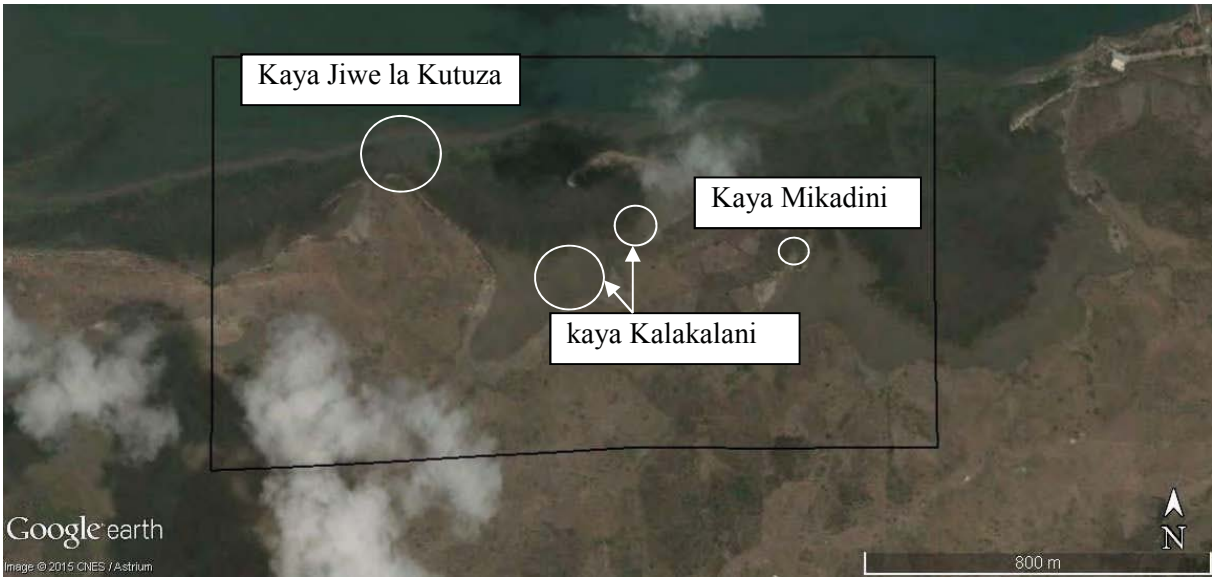


Figure 4.3.10 Location of Kaya
Source: JICA Team

i) Other cultural heritages

Archeological impact assessment for the dredging works at Kilindini channel and second container terminal (2011, NMK) revealed that;

- Port Reitz has high potential for palaeontological remains such as fossil ammonite remains and petrified wood and archaeological lithic implements which suggest presence of Stone Age culture.
- Some locations in the access and navigation channels have potential for underwater cultural heritage.
- Port Reitz has remains of early colonial history and World War II (such as ammunition).

NMK suggested this Master Plan Project include an Archeological Impact Assessment which could be conducted together with the EIA.

(6) Project Affected People

Total 19 households with 84 people were confirmed in the Study Area of Dongo Kundu based on the demographic survey data in 2014 (MOIED, SEA for Master Plan for the development of Mombasa SEZ, 2014). Enumeration of structures and households was not done for Port Reitz due to hostility of the residents who felt that they had already been catered for by the SGR project. However a preliminary assessment of the area taking into account the Study Area boundaries indicates there are about 50 households within the Study Area but they will not fall in the target construction site for the port development.

4.3.4 Regulatory and institutional framework

(1) Regulations related to environmental management

The basic environmental law in Kenya is the Environmental Management and Co-ordination Act (EMCA) which came into force in 1999. This Act has brought forth some subsidiary regulations for each environmental component including EIA as shown in Table 4.3.10. The environmental standards for discharged water quality are specified by Environmental Management and Coordination (Water Quality) Regulations (2006) and maximum permissible noise levels are regulated by Noise and Excessive Vibration (Pollution Control) Regulations (2008).

Table 4.3.10 Subsidiary Regulations under EMCA

Name of Regulation	Summary
Environmental (Impact Assessment and Auditing) Regulations, 2003	These Regulations guide on the procedure for conducting EIA studies by detailing the parameters to be evaluated during the study. They also provide guidelines on the payment of the EIA license fees, procedures for environmental audits and development of environmental monitoring plans.
Environmental Management and Coordination (Water Quality) Regulations, 2006	These regulations provide for protection of ground water or surface water from pollution and also provide the limits and parameters of pollutants in treated waste water which can be discharged into the environment.
Environmental Management and Coordination (Waste Management) Regulations, 2006	These regulations outline the responsibility of the waste generator and prescribe proper mechanism of handling all waste through segregation, recycling and reuse.
Noise and Excessive Vibration (Pollution Control) Regulations, 2008	These regulations apply to operation of equipment or machinery and engagement in commercial or industrial activity that is likely to emit noise or excessive vibrations. The regulations specify the limits or levels within which these shall be undertaken. The Regulations also stipulate in the second schedule that construction activities undertaken during the night should not emit excessive noise beyond the permissible levels.

Source: JICA Team

(2) EIA procedure

According to Section 58 of EMCA, projects specified in the second schedule are subjected to an EIA study. It is assumed that the Master Plan to be proposed in the Project would put forth some development projects of port and other facilities, requiring a comprehensive EIA due to significant social and environmental impacts from its implementation.

The EIA procedure in Kenya is shown in Figure 4.3.11. An EIA study shall be carried out by a lead expert qualified and registered by NEMA. Environmental (Impact Assessment and Auditing) Regulations (2003) stipulate that an EIA study shall take into account environmental, social, cultural, economic, and legal considerations, and shall;

a) identify the anticipated environmental impacts of the project and the scale of the impacts,
b) identify and analyze alternatives to the proposed project,
c) propose mitigation measures to be taken during and after the implementation of the project, and
d) develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures

In addition, the following process is required to ensure public consultations in the process of the EIA study.

- The proponent shall publicize the project and its anticipated effects and benefits by posting posters, publishing a notice in a newspaper and making an announcement of the notice in both official and local languages in a radio.

- The proponent shall hold at least three public meetings with the affected parties and communities to explain the project and its effects, and to receive their oral or written comments.
- NEMA shall invite the public to make oral or written comments on the report after the receipt of EIA study report.

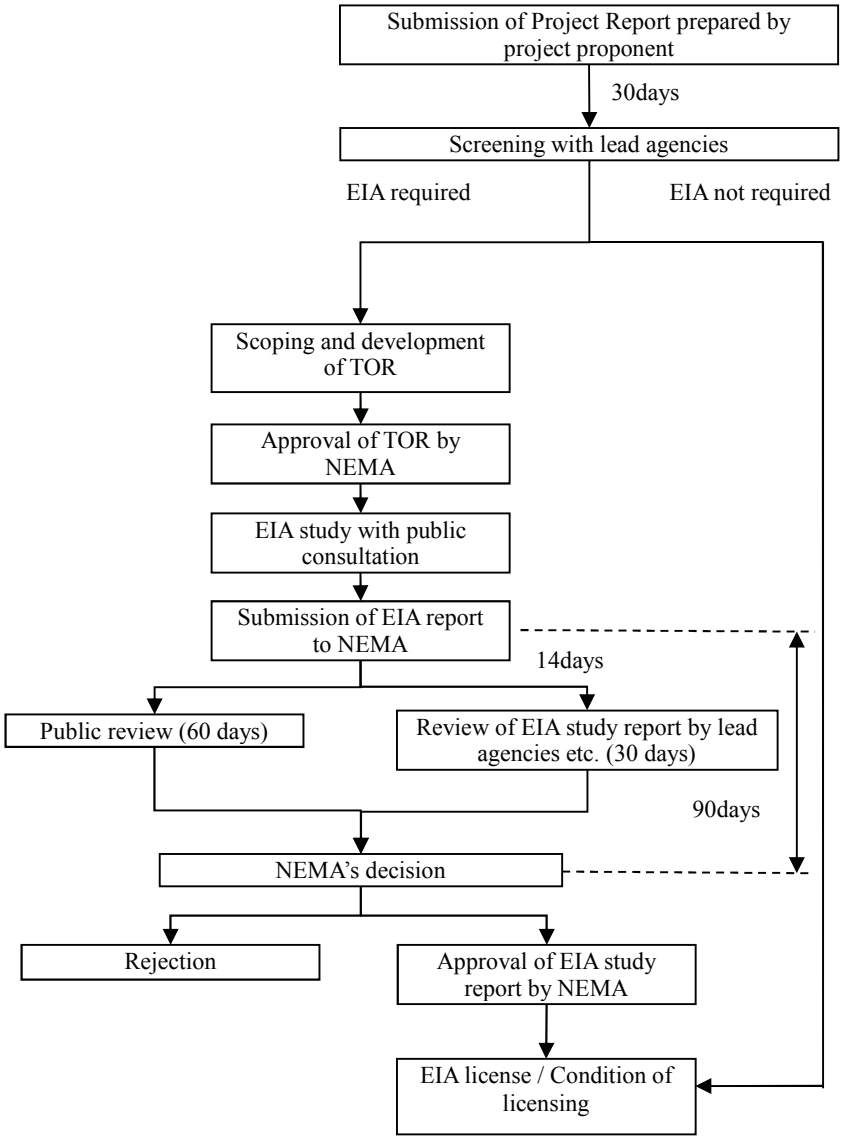


Figure 4.3.11 EIA Procedure in Kenya
Source: JICA Team

On the other hand, Mombasa SEZ Master Plan implemented by JICA includes the same geographical area as the Master Plan for Dongo Kundu area and the social and environmental issues likely to come up in the Master Plan have been largely addressed in the SEA for Mombasa SEZ Maser Plan. The EIA study for the port area in Dongo Kundu to be derived from this Master Plan in the future feasible study will be required to ensure the close linkage and coordination with the output of the SEA.

(3) Regulations related to land and resettlement

Section 40 in the Constitution provides the article for land acquisition as follows;

(3) The State shall not deprive a person of property of any description, or of any interest in, or

right over, property of any description, unless the deprivation—

(a) results from an acquisition of land or an interest in land or a conversion of an interest in land, or title to land, in accordance with Chapter Five; or

(b) is for a public purpose or in the public interest and is carried out in accordance with this Constitution and any Act of

Parliament that—

(i) requires prompt payment in full, of just compensation to the person; and

(ii) allows any person who has an interest in, or right over, that property a right of access to a court of law.

(4) Provision may be made for compensation to be paid to occupants in good faith of land acquired under clause (3) who may not hold title to the land.

(5) The State shall support, promote and protect the intellectual property rights of the people of Kenya.

(6) The rights under this Article do not extend to any property that has been found to have been unlawfully acquired.

The Land Act, 2012 is an Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources. It has repealed the Way leaves Act, Cap 292 and the Land Acquisition Act, Cap 295 and therefore provides for land acquisition for various purposes.

The methods of acquisition of title to land are specified in Article 7 in this Act as follows;

Title to land may be acquired through—

(a) allocation;

(b) land adjudication process;

(c) compulsory acquisition;

(d) prescription;

(e) settlement programs;

(f) transmissions;

(g) transfers;

(h) long term leases exceeding twenty-one years created out of private land; or

(i) any other manner prescribed in an Act of Parliament.

The Land Act specifies that there shall be equal recognition and enforcement of land rights arising under all tenure systems and nondiscrimination in ownership of, and access to land under all tenure systems. Under this Act the National Land Commission (NLC) is charged with carrying out acquisitions at the request of government institutions (Section 107(1)). The NLC shall also have the authority to prescribe criteria and guidelines to be adhered to by the acquiring authority, and may reject requests by the relevant authority to acquire land if such requests do not comply with the criteria or with Article 40(3) of the Constitution (Section 107(2-3)). Pursuant to Article 40 of the Constitution, this Act requires prompt, just and full compensation for any person holding interests in the land to be acquired (Section 111).

Projects under the Master Plan target some areas that are inhabited therefore would call for relocation of the resident population. This would require a Resettlement Action Plan (RAP) to be prepared in line with provisions of this Act. In fact, in the case of the project involving the involuntary resettlement, which is financed by international funding agencies such as World Bank and JICA, the preparation and

implementation of RAP (or Abbreviated RAP) are usually required by the Kenyan side, too.

(4) Other related regulations

Other related regulations are listed as follows.

- Occupational Safety and Health Act, 2007(revised in 2010)
- Water Act 2002, Cap 371
- Wildlife Conservation Act, 2013
- Tourism Act No.28, 2011
- National Museums and Heritage Act, No.6, 2006 (revised in 2009)
- Fisheries Act, 2012, Cap 378
- Forest Act, 2005, Cap 385
- Physical Planning Act, 1996, Cap 303
- National Land Commission (NLC) Act, 2013
- Public Health Act, Cap 242
- Agriculture Act, 1986, Cap 318
- Coast Development Authority (CDA) Act, 1992,Cap 449
- Energy Act, 2006
- Kenya Maritime Authority Act, 2006
- Merchant Shipping Act, 2009 (revised in 2012)

In addition, a summary of relevant international conventions and treaties is listed in Table 4.3.11.

Table 4.3.11 International conventions and treaties relevant to Port Development Plan

Issue	Referral Treaty or Convention
Disposal of Dredged Material	London convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter (1972) International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78)
Cultural and Historical sites	UNESCO Convention Concerning The Protection Of The World Cultural And Natural Heritage Paris 1972
Natural Resource Conservation	African Convention on the Conservation of Nature and Natural Resources, 1968 (as revised in 2003).
Wetland	Convention on Wetland of International Importance (Ramsar,1971)
Biodiversity	Convention on Biological Diversity (1992)
Coastal and Marine Conservation	Convention for the Protection, Management and Development of the Marine and Coastal Environment of the East African Region with its Protocols (Nairobi Convention, 1985) Global Program of Action for the Protection of the Marine Environment from Land Based Activities (1995)
Wildlife	Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS, 1979) Washington Convention on International Trade In Endangered Species (CITES, 1973)
Hazardous Waste	Basel Convention on the Control of Trans boundary Movement of Hazardous Wastes and other disposal (1989)
Oil Spill	International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC 1990)

Source: JICA Team

(5) Environmental Management in KPA

KPA complies with the environmental conservation requirements by the following activities;

- Compliance to the relevant laws, regulations, standards and guideline
  - ✓ Environmental monitoring are periodically conducted and annual environmental audit report is submitted to NEMA
  - ✓ EIA for Mombasa Port Development Plan, dredging project of channel and so on are

implemented and licensed by NEMA.
  - ✓ Occupational safety and health section ensures health and safety for workers. The occupational health and safety audit is conducted in accordance with the Occupational Safety Act.
- Development of ECO/Green Port Implementation Plan aimed at;
  - ✓ Balancing environmental challenges with economic demands;
  - ✓ Implementing resilient infrastructure projects that will check on climate change processes; and
  - ✓ Addressing pollution and ensuring health and safety for all.
- Handling social issues;
  - ✓ A Resettlement Action Plan (RAP) for the entire area of Dongo Kundu SEZ is currently prepared ;
  - ✓ Compensation of Project Affected Persons (PAPs) is ongoing in Lamu and this will be accompanied by relevant training on financial management;
  - ✓ The consultation was done with fishermen and Beach Management Units (BMUs) in Kwale for sand harvesting for land reclamation for the MPDP
- Others
  - ✓ The sewage from port is treated by the septic tank with the activated sludge system and discharged to the harbor.
  - ✓ Pollution control section is responsible for dealing with oil spills and other pollution-related accidents.
  - ✓ The collection, storage and transportation of the waste in the port are conducted by the contractor as required by NEMA.
  - ✓ Shipping companies engage contractors to dispose of ship waste.
  - ✓ The Climate-Resilient Infrastructure Project is being implemented against the climate change-related issues.

(6) Related organizations

Some of the key institutions dealing with environmental issues in Kenya include NEMA, Kenya Wildlife Service (KWS), Kenya Forestry Research Institute (KEFRI), National Museums of Kenya (NMK), Kenya Maritime Authority (KMA), Kenya Marine Research Institute (KMFRI), and Regional Development Authorities. Representative governmental institutions in charge of environmental protection and social considerations are summarized in Table 4.3.12. The stakeholders and their concerns have been identified in the course of development of this Master Plan.

Table 4.3.12 List of Key Related Agencies/Organizations

Agency/organization	Mandate / Functions
Mombasa County Government	• Local government is in charge of providing a variety of services to residents within its area of jurisdiction • Among others, Department of Water, Environment and Natural Resources in Mombasa County is responsible for access to water and sanitation and conservation of environment and natural resources in the Project area.
National Environment Management Authority (NEMA)	• Coordination of the various environmental management activities being undertaken by the lead agencies • Promotion for the integration of environmental considerations into development policies, plans, programmes and projects, with a view to ensuring the proper management and rational utilization of environmental resources, on sustainable yield basis, for the improvement of the quality of human life in Kenya etc.
Fisheries Department, Ministry of Fisheries Development	• Leading authority for management and development of aquaculture and fisheries resources whose area covers policy and legal framework for fisheries development; promoting sustainable utilization of marine fisheries and so on.
National Land Commission	Mandated to oversee all aspects of land use and management including; • to manage public land on behalf of the national and county governments; • to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities; and • to develop and encourage alternative dispute resolution mechanisms in land dispute handling and management etc.
Kenya Marine and Fisheries Research Institute (KMFRI)	• Research in marine and freshwater fisheries, aquatic biology, aquaculture, Environmental Chemistry, Ecological, Geological and Hydrological studies, as well as Chemical and Physical Oceanography.
National Museums of Kenya (NMK)	• Collection, preservation, study, documentation and presentation of Kenya's past and present cultural and natural heritage
Kenya Wildlife Service (KWS)	• Conservation and management of Kenya's wildlife
Kenya Forestry Services (KFS)	• Conservation, development and sustainably management of forest resources
Kenya Forest Research Institute (KFRI)	• Research in forests and allied natural resources under five areas (forest productivity and improvement, biodiversity and environment management, forest products development, socio-economics, policy and governance and technical support services)
Coast Development Authority (CDA)	• Planning for the development of the Area (Coast Province) and initiate project activities identified from such planning in the development and through the Government generally, etc/
Kenya Maritime Authority (KMA)	• Maritime safety and security as well as fostering of effective implementation of international maritime conventions and other mandatory instruments on safety and security, promotion of maritime training, coordinating Search and Rescue, prevention of marine pollution and promotion of preservation of the marine environment.
NGOs	Key NGOs in the coastal area of Kenya that would be considered as stakeholders in the proposed Master Plan include: • CORDIO (Coastal Oceans Research and Development in the Indian Ocean); • KWETU Training Centre; • World Wide Fund for Nature

Source: JICA Team

(7) Gap analysis

Legal framework in Kenya was compared with JICA Guidelines for Environmental and Social Considerations (April 2010) to analyze those gaps in the forthcoming stage of EIA and RAP study (Table 4.3.13). While no significant differences between the Kenyan regulation and JICA Guidelines

for Environmental and Social Considerations are confirmed regarding the EIA process and its TOR, there are several gaps in respect to the regulatory requirement of resettlement and land acquisition since the development of RAP is not specified by Kenya law. However, NEMA typically requires the project proponents to develop RAP in line with World Bank safeguard policies or other applicable safeguard policies at the time of EIA study.

Table 4.3.13 Gap Analysis between Kenyan law and JICA Guidelines for Environmental and Social Considerations for the forthcoming EIA and RAP study

Item	Kenyan Regulation	JICA Guidelines for Environmental and Social Considerations(JICA GL)	Gaps between Kenyan Regulation and JICA GL	Countermeasure and/or Recommendations to bridge the gaps
EIA Process				
Impact to be Assessed	The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short term and long-term effects anticipated. (Impact Assessment and Auditing) Regulations, 2003).	The impacts to be assessed include impacts on human health and safety, as well as on the natural environment and social impacts. In addition to the direct and immediate impacts of projects, the derivative, secondary, and cumulative impacts as well as impacts associated with indivisible projects will also be assessed. The life cycle impact of a project period is also considered. (JICA GL p13-14)	The impact items specified in Kenya's law mostly satisfy with the requirement of JICA GL. On the other hand, JICA GL specifies the items to be assessed in detail. The impacts associated with indivisible projects are not listed in Kenya's regulations.	The impact items suggested in EIA study need to be checked comparing with JICA GL.
TOR for EIA	EIA study shall take into account environmental, social, cultural, economic, and legal considerations by the steps of the prediction of impacts, alternative analysis for project plan, proposal of mitigation measure, development of an environmental management plan. (Environmental (Impact Assessment and Auditing) Regulations, 2003).	TOR includes understanding of needs, impacts to be assessed, study methods, analysis of alternatives, a schedule, etc. JICA conducts (at the EIA level for Category A projects and at the IEE level for Category B projects) environmental and social considerations studies, including mitigation measures to avoid, minimize, or compensate for adverse impacts; a monitoring plan; and an institutional arrangement. JICA also analyzes alternatives, including "without project" situations. (for Feasibility Study, JICA GL p26)	No significant gaps are confirmed.	NA
Information disclosure and consultations with stakeholders	At least three public meetings, public review of EIA report and media publication are required during the EIA process. (Environmental (Impact Assessment and Auditing) Regulations, 2003).	For all Category A projects and for Category B projects as needed, after disclosing scoping drafts, project proponents etc. conduct consultations with local stakeholders based on stakeholder analyses (for Feasibility Study, JICA GL p26)	Kenyan Regulation satisfies the requirement of JICA GL on this matter.	NA
Resettlement/Land acquisition				
Resettlement Action Plan(RAP)	RAP for involuntary resettlement is not specified by regulation in Kenya.	For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public.(JICA GL p30)	JICA GL requires projects involving large-scale involuntary resettlement to prepare RAPs. However, it is not required by Kenyan regulation legally.	RAP shall be developed for the project which adheres to JICA GL
Eligibility of non-title holders	The compensation for a person without official title of land is not specified in Kenya while "Provision may be made for compensation to be paid to occupants in good	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. (JICA	Illegal occupants are not eligible for compensation and support in Kenyan regulation.	PAPs including illegal dwellers shall be compensated and supported as for the project which adheres to JICA GL.

Item	Kenyan Regulation	JICA Guidelines for Environmental and Social Considerations(JICA GL)	Gaps between Kenyan Regulation and JICA GL	Countermeasure and/or Recommendations to bridge the gaps
	faith of land acquired who may not hold title to the land (The Constitution of Kenya, 2010)".	GL p30) Illegal occupants are to be provided with resettlement assistance.		
Compensation based on full replacement cost	If land is acquired compulsorily under the Land Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The National Land Commission shall make rules to regulate the assessment of just compensation. (Section 111, Land Act)	Prior compensation, at full replacement cost, must be provided as much as possible. (JICA GL p30)	The compensation based on Kenyan regulation does not exactly mean the full replacement cost since the cost of preparation of the land to levels similar to those of the affected land and the cost of any registration and transfer taxes are not clarified in Kenyan regulation.	Full replacement cost shall be provided as much as possible as for the project which adheres to JICA GL.
Livelihood Restoration and Assistance	There are no specific provisions for livelihood restoration and assistance for PAPs.	Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. (JICA GL p30)	Livelihood restoration and assistance for PAPs are not specified by Kenya regulation	Livelihood restoration and assistance for PAPs shall be secured for the project which adheres to JICA GL.
Support for socially vulnerable people	The Constitution of Kenya prohibits discriminate directly or indirectly against any person on any ground, including "Marginalised group". However, there are no specific provisions for support for vulnerable people in PAPs.	Appropriate consideration must be given to vulnerable social groups such as women, children, the elderly, the poor, and ethnic minorities.(JICA GL p29)	The consideration for vulnerable people in PAPs is not specified by Kenya regulation	Support for socially vulnerable people in PAPs shall be secured for the project which adheres to JICA GL.
Public participation into planning and implementation of resettlement plan	Planning and implementation of resettlement plan and public participation in the RAP process are not specified by Kenyan regulation.	Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. (JICA GL p30)	Public participation in RAP process is not specified by Kenya regulation, in contrast to JICA GL.	Public participation in RAP process shall be secured for the project which adheres to JICA GL.
Grievance mechanism	At least thirty days after publishing the notice of intention to acquire land, the Commission shall appoint a date for an inquiry to hear issues of propriety and claims for compensation by persons interested in the land (Section 112, Land Act) Any dispute arising out of any matter provided for under this Act may be referred to the Land and Environment Court for determination.(Section	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL p30)	Land Acquisition Compensation Tribunal provides the chance of grievance resolution to the affected people. However, it is not exactly accessible to all affected people.	The supplemental grievance mechanism needs to be prepared with consideration for its accessibility depending on the type and features of affected people, in case of the project which adheres to JICA GL.

Item	Kenyan Regulation	JICA Guidelines for Environmental and Social Considerations(JICA GL)	Gaps between Kenyan Regulation and JICA GL	Countermeasure and/or Recommendations to bridge the gaps
	128, Land Act)			
Monitoring	Planning, and implementation of monitoring for RAP are not specified by Kenyan regulation.	Appropriate follow-up plans and systems, such as monitoring plans and environmental management plans, must be prepared; the costs of implementing such plans and systems, and the financial methods to fund such costs, must be determined. (JICA GL p28)	Monitoring for RAP is not specified by Kenya regulation, in contrast to JICA GL.	Monitoring system for RAP shall be established for the project which adheres to JICA GL.

Source: JICA Team and Ministry of Industrialization and Enterprise Development (Draft SEA Report for Strategic Environmental Assessment for Master Plan for Development of Mombasa Special Economic Zone, 2014)

4.4 Urban, road, railway and SEZ development projects in Mombasa area

4.4.1 Road development project

Followings are citation from the JICA Report on Preparatory Survey on Mombasa Port Area Road Development Project in The Republic Kenya .

(1) 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 neighboring countries for achieving economic and social development in Kenya and neighboring countries.

Figure 4.4.1 Project Road Location

The Project roads are comprised of two roads, namely Mombasa Southern Bypass and Kipevu Link Road. Mombasa Southern Bypass branches off from Nairobi-Mombasa Road (A109) at Miritini then runs down to Tsunza Peninsula and Dongo Kundu, and finally emerges with Mombasa-Tanzania Road (A14). The Kipevu Link Road branches off from Mombasa Southern Bypass at Mwache then runs to Mombasa New Port Container Terminal. Mombasa Southern Bypass is about 19.8 km and Kipevu Link Road is about 5.7 km.

(2) Project implementation

This project has been on-going with Japanese ODA loan. This road will be open to traffic in August 2018.

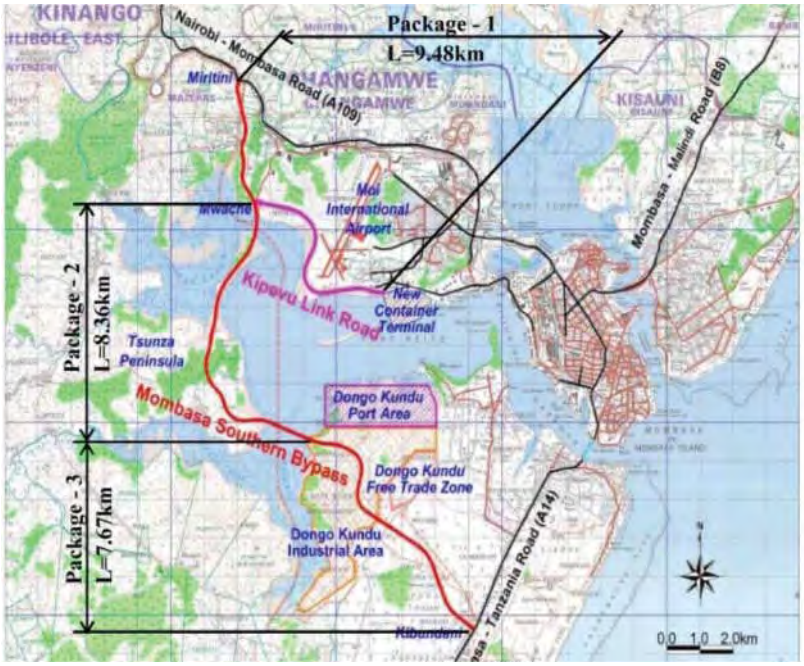


Figure 4.4.2 Project Packaging

(3) Phased 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

(4) 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:

a) Northern Corridor Transport Improvement Project (IDA and NDF)

The Government of Kenya has received financing in the amount of US$ 207 million equivalent from the World Bank toward the cost of the Northern Corridor Transport Improvement Project, and it intends to apply part of the proceeds to payments for goods, works and related services and consulting services to be procured under this project. This project will be jointly financed by the Nordic Development Fund (NDF) and IDA will play the role of Lead Donor.

b) Feasibility study and detailed engineering design of Malindi-Mombasa-Lunga

The East African Community is finalizing plans for a transnational highway to link the Kenyan and Tanzanian coasts. The 460km highway, expected to cost $600 million, will start in Malindi, pass through Mombasa and Lunga Lunga on the Kenyan side, across to Tanga, then on through Pangani and Saadani to Bagamoyo in northeastern Tanzania.The road is hoped to increase regional trade by linking the port of Mombasa in Kenya to northeastern Tanzania. The highway will unlock the potential of tourism, trade and shipping in the two countries. The African Development Bank had agreed to fund the project and it would allocate the first tranche of money. The construction is expected to take three years, and will start in early 2016. The road is expected to boost regional integration, cross-border trade, tourism, and socio-economic development.

c) Lunga-Tanga-Bagamoyo Road (EAC)

This is another sub-component of the Development Project with the objective of determining the viability of rehabilitating the 240-km long Malindi - Lunga Lunga Road and upgrading to bitumen standards the 172-km long Tanga - Bagamoyo road. The road runs along the East African coastline which has a rich tourism and agricultural (horticultural) potential

4.4.2 Railway development project

(1) Current state of rail and port

Part of the road congestion problem is related to the absence of effective rail services. The existing meter gauge railway which runs from Mombass to Kampla and on to Kasese is widely acknowledged to be close to obsolescence and as a result it now accounts for less than 4% of freight haulage to the port. The rejuvenation of rail system is thus another priority required on the one hand to relieve congestion on the roads and on the other to release the full potential of the port of Mombasa to serve its hinterland and to do this in an expeditious and cost effective manner.

Currently, it is reported by freight interests that it can take up to a month to move from Mombasa to Kampala (Uganda) by rail. The only real positive about the rail system at present is that for certain journeys it can cost about half the price of the road transport alternative. The average cost of moving a 40 ft container by road from Mombasa to Kampala is put at $3800 and around $1900 by the slower rail alternative. On shorter journey legs, however, rail con prove the more expensive option – overall action needs to be taken to bring down transport costs in conjunction with both road and rail operations. And to achieve this, a big step forward will be achieved by investment in basic infrastructure.

In a freight context, the manifest goals of RVRI are to move a substantial portion of traffic onto the rail system and deliver it in a time efficient manner at a lower cost. The rail system has been developed previously with the idea of catering for freight –incorporating elements such as the Nairobi ICD – and so while RVRI faces significant challenge it does so in the context of a system that been shaped with accommodation freight operations very much in mind, within Kenya and cross border.

It is pointed out that both internal port road and rail system development is required as part of the ultimate goal of achieving seamless transportation. Father, it is felt that the KPA and other involved parties have scope to be innovative in this respect. It may be feasible, for example, as part of the concession of Berth 11 – 14 for container operations to add a rail terminal pacage to the concession offer – specially the rail facility that is required to serve the terminal and optimize block train operations.

Also notable in a rail freight contex is the plan to build a regional railway besed on the African standard gauge. This offers most promise for the increased utilization of the rail system for freight movement over the longer term. Followings are citation from the seminar booklet of Kenya Railway Cooperation on Standard Gage Railway Development in 2013.

Figure 4.4.3 Map of Standard Gage Railway (SGR)

(2) Purpose of standard gage railway development

The Government of Kenya, Uganda, Rwanda and South are committed to providing high capacity cost effective railway transport within the Northern Corridor. This will be achieved through the construction of the proposed Standard Gauge Railway (SGR) connecting Mombasa to Kampala and to Kigali and later a connection to Juba from Tororo. The Railway line will have a uniform design specification which will permit seamless operation across the borders and in turn reduce costs. The railway development will include upgrading and modernization of the railway training institutes in Nairobi and Tororo to provide local manpower for the reconstruction and operation of the railways.

(3) SGR development plan in Kenya

The Government of Kenya will develop Mombasa-Nairobi-Malaba/Kisumu section in two Phases.

- Phase 1: Mombasa to Nairobi
- Phase 2: Nairobi to Malaba and Kisumu

Construction of the phase 1(Mombasa-Nairobi Section) will commence early 2014 while feasibility studies and preliminary design for phase 2 are in progress.

The Government of Kenya is in the process of consolidating funding for phase 1 (Mombasa-Nairobi Section) and far has made budgetary allocation in the 2013/14 budget as well as settling up a railway development fund to be financed by a levy on the coast of all imports. Cost of the project is estimated at 223.6 billion Kshs for infrastructure. The Mombasa to Nairobi-Malaba/Kisumu section is expected to be operational by 2018.

(4) Development plan in Uganda, Rwanda and South Sudan

Feasibility Study and Preliminary Design of Malaba to Kampla section is in progress. The Government of Uganda and Rwanda are discussing joint procurement of consultants to undertake the Feasibility Studies and Preliminary Designs of the Kampala to Kasese and Bihange to Kigali Sections. Uganda and South Sudan also intend to jointly study Tororo to Pakwach and Gulu to Juba sections for standard gauge railway installation.

(5) Northern corridor transportation

The Northern Corridor is the transport artery for Kenya, Uganda, Rwanda, Burundi, Northen Tanzania, Eastern DRC, Southern Sudan and Ethiopia- a region larger than Western Europe. All the countries depend on the Port of Mombasa for some of their imports and exports.

Road transport dominates the Northern Corridor accounting for 94% of all freight movement compared to 5% by the existing Meter Gauge Railway (MGR) but the combined capacity is inadequate. The Situation will worsen as transport demand through Mombasa increases from the present 22 million tons towards projected 30+ million tons by the year 2030 and the region starts exploiting stranded resources that cannot be exploited until transport capacity is increased. The combined road and rail has failed to provide fast, reliable, affordable services and adequate capacity required to attract investment into the region.

As a result, the cost of transport in the Corridor and the region as a whole is on the average 45% of the coast of goods and services compared to 15% on the average elsewhere making the region uncompetitive investment destination.

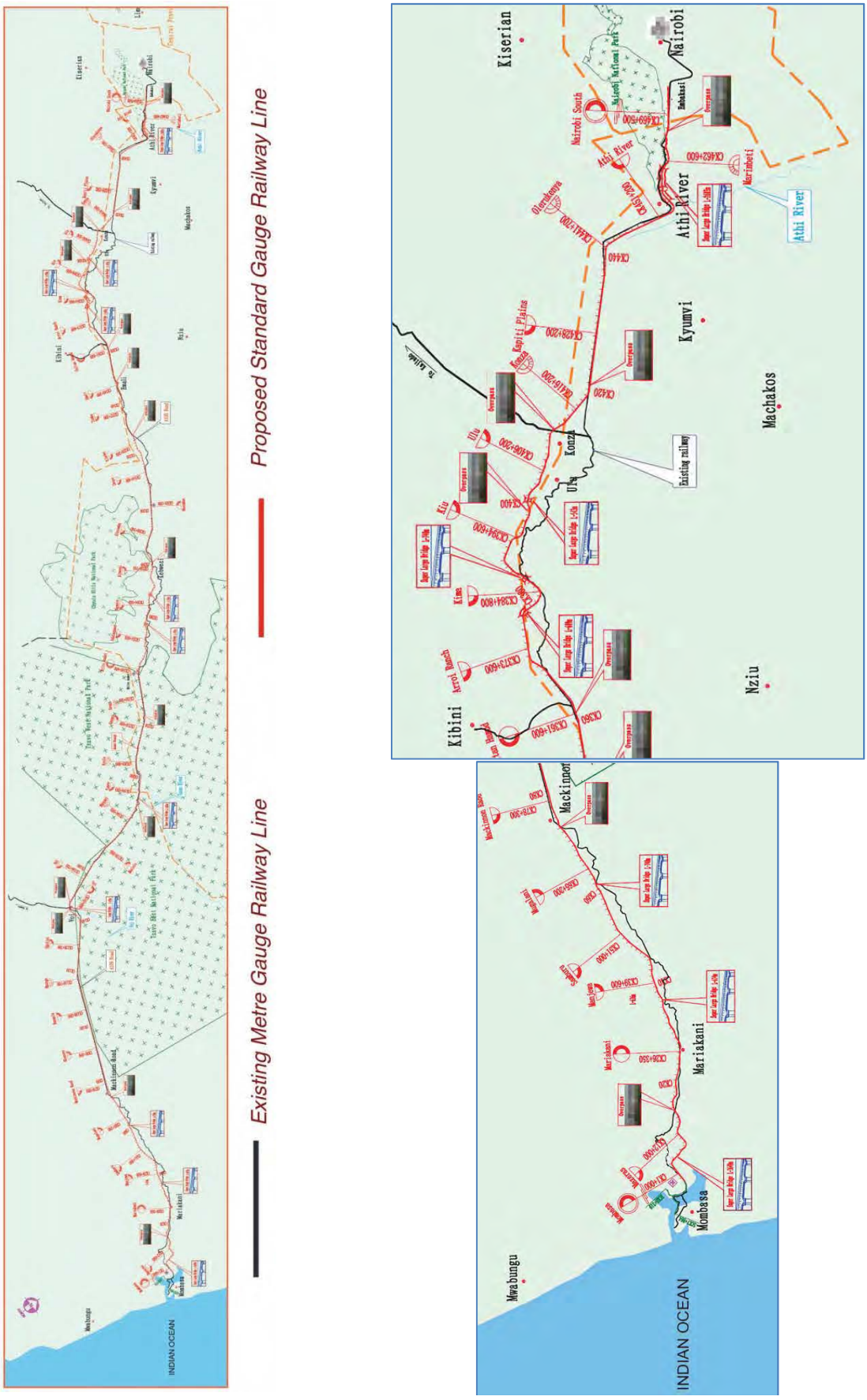


Figure 4.4.4 SGR Route Map from Mombasa to Nairobi

(6) Standard gauge and meter gauge railway track compared

The new railway line will run generally paralled to the existing meter Gauge railway but will deviate as appropriate in order to achieve the desired gradient and curvature. It will be designed to achieve high capacity, reliability, efficiency, safety and cost effectiveness to meet the transport demands for the region in the immediate and long term futures.

Table 4.4.1 SGR and MGR Tracks Compared

Design Features	Standard Gauge	Metre Gauge
Gauge	1,435 mm	1,000 mm
Structure	Single track	Single track
Axle loading	25 tonnes	16 tonnes
Tonnage of freight train	4,000 tonnes (216 TEUs)	1,000 tonnes (40 TEUs)
Horizontal curvature	Radius 1,200 meters	Radius 175 meters
Ruling gradient	<1.20%	<1.50%
Loading gauge	Suitable for double stacked containers,double decker passenger cars & future electrification at 25 KV	Unsuitable for double stacked containers Unsuitable for double deck passenger cars Unsuitable for electrification
Design speeds	**Passenger trains:** 160 kph **Freight trains:** 100 kph	**Passenger trains:** 70 kph **Freight trains:** 65 kph

(7) Salient features of the proposed SGR

The Railway will be developed for freight and passenger traffic.

Figure 4.4.5 Wagons with Double Stack Containers

- Each freight train will have a capacity of 216 TEUs and will travel and a average speed of 80 km/h
- The railway will complement the existing railway and the roads, which will continue providing vital transport services for freight destinations and the “last mile” links within and around the region.
- Freight trains will be operated on the basis of speed, safety and cost effectiveness.
- Contribute to an annual GDP growth of at least 1.5% during construction and subsequent operation.
- Enhance the region’s competitiveness
- Reduce congestion at Mombasa Port securing the port as the preferred facility in the region.
- Reduce wear and tear on roads; hence reduce maintenance cost.
- Enhanced freight security

4.4.3 Mombasa SEZ Master Plan

(1) Project background

The Government of Kenya (GOK) prepared the Vision 2030 which aimed at bringing about new industrialization and transforming Kenya a middle-income country. Development of Special Economic Zones (SEZ) at Mombasa, Kisumu, Lamu was proposed as a core instrument to achieve the Vision 2030, and the Mombasa SEZ was proposed as one of the flagship projects to realize the vision.

The GOK requested the Government of Japan (GOJ) to assist with the formulation of a master plan for the SEZ development in Mombasa. In response, GOJ accommodated the GOK's request and decided to facilitate support for the formulation of the master plan for the SEZ development in Mombasa.

(2) Project objective

The Project aims at achieving the following outputs:

Output 1: Formulation of the visions and concepts of the Mombasa SEZ

Output 2: Identification of targeted industries and functions of the Mombasa SEZ

Output 3: Formulation of the general plan of infrastructure development in the Mombasa SEZ

Output 4: Operation and management of the Mombasa SEZ

These outputs will contribute to efficient execution of the SEZ development in Mombasa in the coming years. Therefore, this Project becomes the stepping stone of industrialization in Kenya.

(3) Project organization

The executing agency of the Project is the Ministry of Industrialization and Enterprise Development (MIED), together with the Ministry of Transport and Infrastructure (MOTI). The related organizations include the Kenya Port Authority (KPA), Mombasa County Government, and others. Below is the list of members at the Joint Coordination Committee (JCC) for the project.

(4) Project schedule

The Project on Master Plan for Development of Mombasa SEZ was commenced in January 2014. The Grand Design, preliminary project plan, was presented to the Joint Coordination Committee (JCC) in June 2014. The Project is to be completed in August 2015 with the presentation of the master plan and the submission of the Final Report.

(5) Project target area

The Mombasa SEZ is the term for the series of SEZs in the Coast region. Originally, the Project targeted the two (2) locations: Dongo-Kundu SEZ (DK-SEZ), and Mombasa Corridor SEZ (MC-SEZ, About 2,220 km^2, 50 km inland to the direction of Nairobi from Mombasa).

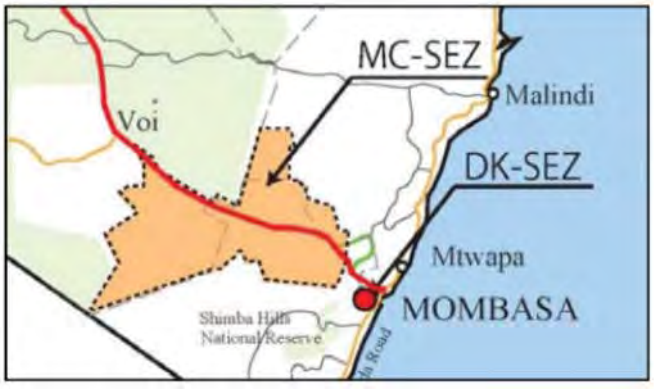


Figure 4.4.6 Study Area for Mombasa SEZ Master Plan
Source: JICA Team

However, the planning for the MC-SEZ was opted out due to delay in the land selection. As a result, the master plan focuses on the DK-SEZ. The DK is next to the Mombasa Island and is located in the south coast of the Mombasa port. The total area is 12km^2 (1,200 ha).

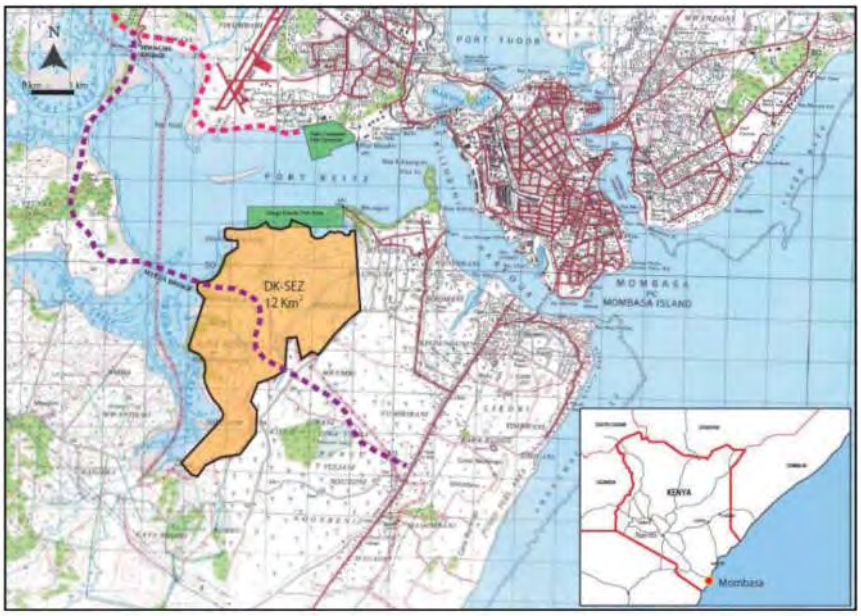


Figure 4.4.7 Location of Dongo Kundu SEZ
Source: JICA Study Team

(6) Investment Demand Survey

In order to grasp the investment demand specific to the planned SEZs in Mombasa, a survey was conducted using the following two methods;

- Questionnaire Survey to Companies
  The questionnaires comprised following three items; Degree of Interest for Doing Business in Africa, Degree of Interest for Mombasa SEZ in Kenya, and Opinion or Suggestion for Mombasa SEZ (Free description).
- Interview Survey to Companies, Business Groups and Economic Organizations

The overview of the survey is as summarized as below:

Methods	Period Conducted	Description	Resource
Questionnaire survey	May 2014	Questionnaires sent: Total: 3,801 (Japan, India, UAE, UK, Saudi Arabia, Kenya, Uganda, South Sudan, Sudan) Response rate Japan: 7.3% Other countries in total: 12.9% Covered industries: Major companies with the certain size of business in Manufacturing, mining, construction, transportation, wholesale Japan: Selected from the listed companies from the Tokyo Stock Exchange and some additional companies based on the size of the sales, added from those in the List of	Japan: Database on the Companies' Information by the Tokyo Shoko Research, the List of Japanese Enterprises (AfDB) Other countries: International Companies' Information File by Cross Index Corporation

Methods	Period Conducted	Description	Resource
		Japanese Enterprises by the Africa Development Bank	
Interview survey	May to June 2014	Surveyed in total: Japan: 46, India: 6, UAE: 3, UK: 4, South Africa: 3 Kenya: 4	

(7) Selection of Potential Industries

It is important to identify the critical position of Mombasa in the important industries in order for the industries located in Mombasa to fulfill the roles of value addition, product diversification and domestic and regional industrialization. Based on the overall economic development projections, the subsequent analysis will be undertaken to develop the short list with phasing as well as to identify the obstacles of investment. Therefore, the selection will be done by combining the critical factors such as the national policy framework and current status of Kenya's industry, the characteristics of Mombasa as an industrial site and investors' demand. Based on the information, the selection criteria were set to select the potential industries. The sequence is as shown in the Figure 4.4.8.

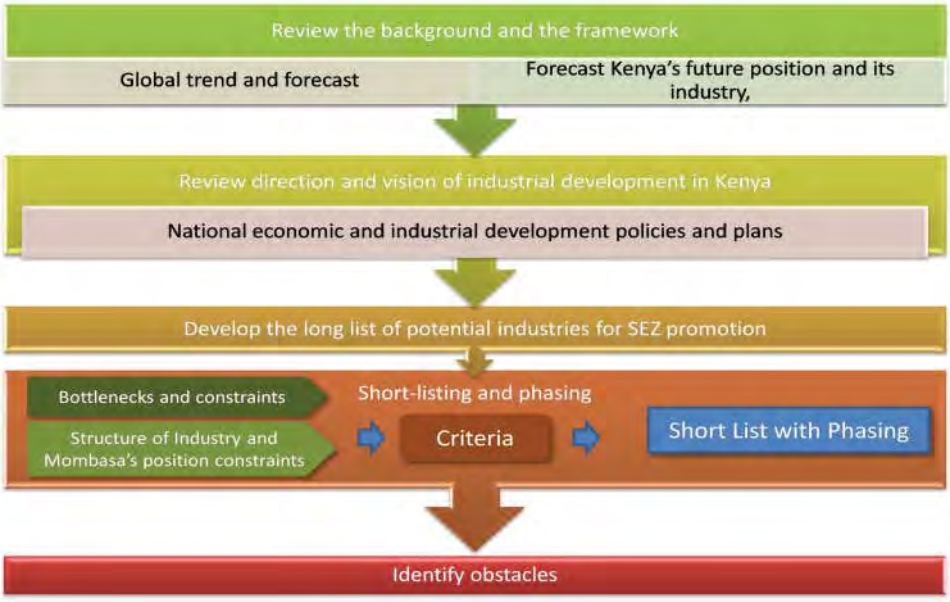


Figure 4.4.8 Flow of Selecting Potential Industries
Source: Mombasa SEZ M/P Draft Final Report

Relevant policies in terms of industrial development and trade and investment promotion provide the direction of the overall policy objectives as well as the specific objectives of SEZ. Although these policies focus on the different process or scope of the economic activities, the targets may be broadly organized as shown in Table 4.4.2.

Table 4.4.2 Industrial Development, Investment and Trade Promotion Policy Target

Target and Priority industries		Kenya Vision 2030	Industrial Development		Investment Policy	Trade Policy
		Mid-Term Programme 2008-2012 Industries to be promoted in SEZs	Master Plan Survey for Kenyan Industrial Development (MAPSKID)(2008)	National Industrialization Policy Framework (2012)	Summary of Key Investment Opportunities in Kenya (2008)	Export Promotion
Agro-processing (Fruits and vegetable, coffee, dairy, meat products etc)		○	○	○	○	○
Fish and marine resource processing		○	○	○		○
Textile and clothing				○		○
Leather and Leather goods			○	○		○
Chemicals	Fertilizer, other chemical products	○			○	
Pharmaceuticals and medical products				○	○	
Construction materials	Cement, glass sheet etc				○	
Iron and Steel				○	○	
Metal fabrication	Can, structured metals etc				○	
Machinery	Machine tools and spares			○		
	Agro machinery and farm implements		○	○		
Electrical appliances & equipment	Electrical appliances and equipment (electrical equipment, personal computer, white goods)		○			
	Electricity generation equipment (solar and wind generator) and equipment for transmission (e.g., transformer, switchboard)		○		○	
Biotechnology and nanotechnology				○		
Horticulture	Cut flower, fresh produce				○	○
Energy	Power generation				○	
	Minieral extraction, bio-fuel				○	
ICT	BPO				○	
	Data processing and management for public administration				○	
	Software and hardware development				○	
Tourism	Conferrence facilities, business tourism				○	
Logistics and trading	Car trading hub				○	

Note: the industrial sectors with screen are selected as the priority sectors as identified by more than two policies as a priority sectors.
Source: Mombasa SEZ M/P Draft Final Report

A further analysis was made in order to narrow down the long list to the short list of potential industries for the planned SEZs. The industries and Mombasa's strategic positioning are analyzed based on the simplified concept of value chain.

The type of industries for potential industries can be categorized as follows:

Table 4.4.3 Types of Industries to be Located in Mombasa

	Descriptions	Nature of the industry
Trade hub for export	Industries located in Mombasa to form a trade hub	Export-oriented or potential of export
Trade and logistics hub for regional and domestic market	Industries to streamline the trading whereby marketing activities can be conducted	Capturing demand of the domestic and regional demand Imported with a large amount Imported as the finished goods Kenya and the region may not be integrated largely into the supply chain.
Processing of locally available resources	Processing of locally available resources mainly for export and partially domestic consumption	Availability of resources
Processing of imported materials for domestic and regional market	Processing of locally available resources for the domestic and regional market or export to outside of the regional market	Relying on the imported material. Semi- or finished process can reduce the quantity for transportation

Source: Mombasa SEZ M/P Draft Final Report

In order to identify these industries, the following criteria will be applied and screen the industries in the long-list.

Table 4.4.4 Criteria of Selecting Potential Industries

Factors	Criteria	Rationales and points to be reviewed
Policy context	Selected as priority sectors/industries in the relevant policies	・ ◎ as those raised in multiple policies. ・ ○ as those raised only one source.
Export	Volume of exported goods through the Port of Mombasa and its degree of growth	・ Dependency on the sea route for the exportation ・ Exhibited export-orientedness
Import	Volume of imported finished goods through the Port of Mombasa and its growth rate	・ Demand in the domestic and regional market
	Volume of imported Semi-finished goods and raw materials through the Port of Mombasa	・ Demand in the domestic and regional market ・ Possibility in processing, assembling and finishing in Mombasa
Resource Endowment	Any available raw material	Comparative advantage, possibility of processing locally
Human resources endowment	Specific needs of human resources nurtured from available industrial activities	Some industries require specific skilled labor and technical professionals who can be nurtured through the existing industrial activities. In case of these industries, availability of these existing industries in Mombasa will be assessed.
Relation with other industries	Strong relation with other industries (as a result of forward and backward linkages)	Observed ripple effect in development as a result of linkage with production or trading activities with other products/services to enjoy the forward/backward linkage
Logistics factor	Whether the proximity to the center of the targeted market required or not	Some industries prioritize the proximity to the consumer. Therefore, among the industries targeting the domestic and regional industries, those which do not stress the proximity to the market are evaluated as more positive for Mombasa.

Factors	Criteria	Rationales and points to be reviewed
	Production process and transportation cost	Among the products for the domestic and regional market with the heavy reliance of imported materials, some products may be able to reduce the size and weight before reaching to the sites for next production process or final markets.

Source: Mombasa SEZ M/P Draft Final Report

Based on the analysis using the criteria set in the previous section, the short list of the industries is developed as the Table 4.4.5.

Table 4.4.5 Short List of Industries in Mombasa SEZ

Industry		Factors Determining Mombasa's Competitiveness as Industrial Location					
		Trade Volume and Growth		Resource Endowments in the Coast	Human Resource Endowment	Relation with Other Industries	Logistics Factors
		Export from Mombasa	Import of Complete, Semi-finished or Raw Materials				
Agro-processing	Agro-processing mainly for the domestic and East and Southern Africa		○	○			
	Agro-processing mainly for export to outside of East and Southern Africa	○		○	○		
Fish and marine resource processing	Fish and marine resource processing	○		○			
Textile & clothing	Textile					○	
	Wearing apparels	○	○		○		
Leather and leather products	Leather products	○		○			
Chemical Industries	Consumer goods	○	○		○		○
	Chemical industries (Fertilizer, other chemical products)	○	○				○
Pharmaceuticals	Pharmaceutical and medical products		○				
Petroleum products	Petroleum and petrochemical products	○	○		○		○
Energy	Electricity generation						
	Bio-fuel						
Rubber and plastic	Rubber and plastics	○	○		○	○	○
Paper and paper products	Packaging industry		○			○	
Printing							
Construction materials	Cement, glass sheet etc	○		Depending on the Products	○		○
Iron and Steel	Basic metals	○	○	○			○
Metal fabrication	Can, structured metal etc	○	○				
Machinery and equipment	Agro- and other machinery for manufacturing and general use		○				
Electrical appliances & equipment	Electrical appliances and equipment		○			○	
	Electrical generation equipment		○				
Motor vehicles	Motor vehicles	○	○				
Cut flower and Fresh produce	Cut flower and fresh produce	○					
Infrastructure development services	Infrastructure development services		○			○	
Logistics & services	Logistics & services				○	○	
ICT	BOP, data processing and management for					○	
MICE (conference & exhibition&accomodation)	MICE			○	○	○	

Source: Mombasa SEZ M/P Draft Final Report

While most of the industries have more than one positive factor as a positive sign for locating in Mombasa and the planned SEZ, it should also be noted that some are with low score. Moreover, the type of activities to be located in Mombasa may require further analysis.

The activities are further forecasted in 3 phases, namely around the assumed time of the launch of SEZ (around the year 2018) to the second phase development (up to 2025), from 2025 to the third phase (2035) and the long term (around 2035 onward). As seen in Table 4.4.6, logistics, distribution and services are projected to be launched more and earlier than production.

Table 4.4.6 Phasing of Potential Industries

Industry		Selected Target Industries for Mombasa SEZ			
		Activity	Timeframe		
			Short	Medium	Long
Agro-processing	Agro-processing mainly for the domestic and East and Southern Africa	Processing and packaging		○	
	Agro-processing mainly for export to outside of East and Southern Africa	Warehousing	○	○	
		Processing and packaging	○	○	
		Trade center function	○	○	○
Fish and marine resource processing	Fish and marine resource processing	Processing and packaging		○	
Textile & clothing	Wearing apparels	Assembling	○		
Leather and leather products	Leather products	Production of semi-processed goods for further value addition in the country. Environmental concerns may be noted.			○
Chemical Industries	Consumer goods	Production		○	
	Chemical industries (Fertilizer, other chemical products)	Production		○	
Pharmaceuticals	Pharmaceutical and medical products	Production			○
Petroleum products	Petroleum and petrochemical products	Storage and distribution		○	
Energy	Bio-fuel, mineral extraction	Logistics, processing			
Rubber and plastic	Rubber and plastics	Production		○	
Paper and paper products	Packaging industry	Production		○	
Printing		Printing			
Construction materials	Cement, glass sheet, pipes and tubes etc	Warehousing and distribution hub		○	
		Showcasing and wholesaling		○	
		Production		○	
Iron and Steel	Basic metals and the fabrication of metal products	Production	○	○	
Metal fabrication	Can, structured metal etc	Production	○	○	
Machinery and equipment	Agro- and other machinery for manufacturing and general use	Warehousing and distribution			○
Electrical appliances & equipment	Electrical appliances and equipment	Warehousing and distributing		○	
		Showcasing			
	Electrical generation equipment	Warehousing and distributing		○	
		Production		○	
Motor vehicles	Motor vehicles	Stockyard and distribution of new and used vehicles and parts and spares	○		
		Trading and merchandizing	○	○	
		Service and repairs	○	○	
		Parts Warehousing		○	
Cut flower and Fresh produce	Cut flower and fresh produce	Packaging materials and warehousing			○
Infrastructure development services	Infrastructure development services	Stockyard for equipment and materials for infrastructure development		○	
		Ship building and repair		○	
Logistics & services	Logistics & services	Warehousing, depots	○		
MICE (conference & exhibition&accommodation)	MICE	Conference and exhibition functions, accomodations and related services		○	
		Logistics, distribution and services			
		Production			

Source: Mombasa SEZ M/P Draft Final Report

(8) Conceptual Design of Mombasa SEZ

a) Development Concept

The Mombasa SEZ Project comprises two SEZs; Dongo Kundu SEZ (DK-SEZ) and Mombasa Corridor SEZ (MC-SEZ). DK-SEZ is a port based SEZ located on the opposite side of Mombasa Port, which is the only deep sea port in the region, functioning as the logistic gate of EAC and surrounding area. MC-SEZ can be developed along the national corridor connecting Mombasa, the second largest city in Kenya, to the capital Nairobi and beyond.

DK-SEZ will be developed in full utilization of the advantageous location in proxy to the international port, while MC-SEZ will be developed through exploiting the economic development potential of national development corridor.

Development concept of each SEZ is summarized below. MC-SEZ will be industrial base SEZ for Kenya and EAC, while DK-SEZ will be logistics and trade hub for Kenya and Northern African region.

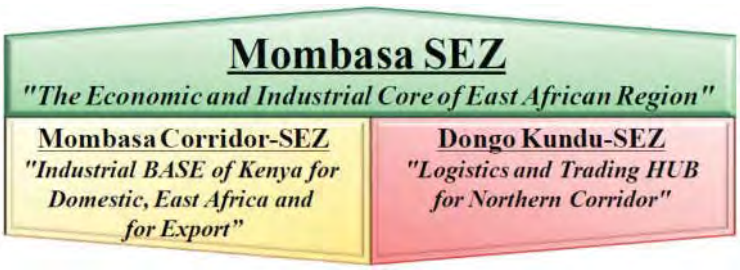


Figure 4.4.9 Development Concept of Mombasa SEZ and its Components
Source: Mombasa SEZ M/P Interim Report

b) Necessity Function of Dongo Kundu SEZ

Necessary function was considered based on the development concept and characteristics of the location as listed below.

Advantageous characteristics:

- Located in the sea logistic gateway of Kenya as well as East Africa,
- Possibility for integrated operation as a freeport and/or free trade zone,
- Close to Mombasa city, the second largest city of Kenya,
- Plenty of labor resource in surrounding area,
- Potential investment opportunity for LNG power generation and oil tank farm.

Disadvantageous characteristics:

- Hilly area imposing potentially a high development cost.
- Existence of swampy area along the coast,
- Currently no basic infrastructure,
- More than 400 informal households scattered in the site,

To fully utilize the indigenous advantage of proximity to the international port, logistic industry base such as FTZ (Free Trade Zone), industrial park, as well as energy base should be introduced in DK-SEZ. In addition, residential and tourism function is recommendable to create an integrated SEZ. Infrastructure including power supply, water supply, waste treatment and telecommunication, etc. should be inevitable for attracting investors.

c) Land Use Plan

Considering that Mombasa Port is the principal international sea port servicing the cargo logistics for Kenya as well as East African Community (EAC), land use for the logistics function by free trade zones should be fully introduced in DK-SEZ. Land use function for manufacturing activity by industrial parks should be introduced in DK-SEZ for contribution of promotion of Kenyan manufacturing industry.

It is also necessary to minimize the land reclamation works by balancing cut and filling works within each development phase's area, to keep the competitiveness compared to the land price in the Mombasa inland area (e.g. Export Processing Zone and Industrial Zone).

Land use for housing land will be secured for workers as well as informal settler's resettlement and Kaya's reservation for the purpose of environmental countermeasures should be attained by fully attention.

Land use for utility and facility such as waste water treatment plant, power sub-station, water supply facility, etc. necessary for industrial activity and residential purpose should be constructed in land use specifically reserved for utilities.

DK-SEZ is thus planned to introduce the following land use functions. Figure 4.4.10 depicts the proposed land use plan of DK-SEZ.

- Port
- Free port/ Free Trade Zone
- Industrial park
- High grade residential housing
- Resettlement housing area for informal settlers
- Tourism park, recreation, MICE
- Enterprise area (land for development on demand)
- Environmental reserve, etc.

Development phasing is set for three target years; 2018, 2025 and 2030, in consideration of the following conditions.

- Target year of Phase 1 is set for the year 2018 when Mombasa Southern By-pass road will be completed and DK-SEZ connects with external areas including the Port and city of Mombasa through the road.
- Target year of Phase 3 is set in 2030, following National Development Vision 2030.
- In-between, the year 2025 is set as the target year of Phase 2.

Table 4.4.7 shows land use areas and land use figures by phase.

Table 4.4.7 Land Use Plan by Phased Development

(Unit: ha)

	Phase 1 (2018)	Phase 2 (2025)	Phase 3 (2030)	Total
1 Port*1	0.0	34.2	32.3	66.5
2 Free port/Free trade zone A/B/C/2	67.3	9.0	45.3	121.6
3 Free port/Free trade zone D	0.0	10.2	23.0	33.2
4 Industrial parks*2	34.4	65.6	21.6	121.6
5 Miscellaneous zone*2				
5.1 Residential area E	0.0	4.3	7.0	11.3
5.2 MICE area	0.0	2.2	0.0	2.2
5.3 Tourism parks	0.0	15.2	34.2	49.4
5.4 Service area	2.8	0.0	6.9	9.7
6 Power plant (Including transimission lin	120.0	0.0	0.0	120.0
7 Enterprise area				
7.1 Enterprise area A/B/C *3	85.4	113.1	0.0	198.5
7.2 Enterprise area (D~J)	0.0	69.0	60.3	129.3
8 Residetial area A/B/C/D	29.2	0.0	0.0	29.2
9 Infrastructure/utility				
9.1 Internal arterial roads*4	13.0	6.0	3.0	22.0
9.2 Utility (SS, DC, utility area)*5	18.0	0.0	0.0	18.0
9.3 Main drainage network area	18.6	1.7	5.6	25.9
Total Development Area	388.7	330.5	239.2	958.4

Note: Kaya (24ha), Mombasa southern bypass road (34ha) and green/reserve area (310ha) are exclusive.

Source: Mombasa SEZ M/P Draft Final Report

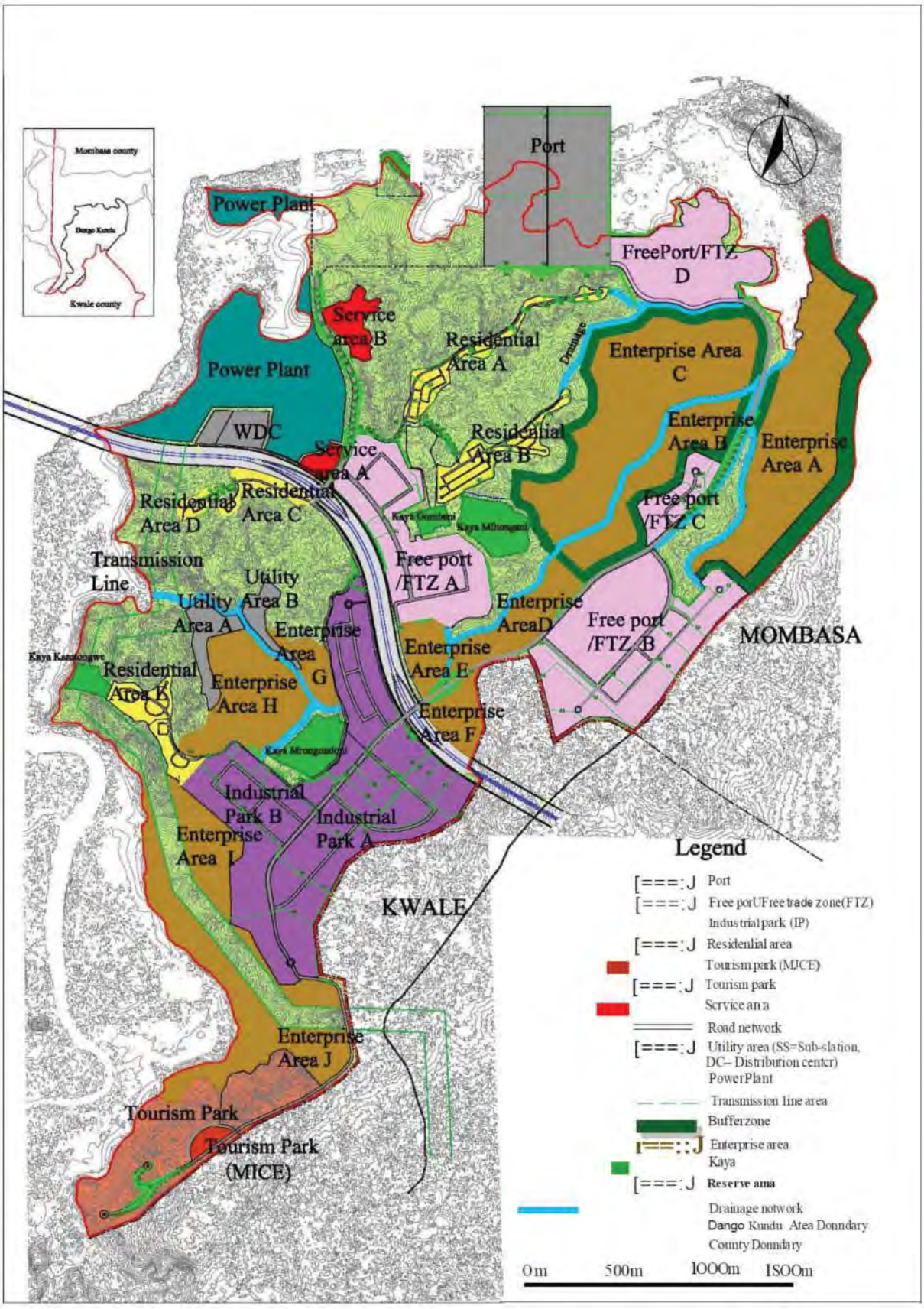


Figure 4.4.10 Proposed Land Use Plan of DK-SEZ
Source: Mombasa SEZ M/P Draft Final Report

4.4.4 Mombasa Gate City Comprehensive Development Master Plan

Kenya Vision 2030 is the new long-term development blueprint for the country. It is motivated by a collective aspiration for a better society by the year 2030. The aim of Kenya Vision 2030 is to create *"a globally competitive and prosperous country with a high quality of life by 2030"*. It aims to transform Kenya into *"a newly-industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment"*.

The Vision is anchored on three key pillars: economic; social, and political governance. The economic pillar aims to achieve an average economic growth rate of 10 per cent per annum and sustaining the same till 2030 in order to generate more resources to meet the MDGs and vision goals. The Vision has identified a number of flagship projects in every sector to be implemented over the Vision period and to facilitate the desired growth rate. The identified flagship projects directly address priorities in key sectors such as agriculture, education, health, water and the environment. The social pillar seeks to create a just, cohesive and equitable social development in a clean and secure environment. The political pillar aims to realize an issue-based, people-centered, result-oriented and accountable democratic system.

The major development challenges include among others; poor road networks, rapid urbanization and housing problems, inadequate education facilities, inadequate health care delivery points, high unemployment among the youthful, insecurity, weak land ownership regime, perennial water shortages and growth of unplanned and informal settlements.

Under such circumstances and objectives/development challenges articulated in the Kenya Vision 2030, the Project for Formulation of Comprehensive Master Plan in the Mombasa Gate City is being underway intended to suggest a spatial framework for development of the region. It articulates the aims of the Government of Kenya, the City County Government and the citizens of Mombasa City County, proposing strategies and policies intended to achieve those aims. The mandate to prepare the plan derives from the provisions of the Constitution of Kenya 2010, Urban Areas and Cities Act No. 13 of 2011, The County Governments Act, 2012, Physical Planning Act Cap 286 of the Laws of Kenya.

The Project for Formulation of Comprehensive Master Plan in the Mombasa Gate City started in March 2015 and is expected to be completed in March 2017. The study includes the following scope of works.

- Reviewing current situation
- Conducting traffic volume survey and household survey
- Conducting strategic environmental assessment (SEA)
- Identifying development constraints
- Formulating development vision
- Setting socio-economic framework
- Formulating structure plan
- Formulating land use plan
- Conducting traffic demand projection
- Formulating urban transport network
- Formulating development strategy for infrastructure
- Formulating development strategy for socio economic aspect
- Proposing urban development management
- Determining priority area and priority projects
- Conducting seminars/stakeholder meetings
- Conducting training program to local counterparts

A structure plan will be formulated based on the existing conditions, policy and plans, comparison with other cities in consideration of the following key items. The image of the structure plan is depicted in Figure 4.4.11

- Development of CBD

- Development of multi-core
- Linkage with SEZ and port
- Linkage with urban transport

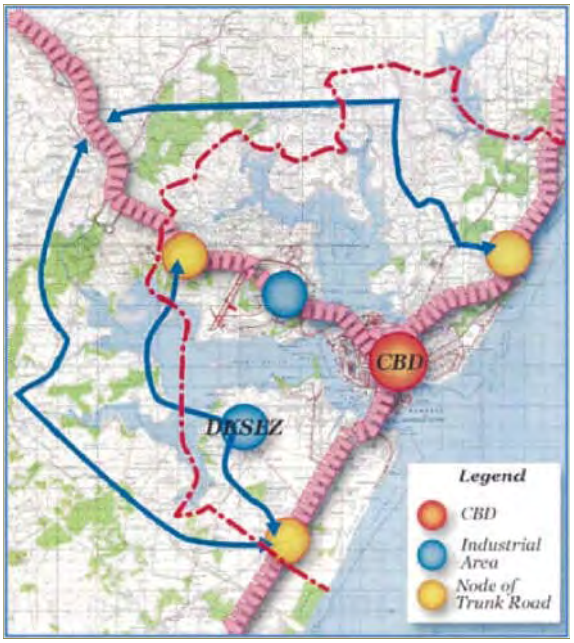


Figure 4.4.11 Image of Structure Plan
Source: Mombasa Gate City M/P Inception Report

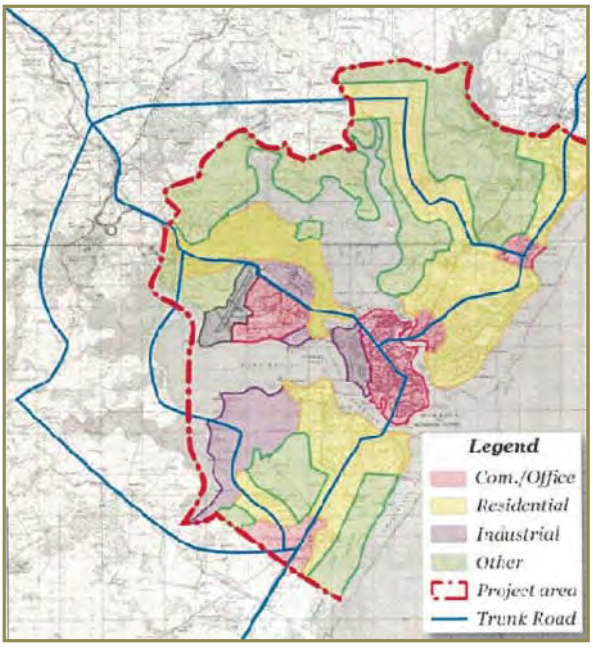


Figure 4.4.12 Image of Land Use Plan
Source: Mombasa Gate City M/P Inception Report

A land use plan will be formulated to improve urban conditions as well as strengthen function as gateway for Northern Economic Corridor in consideration of the following key items. The image of the land use plan is depicted in Figure 4.4.12.

- Classification of land use zones
- Land use demand for residential use, commercial use, industrial use and others
- CBD and core urban area, commercial, industry, residential, coast/mangrove, conservation