Ministry of Transport and Communications
Portos e Caminhos de Ferro de Moçambique

THE PREPARATORY SURVEY
ON
NACALA PORT DEVELOPMENT PROJECT
IN
THE REPUBLIC OF MOZAMBIQUE

FINAL REPORT

June 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

The Overseas Coastal Area Development Institute of Japan
Oriental Consultants Co., Ltd.
ECOH CORPORATION
Ides Inc.

EID
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Cost Estimation Base: the average rate in 2010
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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey on Nacala Port Development Project in the Republic of Mozambique, and organized a survey team headed by Dr. Kobune of Ides and consists of OCDI, Oriental Consultants, ECOH CORPORATION, and Ides between June, 2010 and April, 2011.

The survey team held a series of discussions with the officials concerned of the Government of the Republic of Mozambique, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Mozambique for their close cooperation extended to the survey team.

June, 2011

Kiyofumi KONISHI
Director General,
Economic Infrastructure Department
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

June 2011

Mr. Kiyofumi KONISHI
Director General
Economic Infrastructure Department
Japan International Cooperation Agency

Dear Sir,

It is my great pleasure to submit herewith the Final Report of "The Preparatory Survey on Nacala Port Development Project in the Republic of Mozambique".

The Study Team comprised of The Overseas Coastal Area Development Institute of Japan (OCDI), Oriental Consultant Co. Ltd., ECOH Corporation and Ides Inc. conducted studies during the period of June 2010 and June 2011 according to the contract with the Japan International Cooperation Agency (JICA).

The Study Team compiled this report, which proposed the Medium and Long-term Development Plan of Nacala Port with the target year of 2030 and the Short-term Development Plan, and selected the Urgent Rehabilitation Project through close consultations with officials of the Mozambique Government, in particular, Ministry of Transport and Communications (MTC), Portos e Caminhos de Ferro de Mocambique E.P. (CFM), as well as the Management of Corredor de Desenvolvimento do Norte (CDN), and authorities concerned.

On behalf of the Study Team, I would like to express my sincere appreciation to the MTC, CFM, CDN and authorities concerned for their cooperation, assistance, and heartfelt hospitality extended to the Study Team.

We are also very grateful to the Japan International Cooperation Agency, the Ministry of Foreign Affairs and the Ministry of Land, Infrastructure, Transport and Tourism for valuable suggestions and assistance during the course of the Study.

Yours Faithfully,

小舟 浩治

Koji Kobune
Team Leader
The Preparatory Survey
on Nacala Port Development Project
in the Republic of Mozambique

Nacala Port


Liquid Bulk
General Cargo
Dry Bulk
Gate
Container


Liquid Bulk
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ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ABS	Absolute Figure
ADS-B	Automatic Dependent Surveillance Broadcast
AfDB	African Development Bank
ANE	National Roads Administration
BCI	Banco Comercial de Investimentos
ASTEM	American Standard for Testing Materials
BH	Bore Hole
BOF	Berth Occupancy Factor
BOR	Berth Occupancy Rate
BS	British Standards
BOT	Build Operate Transfer
CAPEX	Capital Expenditure
CBA	Cost Benefit Analysis
CBD	Central Business District
CBR	California Bearing Ratio
CCFB	Campanhia Dos Caminhos De Ferro Da Beira SARL (Beira Railroad Corporation)
CD	Chart Datum
CDIT	Coastal Development Institute of Technology (Japan)
CDL	Chart Datum Line
CdM	Cornelder de Moçambique S.A.
CDN	Corredor de Desenvolvimento do Norte
CEAR	Central East African Railway
CF	Conversion Factor
CFM	Portos e Caminhos de Ferro de Moçambique, E.P.
CFS	Container Freight Station
CFU	Colony Forming Units
CHF	Swiss Franc
CIF	Cost, Insurance and Freight
COFRAC	French Committee for Accreditation
CNG	Compressed Natural Gas
CNT	Container Terminal
CY	Container Yard
DAC	Development Assistance Committee
DANIDA	Danish International Development Assistance
dB	Decibel
DB	Dry Bulk
DBT	Dry Bulk Terminal
DBST	Double Bituminous Surface Treatment
D/D	Detailed Engineering
DDT	Dichloro-diphenylt-richloroethane
DEI	Direccao de Eeconomia e Invetimento, MTC
D.L.	Datum Level
DO	Dissolved Oxygen
DRC	Democratic Republic of the Congo
DSCR	Debt Service Coverage Ratio
DWT	Dead Weight Tonnage
EAS	Estude Ambiental Simplificado
EC	European Code
E. coli.	Escherichia Coli
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
EMODORAGA	Empresa Moçambicana de Dragagens
EN	European Norm
ENRC	Eurasian Natural Resources Corporation

EPDA	Environmental Pre-Viability Report and Scope of Definition
EPZ	Export Processing Zone
EQI	Export Quantity Index
EU	European Union
EUR	Euro
EVSL	Enhanced Variable Spread Loan
FAO	Food and Agriculture Organization
FC	Full Container Ship
FD	Floating Dock
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
FNU	Formazin Nephelometric Units
FOB	Free On Board
F/S	Feasibility Study
FSL	Fixed Spread Loan
FTU	Formazin Turbidity Unit
GAAP	Generally Accepted Accounting Principle
GAZEDA	Gabinete das Zonas Economicas de Dessemvolviment Acelerado
GC	General Cargo
GDP	Gross Domestic Product
GIS	Geographic Information Systems
Gj	Giga Joules
GNI	Gross National Income
GOM	Government of Mozambique
GPS	Global Positioning System
GRT	Gross Tonnage
GT	Gross Tonnage
HWL	Highest Water Level
IBRD	International Bank for Reconstruction and Development, World Bank
ICA	Infrastructure Consortium for Africa
ICB	Interlocking Concrete Block
IDZ	Industrial Development Zone
IEA	International Energy Agency
IEE	Initial Environmental Evaluation
IFZ	Industrial Free Zone
IMF	International Monetary Fund
IMO	International Maritime Organization
INE	National Statistics Institute
IOI	Indian Ocean Islands
ISPS	International Ship and Port Facility Security
ISO	International Organization for Standardization
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
JSPL	Jindal Steel & Power Limited
N	Newton
LDC	Least Developed Countries
IFZ	Industrial Free Zone
LLC	Land Locked Country
LNEC	Laboratório Nacional de Engenharia Civil
LOA	Length Overall
LSCI	Liner Shipping Connectivity Index
LWL	Lowest Water Level
MCLI	Maputo Corridor Logistics Initiative
MDS	MDS Transmodal (UK)
MICCS	Model for International Container Cargo Simulation
MICOA	Ministry of Coordination of Environmental Affairs
MMR	Ministry of Mineral Resources
MN	Mega Newton

MPDC	Maputo Port Development Company
MSL	Mean Sea Level
MT	Metric Ton, Mozambican Methical
MTC	Ministry of Transport and Communications
MUSD	Million United States Dollars
MZ	Mozambique
MZN	Mozambican Methical
NF	French Norm
NGO	Non-government Organization
NILIM	National Institute for Land and Infrastructure Management (Japan)
NPV	Net Present Value
NSO	National Statistical Office (Malawi)
NTU	Nephelometric Turbidity Units
OCDI	The Overseas Coastal area Development Institute of Japan
OD	Origin and Destination
ODA	Official Development Assistance
OPIC	Overseas Private Investment Corporation
O.R	Operating Ratio
ORET	Dutch International Development Agency
OSBP	One Stop Border Post
PAPA	Plan of Action for food Production
PARPA II	Action Plan for the Reduction of Absolute Poverty 2006-2009
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCC	Pure Car Carrier
PEP	Plano Estrategico Provincial
pH	Potential of Hydrogen
PR	Progress Report
PMU	Project Management Unit
PPG	Public and Publicly Guaranteed
PSU	Practical Salinity Unit
PV	Present Value
RC	Reinforced Concrete
RORO	Roll-on/Roll-off
RTG	Rubber Tired Gantry crane
SADC	Southern African Development Community
SATCC	South Africa Transport and Communications Commission
SC	Semi Container Ship
SDI	Spatial Development Initiative
SDCN	Sociedade de Desenvolvimento do Corredor do Norte SA
SER	Simplified Environmental Report
SEZ	Special Economic Zone
SF	Safety Factor
SIDA	Swedish International Development Cooperation Agency
SM	Steel Marine
SPSP	Steel Pipe Sheet Pile
SPT	Standard Penetration Test
SS	Suspended Solid
St.	Station
SWOT	Strength, Weakness, Opportunity and Threat
TAT	Total Turnaround Time
TBT	Tributyltin, Turbidity,
TEU	Twenty-foot Equivalent Unit
THC	Total Hydrocarbon
TICAD IV	The Fourth Tokyo International Conference for African Development
TICTS	Tanzania International Container Terminal Services
TKM	Ton-kilometer
T-N	Total nitrogen
TOC	Total Organic Carbon

TOR	Terms of Reference
T-P	Total Phosphorus
TPA	Tanzania Port Authority
T-S	Total Sulphur
TSS	Total Suspended Solid
UAC	Unit of Account
UCCD	Corridor Development Coordination Unit、MTC
UK	The United Kingdom of Great Britain and Northern Ireland
UNCTAD	The United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
USA	The United States of America
USD	US Dollar
USGS	United States Geological Survey
UVI	Unit Value Index
VAT	Value Added Tax
VLCC	Very Large Crude Carrier
VLR	Variable Rate Loan
WB	World Bank
WHO	World Health Organization
WO	Without
W.R	Working Ratio
ZAR	South African Rand
ZEEN	Zona Economicz Especiale de Nacala (Nacala Special Economic Zone)
ZH	Zero Hidrográfico

Table of Contents

List of Figures and Tables

CHAPTER 1

1. Background, Objectives and Outline of the Study

1.1. Background of the Study

Mozambique has three major commercial ports - Maputo, Beira and Nacala. In 2009, Maputo Port handled 8.2 million tons of cargo, while Beira handled 3.0 million tons, and Nacala 1 million tons. Among these three ports, Maputo and Beira need constant dredging for the accretion of sand, and therefore the capability of the ports to accept large vessels is limited. Meanwhile, Nacala Port (hereinafter referred to as 'the Port') is a natural port with sufficient depth for accommodating large vessels. In order to respond to the rapid increase in the traffic volume of the Nacala Corridor (hereinafter referred to as 'the Corridor') which is under upgrading work, the Port is expected to be the principal gateway providing efficient logistics services for the landlocked countries in its hinterland as well as for the Northern Provinces of Mozambique. Furthermore, the Port has the potential to become a hub port which serves for the larger areas in south-eastern Africa, taking advantage of its deep water basin.

The existing terminals of the Port, however, are significantly degraded due to insufficient maintenance. In addition, insufficient understanding of terminal operation as well as lack of modernized cargo-handling machinery is hindering the productive operation of the Port. High indirect costs such as X-ray scanning fee also render the competitiveness of the Port very low. For these reasons, the Port has not been able to reach its potential.

Furthermore, the current dimensions of the container terminal are not suitable for modern container handling, and the depth of the basin alongside the conventional terminal is utterly insufficient for bulk cargo handling. These will be the serious bottlenecks for the growth of the Port and the Corridor. Therefore, the development of the Port to enhance its handling capability is urgently required.

From the viewpoint of regional development of Northern Mozambique, the Port is expected to play a crucial role as the driving force of the development. The Northern provinces are populous but less developed than other regions in the country. The development of this region so as to fully realize its high potential in agriculture, forestry and mining is one of the top priorities of the nation. If the Port is entirely rehabilitated, fully furnished, and properly operated, the Port will be able to play a large role in accelerating the socio-economic development of the region.

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a mission to Mozambique from November 16 to December 4, 2009. The mission prepared the Scope of Works and the Implementing Arrangements for the Preparatory Survey on Nacala Port Development Project in the Republic of Mozambique, hereinafter called "the Study" based on the investigation of the Mission. The "Scope of Works" was agreed upon between the Ministry of Transportation and Communications (hereinafter referred to as "MTC") and JICA on February 16, 2010.

In accordance with the "Scope of Work", JICA has selected a study team composed of OCDI, ECOH, Oriental Consultants and Ides (hereinafter referred to as 'the Study Team').

1.2. Objectives of the Study

The objective of the Study is to enhance transaction capability by rehabilitating/expanding terminals and providing new handling facilities at the Port, with a larger goal of facilitating trade and economic development of the Nacala Corridor area.

1.3. Outline of the Study

1.3.1 Scope of the Study

The Scope of the Study is as follows;

[1] Analysis of the Existing Conditions

(1) Trends of socio-economic situation of Mozambique and neighboring countries (southern Africa region)
   1) Macro economy
   2) Trade and industries
   3) National/regional development policy/plans

(2) Situation of the Nacala Corridor
   1) Socio-Economic situation
   2) On-going/proposed development projects and investments along the Corridor

(3) Logistics and maritime transport situation in/around Mozambique
   1) Overall cargo movement including maritime and cross-border transport
   2) Trends of maritime transport focusing on hub/feeder network, trade route, shipping lines and ship fleet

(4) Situation of the Port of Nacala and other ports in and around Mozambique
   1) Present situation of port facilities, port activities, port management and operation, financial status and institutional affairs of the Port
   2) Connectivity with inland transportation
   3) Land use in/around the Port
   4) Existing port development plan

(5) Natural conditions of the Port
   1) Topographical and bathymetric conditions
   2) Geological conditions (subsoil condition etc.)
   3) Meteorological and oceanographic conditions (wind, wave, tide, current etc.)

(6) Laws and regulations for environmental and social conditions

(7) Other data and information related to the Study such as design standard

[2] Formulation of Medium/long-term Port Development Plan (Target Year: 2030)

(1) To analyze the development potential of the Corridor and the Port

(2) To clarify the role/function of the Port considering the situation of neighboring ports

(3) To identify issues of the Port and formulate the development strategy

(4) To conduct the demand forecast
   1) To set the socio-economic framework
   2) To assume the future transport network
   3) To forecast cargo demand and maritime/inland traffic at the Port for container, general cargo and bulk cargo

(5) To formulate the Medium/long-term Port Development Plan
   1) To analyze the port capacity and examine the development scale in the Port based on the demand forecast
   2) To explore appropriate development space in the Port
   3) To propose the roadmap for modernization and expansion of the Port
   4) To draft the basic layout of the port facilities
   5) To examine the road/railway access to the Port
   6) To formulate the project list and prioritize the projects

[3] Formulation of Short-term Plan/Urgent Project for Rehabilitation of the Port

(1) To examine repair methods for the existing port facilities

(2) To prepare alternative plans for rehabilitation of the Port taking into account the Medium/long-term Development Plan

(3) To evaluate the alternative plans and select the best option for the Shot-term Plan/Urgent Project

1) To conduct boring survey and set design conditions
2) To prepare preliminary design, implementation procedure, and cost estimation
3) To conduct IEE (Initial Environmental Examination)
4) To evaluate the alternatives and select the best option

(4) To conduct design works for civil structure and related facilities
(5) To formulate an implementation plan
(6) To estimate the project cost
(7) To conduct an economic analysis (EIRR etc. including sensitive analysis)
(8) To formulate a financial plan, examining financial situation of MTC, CFM and the Concessionaire of the Nacala Port (CDN)
(9) To conduct a financial analysis (FIRR etc. including sensitive analysis)
(10) To evaluate the environmental and social impact
   1) To support implementation of Environmental Impact Assessment (EIA) by the Government of Mozambique on the contents and time-schedule
   2) To support relevant government authorities to organize stakeholder meetings, which include local government, residents, enterprises, artisanal fishermen and NGOs, on the agenda of environmental and social consideration
(11) To propose the effective and efficient operation and management scheme
(12) To identify and calculate Operation and Effect Indicators
(13) To propose procurement packages including consulting service
(14) To propose institution framework for the project implementation including structure and personnel composition for the project steering committee

1.3.2 Study schedule

The study schedule is shown in Figure 1.3-1.

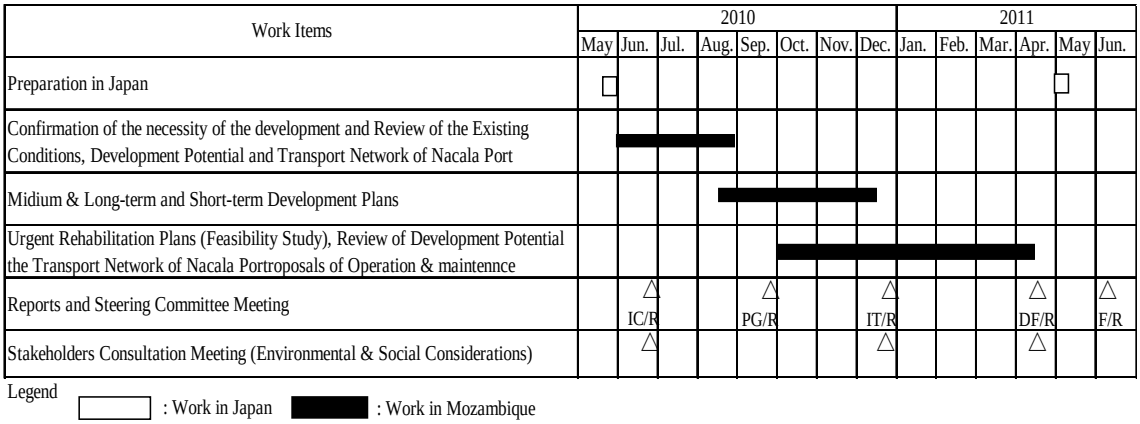


Figure 1.3-1 Work schedule

1.3.3 Members of the Study Team

The Study Team consists of four members from the Overseas Coastal Area Development Institute of Japan, three members from Oriental Consultants Co., Ltd, three members from ECOH CORPORATION and three members from Ides Inc. Members and their specialties are listed hereunder;

Dr. Koji Kobune	Team Leader / Port Development Policy	Ides
Mr. Takashi Kadono	Assistant Leader / Port Planning	OCDI
Mr. Tatsuo Kawabata	Regional Development	OCDI
Mr. Masakazu Okuno	Port Administration / Management Planning	OCDI
Mr. Tsuyoshi Nakajima	Port Access / Demand Forecast I	ORICONSUL
Mr. Kiyoshi Nakashima	Demand Forecast II / Economic Analysis / Logistics and Maritime Transport Network	OCDI
Mr. Masafumi Ito	Design of Port Facility I (Facility improvements) / Facility Maintenance	ECOH
Mr. Isao Hino	Design of Port Facility II (New Facility)	ORICONSUL
Mr. Atushi Nishikori	Execution Planning	ORICONSUL
Mr. Yuhei Yamamoto	Procurement of Materials and Equipment Cost Estimation	ECOH
Mr. Nobuhide Miyawaki	Financial Analysis Coordinator	Ides
Mr. Masanori Ikeda	Natural Condition Investigation	ECOH
Mr. Takeshi Sato	Environmental and Social Considerations	Ides

OCDI: The Overseas Coastal Area Development Institute of Japan
ORICONSUL: Oriental Consultants Co., Ltd
ECOH: ECOH CORPORATION
Ides: Ides Inc

1.3.4 Counterparts

The Study Team collaborates with counterparts listed hereunder;

Ministry of Transport and Communications (MTC)
Portos e Caminhos de Ferro de Mocambique (CFM)
Corredor de Desenvolvimento do Norte (CDN)

1.4. Relevant institutions

1.4.1 Steering Committee

The meetings of the Steering Committee were held four times during the study period.

The first Steering Committee Meeting was held on June 29, 2010, at the conference room of the Hotel Maiaia in Nacala. The meeting was chaired by Ms. Ana Matusse Dimande, Director of Infrastructure, Ministry of Transport and Communications. The meeting started at 09:00 and adjourned at 14:00.

The objective of the meeting was the presentation, the discussion and the approval of the Inception Report for the Study submitted to the Committee by the Study Team.

The participants were representatives from the following institutions:

- Ministry of Transports and Communications (MTC)
- Ministry of Planning and Development (MPD)
- National Highway Administration (ANE)
- Portos e Cominhos de Ferro de Mozambique E.P. (CFM）
- Provincial Directorate for Coordination of Environmental Affairs (DPCA)
- Corredor de Desenvolvimento do Norte (CDN）
- Mozambique Office, Japan International Cooperation Agency (JICA)

The second Steering Committee Meeting was called for by the Study Team to make explanation of the scheme of the study once again to those agencies concerned. The meeting was held on August 20, 2010, at the conference room of the Ministry of Transport and Communications (MTC), in Maputo City, where the JICA Study Team made a presentation on the following topics: (1) Position of the Study, (2) Current operation at Nacala Port, (3) Options of physical plans of Urgent Rehabilitation and (4) Options of financing plans for Urgent Rehabilitation. The committee meeting was chaired by Laurenço Albino, Vice Minister, Ministry of Transport and Communications. Despite of the request of the Study Team, no representatives of Portos e Cominhos de Ferro de Mozambique E.P. (CFM), participated in the meeting.

The participants were representatives from the following institutions:

- Ministry of Transports and Communications (MTC) (Vice Minister, Directors of Infrastructure and Economic Investment)
- Ministry of Planning and Development (MPD, Chief, Dept. of International relation)
- Ministry of Fishery (MPESCA)
- National Highway Administration (ANE)
- Gabinete das Zonas Economicas de Dessemvolviment Acelerado (GAZEDA)
- Corredor de Desenvolvimento do Norte (CDN, CEO)
- Mozambique Office, Japan International Cooperation Agency (JICA)

The third Steering Committee Meeting was held on December 7, 2010, at the conference room of the Ministry of Transport and Communications (MTC), in Maputo City, where the JICA Study Team made a presentation on the contents of the Progress Report and the Interim Report of the Study that covers the proposal on the long-term development and the short-term development of the Port of Nacala. The committee meeting was chaired by Ms. Ana Matusse Dimande, Director of Infrastructure, Ministry of Transport and Communications. The main points of the Reports were approved by the committee.

The participants were representatives from the following institutions:

- Ministry of Transports and Communications (MTC)
- Ministry of Energy (ME)
- Ministry of Fishery (MPESCA)
- National Highway Administration (ANE)
- Gabinete das Zonas Economicas de Dessemvolviment Acelerado (GAZEDA)
- Portos e Cominhos de Ferro de Mozambique E.P. (CFM）
- Corredor de Desenvolvimento do Norte (CDN）
- Mozambique Office, Japan International Cooperation Agency (JICA)

The fourth Steering Committee Meeting was held on April 5, 2011, at the conference room of Hotel Girasol, in Maputo City. The JICA Study Team made a presentation on the contents of the Draft Final Report of the Study highlighting the further refined part of the long-term development plan and the Urgent Rehabilitation Plan. During the presentation of the Urgent Rehabilitation Plan, the Study Team focused on the implementing schedule, the cost estimate, the financial Plan and the environmental Impact. The committee meeting was chaired by Ms. Ana Matusse Dimande, Director of

Infrastructure, Ministry of Transport and Communications. The Report was accepted in general and the study Team requested MTC to compile all the comments on the Draft Final Report and send them to JICA Mozambique Office by April 30, 2011.

The participants were representatives from the following institutions:

- Ministry of Transports and Communications (MTC) (Infrastructure and Economic Investment)
- Ministry of Finance
- Ministry of Energy (ME)
- National Highway Administration (MOPH-ANE)
- Gabinete das Zonas Economicas de Dessemvolviment Acelerado (GAZEDA)
- Portos e Cominhos de Ferro de Mozambique E.P. (CFM）
- Institute Nacional de Hidrografia e Navegação (INAHINA)
- Mozambique Office, Japan International Cooperation Agency (JICA)

1.4.2 Relevant ministries, public agencies and enterprises

The study team visited and held discussions with the following organizations:

[Ministries and public agencies]

Ministry of Transport and Communications (MTC)
Ministry of Planning & Development (MPD)
Ministry for Coordination of Environmental Affairs (MICOA)
Ministry of Public Works and Housing (MOPH)
National Institute of Meteorology
National Statistics Institute (INE)
Portos e Caminhos de Ferro de Mocambique (CFM)
National Highway Administration (ANE)
Mozambique Revenue Authority
National Institute of Fishery Inspection (INIP)
Institute of Development of Small-scale Fisheries (IDPPE)
Gabinete das Zonas Economicas de Dessemvolviment Acelerado (GAZEDA)
Provincial Directorate of Transport (DPTC)
Provincial Directorate for Coordination of Environmental Action (DPCA)
Provincial Directorate of Public Works and Housing (DPOPH)
Municipality of Nacala
District of Nacala a Velha
African Development Bank (AfDB)

[Enterprises]

Bakhresa Grain Milling (MOZ) LDA
CINAC
Coega Development Corporation
Cornelder de Mozambique (CdM)
Cornelder de Quelimane (CdM)
Corredor de Desenvolvimento do Norte (CDN)
Empresa Moçambicana de Dragagens (EMODORAGA)
Group Maiaia
Indo Africa Steel
Insitec Investimentos
Kudumba Investments, Lda.
Maersk (Mozambique) Lda
Manica Freight Services (Mozambique), S.A
Mediterranean Shipping Company (MOC) Lda
MOL South Africa Pty Ltd.
Mozal Aluminum Smelter

Paccon Logistics SA (Pty) Ltd.
SANAL
SDV AMI Mozambique s.a.r.l.
Southern African Cargo Logistics (Pty) Ltd
Transnet National Port Authority
Transnet Terminals
Vale Mozambique

1.4.3 Stakeholders

Three stakeholder meetings were held during the course of the Study.

The 1st stakeholder meeting was held on July 2nd, 2010 at Complexo Napala, Nacala. The meeting was chaired by Ms. Ana Matusse Dimande, Director of Infrastructure, MTC. The main objective of the meeting was to inform the stakeholders about the objective, scope and schedule of the Study. Approximately 60 people participated in the meeting including provincial government officials, local government officials, port users, fishermen representative, Southern African Development Community (SADC), GAZEDA, ANE, CDN, media and so on. The outcome of the meeting was later publicized in a national newspaper (Noticias). The minutes of the 1st stakeholder meeting is shown in Appendix-1.

The 2nd stakeholder meeting was held on December 16th, 2010 at Complexo Napala, Nacala. The objective of the meeting was to inform the stakeholders about the proposed Short-term Development Plan and its potential environmental impacts. Approximately 40 people participated in the meeting including port operators, shipping agents, fishermen representative and so on. The minutes of the 2nd stakeholder meeting is shown in Appendix-1.

Prior to the 2nd stakeholder meeting (on December 14th, 2010), with the assistance of IDPPE, a meeting was also held exclusively with representatives of local fishermen. The meeting was held to discuss the impacts of the Short-term Development Plan on fisheries. The minutes of the meeting is also shown in Appendix-2.

The 3rd stakeholder meeting was held on April 12th, 2011 at Naherenque Complexo Turístico, Nacala. The objective of the meeting was to inform the stakeholders about the proposed Urgent Rehabilitation Project and its potential environmental impacts. Approximately 40 people participated in the meeting. The minutes of the 3rd stakeholder meeting is shown in Appendix-1.

CHAPTER 2

2. Status Quo of Nacala Port and Logistics in Southern Africa

2.1. Socioeconomic trends of Mozambique and neighboring countries

2.1.1 Mozambique

(1) Demography

The latest data from the Census of Population and Housing in 2007 indicate that the country currently has a population of 20.5 million, of which 52% are women. Demographic indicators of the country are shown in Table 2.1-1. Around 45% of the Mozambican population is under the age of 15 years. The population is growing at a rate of 2.4% per annum and the birth rates are estimated at around 5 children per woman. Life expectancy is much shorter than the average in Africa.

The population density is 26 inhabitants per km2. Population of each province is shown in Table 2.1-2. The population of the three Northern Provinces (Niassa, Nampula, and Cabo Delgado), which comprise the major hinterland of Nacala Port, accounts for about one third of Mozambique's total population. The majority (61%) of the population in the three Northern Provinces lives in Nampula.

Table 2.1-1 Demographic indicators of Mozambique

	year	Mozambique	Africa
Population Growth Rate - Total (%)	2008	2,4	2,3
Population Growth Rate - Urban (%)	2008	4,1	3,3
Population <15 years (%)	2008	44,4	40,9
Population >= 65years (%)	2008	3,2	3,4
Life Expectancy at Birth (years)	2008	42,4	54,5
Crude Birth Rate (per1,000)	2008	38,7	35,7
Crude Death Rate (per1,000)	2008	19,5	13,0
Infant Mortality Rate (per1,000)	2008	93,5	83,9
Total Fertility Rate (per woman)	2008	5,0	4,6

Source: Study Team based on data from INE and AfDB

Table 2.1-2 Population of each province in 2007

Province	Population (1000 people)	Area Km2	Population per Km2
Niassa	1,178	129,056	9
Cabo Delgado	1,633	82,625	20
Nampula	4,077	81,606	50
Zambézia	3,893	105,008	37
Tete	1,832	100,724	18
Manica	1,419	61,661	23
Sofala	1,654	68,018	24
Inhambane	1,267	68,615	18
Gaza	1,219	75,709	16
Maputo Province	1,260	26,058	48
Maputo City	1,099	300	3,663
TOTAL	20,531	799,380	26

Source: INE

(2) Economy

Mozambique's recent history has been an example of a successful post-conflict recovery and economic takeoff. The proportion of the population living in absolute poverty is falling continuously. The recent annual GDP growth rate is around 7%. GDP per capita increased from 297 USD in 2004 to 478 USD in 2008. The country's macro economic indicators are shown in Table 2.1-3. Future perspectives of the Mozambican economy will be discussed in detail in the demand forecast in the next chapter.

Table 2.1-3 Macro economic indicators of Mozambique

Subject Descriptor	Units	Scale	2004	2005	2006	2007	2008
Population	Persons	Millions	19.167	19.551	19.942	20.34	20.747
Gross domestic product, constant prices	Percent change		8.77	8.673	6.321	7.282	6.739
Gross domestic product, current prices	U.S. dollars	Billions	5.698	6.579	7.215	8.121	9.919
Gross domestic product per capita, current price	U.S. dollars	Units	297.277	336.487	361.798	399.26	478.07
Inflation, average consumer prices	Percent change		12.634	6.428	13.245	8.162	10.328

Source: INE

(3) Industry and investment

Agriculture is the main activity of the Mozambican population. Approximately 84% of the economically active population in Mozambique works in agriculture. Although the share of the agricultural sector in GDP is higher then the Sub Saharan average (14.6%) as shown in Table 2.1-4, the share is not high enough considering the high percentage of agricultural employment in the total work force of the country.

Exploitation of agricultural resources is way below their potential with only 4.9 million ha (12%) of the estimated 36 million ha of cultivatable land area in Mozambique actually under cultivation. The most common crops cultivated by subsistence farmers include cassava; maize; and beans, while commercial farmers focus on sugarcane, cotton, cashew nuts and tobacco. Livestock production is very modest.

Table 2.1-5 shows the principal indicators in the agricultural sector. Mozambique imports cereals, and imports agricultural products more than the volume of agricultural products exported from Mozambique. The proportion of irrigated land, the consumption of fertilizer per arable land area, the agricultural added value per worker and the cereal yield per hectare are lower than Sub Saharan averages.

According to the statistical data of national agricultural production, cassava is currently the main food product in Mozambique as shown in Table 2.1-6. The production levels of cash crops such as cashew and sugar cane are still very small as shown in Table 2.1-7 though they are increasing.

As for the agro-industry, based on the statistical data obtained from INE, the nation-wide agricultural industry has been growing slowly since 2005 (see Table 2.1-8).

Table 2.1-4 Share of added value of each sector in GDP of Mozambique

	2005	2006	2007	2008
Agriculture	27.0%	27.8%	28.1%	28.6%
Industry	25.3%	26.4%	25.9%	24.3%
Service	47.7%	45.7%	46.0%	47.1%

Source: WB

Table 2.1-5 Principal indicators in agricultural sector

	Agriculture value added (% of GDP) (2008)	Cereal (1000 tons)			Trade (million USD)				Share of land area (%)		Irrigated land (% of cropland) (2002 - 2005)	Fertilizer consumption (100g per hectare of arable land) (2001 - 2006)	Agricultural machinery (tractors per 100 sq km of arable land) (2006)	Agriculture value added per worker (2000 $) (2005 - 2006)	Cereal yield (kg per hectare) (2007)
					Agricultural		Food								
		Production (2007)	Export (2007)	Import (2007)	Export (2007)	Import (2007)	Export (2007)	Import (2007)	Permanent cropland (2007)	Cereal cropland (2007)					
SUB-SAHARAN AFRICA	14.6								1.0	3.9	3.5	111.9	13.1	291	1,251
MOZAMBIQUE	25.4	2,173	26	811	334	482	150	426	0.4	2.9	2.6	49.5	14.2	163	942

Source: WB

Table 2.1-6 National agricultural production

No	Cultures	Year					Remarks
		2004	2005	2006	2007	2008	
1	Cassava	5,051	5,353	6,659	4,959	5,809	
2	Corn (Maize)	1,060	942	1,395	1,134	1,265	
3	Beans	193	201	198	211	202	
4	Sorghum	153	115	202	167	184	
5	Rice	91	65	98	103	100	
6	Peanuts	90	93	85	101	58	
7	Millet	18	15	22	25	24	
	Total	6,656	6,784	8,659	6,700	7,642	(x1000 Ton)
	Annual growth rate	-	102	128	77	114	compared with the previous year
	Growth rate	100	102	130	101	115	100 in 2004

Note; Prepared by a JICA study team based on the data provided by INE

Table 2.1-7 National agricultural production (cash crops)

No	Cultures	Year					Remarks
		2004	2005	2006	2007	2008	
1	Raw cotton	89	102	122	72	70	
2	Cashew Nuts	52	52	63	74	96	
3	Sugar cane			2,060	2,028	2,104	
4	Tea (green leafe)			16	17		
5	Citrus			32	35	23	
6	Coconut			47	47	38	
7	Tobacco	47	62	59	73	62	
8	Sunflower	4	4	7	8	10	
	Total	192	220	2,406	2,354	2,403	(x1000 Ton)

Note; Prepared by a JICA study team based on the data provided by INE

Table 2.1-8 Production of agro-industry

No	Products	Year					Remarks
		2004	2005	2006	2007	2008	
1	Cotton Fiber	32	31	42	27	23	
2	Sugar	205	265	243	244	250	
3	Molasses	66	82	69	74	78	
4	Black tea	3		3	3	4	
	Total	306	378	357	348	355	(x1000 Ton)

Note; Prepared by a JICA study team based on the data provided by INE

According to the assessment by EU, productive forests in Mozambique occupy an area of about 20 million hectares or 20% of the national territory. Wood resources are used by commercial and artisanal logging operations and as an energy source by the rural and urban populations. It is estimated that Mozambique forests have the capacity to support about 500,000 m3/year of sustainable logging, but logging operations only account for around 127,000 m3/year at present (down 15% from a decade ago). This is partly a function of strict export policies. Wood consumption for fuel is considerably greater than that accounted for by logging.

Table 2.1-9 shows industrial production of the country in 2008. This indicates that the country's industrial sector is dominated by basic metal, namely aluminum production, which accounts for 55% of the total production of the industrial sector. The traditional food and beverage industry is the second largest industry, which accounts for 20% of total production. Thus the diversification of industry is the most important issue.

As shown in Table 2.1-10, official grants are the largest component of resource flows to Mozambique. Though foreign direct investment is increasing, the amount is much smaller than official grants.

Table 2.1-9 Industrial production in 2008

	(MTN)	Share
TOTAL	65,478,163	
Crude oil and natural gas, services related to oil and gas extraction except exploration	4,133,507	6.3%
Other mining products	107,259	0.2%
Food and beverages	13,677,790	20.9%
Tobacco industry	4,068,235	6.2%
Textiles	130,358	0.2%
Clothing and articles of fur	64,823	0.1%
Leather and leather goods	16,593	0.0%
Wood and articles of wood and cork	193,159	0.3%
Pulp, paper, paperboard and articles thereof	141,248	0.2%
Printed matter and recorded media	308,225	0.5%
Chemicals	3,627,414	5.5%
Rubber and plastics	132,402	0.2%
Other non-metallic mineral products	2,467,644	3.8%
Basic metals	36,150,180	55.2%
Fabricated metal products, except machinery and equipment	47,374	0.1%
Machinery and equipment n.e.c.	12,990	0.0%
Electrical machinery and apparatus, n.e.c.	2,633	0.0%
Appliances and medical instruments	680	0.0%
Motor vehicles, trailers and semitrailers	5,158	0.0%
Other manufactured goods	166,649	0.3%
Recycled materials	23,842	0.0%

Source: INE

Table 2.1-10 Composition of net resource flow

(million USD)

	1998	2007	2008	2009
Official grants	674	1,269	1,463	1,368
Official creditors	183	316	401	480
Private creditors	-4	6	-1	20
Foreign direct investment (net inflows)	213	427	592	881

Source: WB

(4) Energy and natural resources

The energy balance of Mozambique is shown in Table 2.1-11. Though Mozambique has a large coal reserve, the production is still very small. No crude oil is imported since there is no refinery in the country. The country produces natural gas, and almost all of it is exported to South Africa. Hydro power generated in Cahora Bassa power station is an important energy source of the country. This is utilized by the aluminum industry in Matola, the country's most important industry. Due to the lack of an electric grid between Cahora Bassa and Matola, electricity exported to South Africa is transmitted via the South African grid and is re-exported to Mozambique. Fuel wood consumption in Mozambique is reported to be the highest in the SADC region, and is the most important source of domestic energy in the country (accounting for 85% of total household energy requirements).

Table 2.1-12 shows the volume of production of natural resources. Though Mozambique has a rich reserve of natural resources such as coal, natural gas and heavy sand, the amount of production is still rather small. The Government continues to promote the rational exploitation and use of these resources for development. Development of coal in Moatize, heavy sands in Chibuto and Moma, and artisanal gold in Niassa are planned. Increased production of natural gas is also planned. Estimation of mineral production in the future is very important in port planning. This will be discussed further in the demand forecast in the next chapter.

Table 2.1-11 Energy balance of Mozambique in 2007

in thousand tons of oil equivalent on a net calorific value basis

SUPPLY and CONSUMPTION	Coal and Peat	Crude Oil	Petroleum Products	Gas	Hydro	Combustible Renewables and Waste	Electricity	Total
Production	14	0	0	2,246	1,381	7,343	0	10,985
Imports	0	0	735	0	0	0	712	1,447
Exports	-13	0	0	-2,159	0	0	-1,017	-3,189
International Aviation Bunkers	0	0	-67	0	0	0	0	-67
Stock Changes	4	0	-31	0	0	0	0	-27
Total Primary Energy Supply	5	0	637	87	1,381	7,343	-305	9,150
Statistical Differences	0	0	-12	-57	0	0	-82	-151
Other Transformation	0	0	0	0	0	-1,706	0	-1,706
Own Use	0	0	0	0	0	0	-12	-12
Distribution Losses	0	0	0	0	0	0	-190	-190
Total Final Consumption	5	0	625	27	0	5,638	793	7,088
Industry sector	5	0	91	27	0	586	666	1,376
Transport sector	0	0	458	0	0	0	0	458
Other sectors	0	0	67	0	0	5,051	127	5,246
Residential	0	0	44	0	0	5,051	50	5,145
Commercial and Public Services	0	0	17	0	0	0	78	94
Agriculture / Forestry	0	0	6	0	0	0	0	6
Non-Energy Use	0	0	9	0	0	0	0	9

Source: IEA

Table 2.1-12 Production of natural resources

	Unit	2004	2005	2006	2007	2008
Marble stone in blocks	M ^ 3	617	509	472	835	301
Marble stone in plates	M ^ 2	13,666	12,153	12,825	16,641	7,932
Bauxite	Ton	8,977	11,069	1,767	8,650	5,443
Bentonite	Ton	3,944	547	692	9,707	17,047
Natural gas	Gj		88,907,651	102,188,825	104,519,840	116,616,858
Coal	Ton	16,525	3,417	40,953	23,602	37,700
Rhyolite	M ^ 3			1,137,712	1,119,413	5,750

Source: INE (Reorganized by Study Team)

(5) Trade

External trade balance has shown a deficit like most Sub Saharan countries (see Table 2.1-13). The low efficiency of the economy is responsible for this deficit. Although exports have been growing rapidly, imports have been growing at the same time. The mega-projects are responsible for the growth in both exports and imports, with the main imports being fuel, machinery, transport equipment, plastic, iron, and steel.

Table 2.1-14 shows the major trade partners of Mozambique. The Netherlands is the most important trade partner for exports, since almost all of aluminum is exported there. As for imports, South Africa has the largest share. Besides these countries, China and India are important partners both in import and export. Top 10 countries account for 81 % of total exports and 78 % of total imports.

As shown in Table 2.1-15, aluminum, one of the country's most important commodities, accounts for 55 percent of total exports, followed by mineral fuel (10 %). Mineral fuel also occupies the largest portion of imported goods. The exported mineral fuel is natural gas to South Africa, and the imported items are oil products. Thus, the exported commodities are very limited, and this makes the country's economic structure fragile. Although imported alumina is not listed in the table, substantial amount of alumina is imported for aluminum production. According to "Doing business in Mozambique" by Clifford Chance, import value of alumina accounts for 21% of total imports in 2008. Probably because the import duty on alumina is exempted, Mozambican customs doesn't record it in its statistics. Since all alumina is imported from Australia, Australia should have been one of the top ten countries listed in Table 2.1-14.

Mozambique is implementing the SADC Trade Protocol, which should boost trade in the region,

Table 2.1-13 External trade balance (export minus import) of Mozambique

Share of GDP (%)

2004	2005	2006	2007	2008
–8.6	–9.4	–5.8	–6.7	–10.0

Source: WB

Table 2.1-14 Trade partners of Mozambique in 2009

No	EXPORT			IMPORT		
	COUNTRIES OF DESTINATION	1000 USD	%	COUNTRIES OF ORIGIN	1000 USD	%
1	NETHERLANDS	893.933	41.6	SOUTH AFRICA	1.334.667	35.5
2	SOUTH AFRICA	460.323	21.4	NETHERLANDS	488.157	13.0
3	CHINA	74.478	3.5	INDIA	244.684	6.5
4	ZIMBABWE	73.798	3.4	CHINA	173.121	4.6
5	INDIA	56.512	2.6	PORTUGAL	141.953	3.8
6	MALAWI	46.709	2.2	JAPAN	141.572	3.8
7	USA	41.422	1.9	USA	134.779	3.6
8	PORTUGAL	32.189	1.5	THAILAND	127.613	3.4
9	SPAIN	31.443	1.5	UAE	75.618	2.0
10	RUSSIA	29.503	1.4	SINGAPORE	67.225	1.8

Source: INE (Reorganized by Study Team)

Table 2.1-15 International trade of Mozambique in 2008 by commodities

	COMMODITIES	EXPORT		IMPORT	
		1000USD	(%)	1000USD	(%)
	Overall total	**2,653,260**		**4,007,767**	
1	**Live animals and animal products**	**77,794**	**2.9%**	**72,360**	**1.8%**
	Fish and crustaceans, molluscs and other aquatic invertebrates	75,690	2.9%	36,143	0.9%
	Dairy products, eggs, natural honey	47	0.0%	22,384	0.6%
	Others	2,056	0.1%	13,833	0.3%
2	**Vegetable products**	**99,166**	**3.7%**	**295,071**	**7.4%**
	Edible vegetables, roots and tubers	10,846	0.4%	13,470	0.3%
	Peel of citrus fruit or melons	38,114	1.4%	2,432	0.1%
	Grains	5,427	0.2%	244,236	6.1%
	Products of the milling industry; malt; starches	1,813	0.1%	20,215	0.5%
	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and	39,602	1.5%	8,867	0.2%
	Others	3,364	0.1%	5,851	0.1%
3	**Animal and vegetable fats, waxes**	**6,192**	**0.2%**	**111,891**	**2.8%**
4	**Food products, beverages and tobacco**	**207,459**	**7.8%**	**98,995**	**2.5%**
	Tabacco and manufactureded tabacco substitutes	195,022	7.4%	16,036	0.4%
	Others	12,436	0.5%	82,957	2.1%
5	**Mineral products**	**331,170**	**12.5%**	**869,466**	**21.7%**
	Salt, sulphur, earths and stone, plastering material, lime and	4,030	0.2%	57,718	1.4%
	Ores, slag and ash	39,432	1.5%	304	0.0%
	Mineral fuels, mineral oils and products of their distillation	287,708	10.8%	811,445	20.2%
6	**Chemical and similar industries**	**6,073**	**0.2%**	**262,135**	**6.5%**
	Pharmaceutical products	135	0.0%	61,319	1.5%
	Fertilizers	3,150	0.1%	72,752	1.8%
	Essential oils and other perfume products	617	0.0%	25,385	0.6%
	Soaps, cleansing agents, waxes, candles	964	0.0%	24,756	0.6%
	Miscellaneous chemical products	1,208	0.0%	77,924	1.9%
7	**Rubber and plastic products**	**2,591**	**0.1%**	**120,184**	**3.0%**
	Plastics and plastic products	2,004	0.1%	81,465	2.0%
	Rubber and articles thereof	587	0.0%	38,720	1.0%
8	**Skins and hides**	**1,038**	**0.0%**	**4,211**	**0.1%**
9	**Wood and wooden products, charcoal, cork**	**38,971**	**1.5%**	**28,017**	**0.7%**
10	**Pulp, paper, and cardboard and products thereof**	**11,332**	**0.4%**	**75,163**	**1.9%**
	Wood pulp or pulp of other fibrous cellulose materials	46	0.0%	1,084	0.0%
	Paper and cardboard; articles of pulp, paper or cardboard	1,574	0.1%	43,823	1.1%
	Books, newspapers, prints and other products of the printing	9,713	0.4%	30,256	0.8%
11	**Textile materials and their procucts**	**57,243**	**2.2%**	**75,101**	**1.9%**
	Cotton	51,881	2.0%	3,407	0.1%
	Other textile articles	5,362	0.2%	71,695	1.8%
12	**Footwear, hats, umbrellas, walking sticks etc.**	**2,456**	**0.1%**	**12,538**	**0.3%**
13	**Pottery, earthenware, glass and glassware**	**243**	**0.0%**	**37,668**	**0.9%**
14	**Pearls, precious and semi-precious stones, precious metals**	**6,556**	**0.2%**	**217**	**0.0%**
15	**Base metals and articles thereof**	**1,496,002**	**56.4%**	**205,734**	**5.1%**
	Cast iron, iron and steel	21,419	0.8%	80,383	2.0%
	Articles of cast iron, iron or steel	15,945	0.6%	87,738	2.2%
	Aluminium and articles thereof	1,452,525	54.7%	11,437	0.3%
	Others	6,113	0.2%	26,177	0.7%
16	**Machinery, equipment, electrical machinery**	**60,668**	**2.3%**	**532,097**	**13.3%**
	Mechanical machinery, appliances and instruments, and parts	53,134	2.0%	313,404	7.8%
	Electrical machinery, appliances and equipment and parts	7,534	0.3%	218,693	5.5%
17	**Transport equipment**	**39,120**	**1.5%**	**441,664**	**11.0%**
	Automobiles, tractors and other land vehicles	15,508	0.6%	413,887	10.3%
	Ships, boats and floating structures	17,236	0.6%	10,063	0.3%
	Others	6,376	0.2%	17,714	0.4%
18	**Optical and photographic instruments, watches**	**3,377**	**0.1%**	**44,947**	**1.1%**
	Optical, photographic, or cinematographic instruments and	3,310	0.1%	44,122	1.1%
	Others	68	0.0%	825	0.0%
19	**Weapons and ammunitions, their parts and accessories**	**2**	**0.0%**	**253**	**0.0%**
20	**Miscellaneous merchandise and products**	**6,387**	**0.2%**	**45,117**	**1.1%**
	Furniture, medical and surgical equipment, mattresses, cushions, lighting appliances	6,271	0.2%	37,121	0.9%
	Miscellaneous articles	117	0.0%	7,996	0.2%
21	**Works of art, collections and antiques**	**461**	**0.0%**	**74**	**0.0%**
22	**Unspecified merchandise and products**	**198,959**	**7.5%**	**674,864**	**16.8%**

Source: INE (Reorganized by Study Team)

(6) Transport

The transport sector contributes around 10% of Mozambique's GDP, ranking third among economic sectors.

Mozambique has a road network of 30,400 km. Road density is 7.6 km /1,000 sq km of arable land, which is relatively low in Sub Saharan countries.

Table 2.1-16 shows the modal split for domestic cargo transport in Mozambique. The road mode occupies a large share and its share has been increasing in recent years. The railway mode also has a relatively high share, though its share has been decreasing. Despite Mozambique's long coastal line, modal share of maritime transport is rather small.

Table 2.1-17 shows the number of visitors by Provinces. The table indicates that Nampula Province, the largest Province in terms of population and the Province where Nacala Port is located, attracts the smallest numbers of visitors among all Provinces in the country.

Table 2.1-16 Modal split of cargo transport in Mozambique

(million TKM)

	Road	Railway	Sea	Air	Pipeline
2004	950.7	760.6	279.1	9.3	248.3
	42.30%	33.80%	12.40%	0.40%	11.00%
2005	1048.8	762.8	295.6	7.4	125.4
	46.80%	34.10%	13.20%	0.30%	5.60%
2006	1238.3	775.1	178.8	6	102.1
	53.80%	33.70%	7.80%	0.30%	4.40%
2007	1534.5	736.3	217.8	8.1	137.9
	58.20%	27.90%	8.30%	0.30%	5.20%
2008	1771.4	667.1	118.9	11.5	175.3
	64.55%	24.31%	4.33%	0.42%	6.39%

Source: MTC (Reorganized by the Study Team)

Table 2.1-17 Numbers of visitors by Provinces

Provinces	Mozambican		Foreigner		TOTAL	
	2007	2008	2007	2008	2007	2008
TOTAL	217 079	245 110	257 285	257 046	474 364	502 156
Niassa	12 593	12 010	2 364	2 255	14 957	14 265
C. Delgado	8 534	11 345	14 674	16 048	23 208	27 392
Nampula	8 773	9 667	2 664	2 807	11 436	12 474
Zambézia	18 943	19 715	4 813	4 179	23 756	23 894
Tete	14 311	16 744	2 361	4 983	16 672	21 726
Manica	8 358	9 792	1 855	3 362	10 213	13 155
Sofala	18 021	25 490	8 611	8 196	26 632	33 686
Inhambane	9 880	8 639	17 465	15 109	27 345	23 749
Gaza	9 402	10 964	8 430	8 191	17 832	19 156
Maputo Province	8 508	10 474	6 374	7 487	14 883	17 961
Maputo City	99 757	110 269	187 674	184 429	287 431	294 698

Source: INE

In 2009, MTC established the National Strategy for the Development of Integrated Transport System. The main objectives of the strategy are to develop an interconnected transportation system to facilitate investment, to develop tourism, to lead regional economic integration and to expand opportunities for development.

The Five-year Program of the Government from 2010 to 2014 demonstrates the following prioritized areas in the transport sector:

Road Transport

(a) To expand and improve Examination Centres of Car Driving to improve the quality of drivers;
(b) To improve conditions for inspection and maintenance of vehicles;
(c) To improve road signs;
(d) To improve and implement the Code of roads;
(e) To increase efficiency in the road traffic surveillance;
(f) To introduce the routing system for urban and inter-urban public transport in order to reduce waiting time at stops;
(g) To spread the use of alternative transportation, especially bicycle, motorcycle, and animal drawn vehicles;
(h) To promote an appropriate system for rural transport;
(i) To lay foundations for sustainable urban transport;
(j) To encourage the creation of enterprises for municipal urban public transport;
(k) To design and implement integrated ticketing;
(l) To strengthen the urban transport network;
(m) To promote the construction of inter-modal terminals for urban, provincial and international passengers and cargoes.

Port and Railway

(a) To improve the operability and increase the capacity of passenger and cargo transport by railways through the acquisition of locomotives, acquisition and rehabilitation of wagons and carriages;
(b) To ensure safe access to the ports through provision of maritime services, efficient dredging, and installation of buoys;
(c) To build coal terminals at the Ports of Beira and Nacala, and to rehabilitate the Sena line and Nacala Corridor railway;
(d) To conduct marketing of coal transport by railway;
(e) To prepare the plan for the North-south Railway Line including environmental and social assessment, definition of the phased construction program, and definition of the funding mechanisms;
(f) To review the current concession models and private management of the ports and railways,

Water Transport

(a) To revitalize the maritime and cabotage transport through the acquisition of necessary resources;
(b) To promote lake transport on Lake Niassa and Cahora Bassa;
(c) To strengthen institutional capacity for the exercise of maritime surveillance through improvement of network and communications systems for maritime search and rescue;
(d) To review the existing models of provision and management of private shipyards;
(e) To establish and implement a national program for the improvement of port management for increasing the competitiveness and attractiveness of ports.

Air Transport

(a) To design international terminals in Tete, Nacala and Pemba;
(b) To encourage domestic operators to use aircraft registered in Mozambique;
(c) To complete the liberalization of aviation;
(d) To establish and implement the rules of competition for national operators;
(e) To expand the air transport network;
(f) To extend the provision of the service of Air Traffic Control to all domestic routes, to

introduce air satellite navigation systems (ADS-B), and to extend the coverage of aviation communications to the upper airspace;

(g) To construct Nacala airport;

(h) To promote the construction and rehabilitation of airfields of Ponta do Ouro, Inhambane and Vilanculos;

(i) To establish the plan for the construction of the airport in Xai-Xai;

(j) To Study the possibility of relocating Maputo International Airport to outside the capital city.

2.1.2 Neighboring countries

(1) Overview

Main indicators of Mozambique's six neighboring countries (Tanzania, Zambia, Malawi, Zimbabwe, South Africa, and Swaziland) are shown hereinafter.

South Africa is demographically, spatially and economically the largest nation in the region. Mozambique, Tanzania and Zambia are almost the same in terms of the land area and GDP per capita. However, the population of Tanzania is twice that of Mozambique, and more than three times that of Zambia.

Table 2.1-18 Socioeconomic indicators of neighboring countries

	Population (millions)	Land area (thousands of sq km)	GDP per capita Constant 2000 prices		Life expectancy at birth (years)	Under-five mortality rate (per 1,000)	Gini index	Adult literacy rate (% of ages 15 and older)		Net official development assistance per capita (current $)
			(USD)	Average annual growth (%)				Male	Female	
	2008	2008	2008a	2000-08	2007-08b	2007	2000-07b	2007	2007	2008
Tanzania	42.5	886	362	3.9	55.9	116	34.6	79.0	65.9	54.9
Zambia	12.6	743	387	2.9	45.9	170	50.7	80.8	60.7	86.0
Malawi	14.3	94	165	1.6	48.3	111	39.0	79.2	64.6	63.9
Zimbabwe	12.5	387	-	–5.7	45.1	90	-	94.1	88.3	49.0
South Africa	48.7	1,214	3,764	3.1	50.5	59	57.8	88.9	87.2	23.1
Swaziland	1.2	17	1,559	1.7	46.4	91	50.7	-	-	57.7
Mozambique	21.8	786	365	5.6	42.1	169	47.1	57.2	33.0	91.5

a. Provisional
b. Data are for the most recent year available during the period specified
Source: WB

(2) Tanzania

The United Republic of Tanzania is a nation in central East Africa bordered by Kenya and Uganda to the north, Rwanda, Burundi and the Democratic Republic of the Congo to the west, and Zambia, Malawi and Mozambique to the south. The country's eastern borders lie on the Indian Ocean. At 947,300 km², Tanzania is the world's 30th largest country after Egypt. It is mountainous in the northeast, where Mount Kilimanjaro, Africa's highest peak, is situated. To the north and west are the Great Lakes of Lake Victoria and Lake Tanganyika. The United Republic of Tanzania is a unitary republic composed of 26 regions.

Tanzania is one of the few countries in Africa which has enjoyed peaceful political development. Stable political leadership has kept the country out of the types of conflicts that have been afflicting a number of neighboring countries. Since 1995, Tanzania has benefited from high annual GDP growth, averaging almost 6 percent since 2000. However, the country is heavily indebted and remains one of the world's poorest countries with over 30% of the population living below the poverty line.

The economy relies heavily on agriculture and tourism. Agriculture accounts for more than half of the GDP, provides approximately 85 percent of exports, and employs approximately 80 percent of

the workforce. Tanzania has vast amounts of natural resources including gold, diamonds, coal, iron ore, uranium, nickel, chrome, tin, platinum and other minerals. It is the third-largest producer of gold in Africa after South Africa and Ghana. In 2008, Tanzania was the world's only producer of tanzanite. Mineral production (gold, diamonds, and tanzanite) is the country's biggest source of economic growth. The country also played a significant role in the global production of gold, accounting for nearly 2% of the world's gold mine output. Other domestically significant mining and mineral processing operations included cement and diamond.

Supported by its development partners, who contribute some 40% of the country's total budget, the government is implementing its Poverty Reduction Strategy. Successes include school enrolment which has risen from 53% in 1999 to 97% in 2008. HIV/AIDS, however, remain a cause of premature death. Life expectancy was 56 years of age in 2007.

The main indicators of demography, economy, trade and transport are shown in Table 2.1-19 to Table 2.1-22.

Table 2.1-19 Demography of Tanzania

Population dynamics					Population age composition (%)		
Total (millions)	Male (% of total)	Female (% of total)	Annual growth rate (%)	Fertility rate (births per woman)	Age 0-14 (%)	Age 15-64 (%)	Age 65+ (%)
2008	2008	2008	2008	2007	2007	2007	2007
42.5	49.8	50.2	2.9	5.6	44	53	3

Source: WB

Table 2.1-20 Economy of Tanzania

Gross domestic product growth			Agriculture	Industry	Manufacturing	Services
Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth
1980-89	1990-99	2000-08	2000-07	2000-07	2000-07	2000-07
3.8	3.1	6.6	4.9	9.6	8.0	6.2

Source: WB

Table 2.1-21 Trade of Tanzania

External trade balance (exports minus imports)	Export of goods and services, nominal	Imports of goods and services, nominal	Export of goods and services as a share of GDP	Import of goods and services as a share of GDP
Share of GDP (%)	Current prices ($ millions)	Current prices ($ millions)	Share of GDP (%)	Share of GDP (%)
2000-08	2000-08	2000-08	2000-08	2000-08
-7.0	2,185	2,958	19.2	26.2

Source: WB

Table 2.1-22 Transport of Tanzania

Access, supply side		Road density		Road quality		Financing
Road network (km)	Rail lines (km)	Ratio to arable land (road km / 1,000 sq km arable land)	Ratio to total land (road km / 100 sq km arable land)	Road network in good or fair condition (%)	Ratio of paved to total roads (%)	ODA gross disbursements for transportation and storage ($ millions)
2000-07a	2000-07a	2000-07a	2000-07a	2000-08a	2000-07a	2008
78,891	4,460	8.3	8.9	71.4	8.6	162.8

a. Data are for the most recent year available during the period specified.
Source: WB

(3) Zambia

The Republic of Zambia is a landlocked country in Southern Africa. With the area of 752,614 km^2 it is the 38th-largest country in the world (after Chile). The neighboring countries are DRC to the north, Tanzania to the northeast, Malawi to the east, Mozambique, Zimbabwe, Botswana, and Namibia to the south, and Angola to the west. The capital city is Lusaka, located in the south-central part of the

country. The population is concentrated mainly around the capital Lusaka in the south and the Copperbelt in the northwest.

The economy still relies on agriculture to a great extent, and the agricultural sector employs over 70% of the working population. After the economic stagnation experienced during the 1990s, growth accelerated in recent years. The main source of growth has been the rapid expansion of mining (mostly copper), which provides nearly 70% of export earnings. Copper mining and refining were the predominant components of Zambia's mineral industry. Zambia also was a significant producer of cobalt and semiprecious gemstones, such as amethyst, beryl, and emerald. In 2009, Zambia's mines accounted for an estimated 4% of the world's total output of cobalt and copper. Zambia's main export markets are Switzerland, South Africa, DR Congo, China, and Egypt. Imports come primarily from South Africa, India, Kuwait, China, DRC, and the United Arab Emirates.

However, the overall solid performance of the economy has not translated into any significant drop in poverty. The number of people living in absolute poverty remains high. The level of income disparities in Zambia is one of the highest in Sub-Saharan Africa.

The main indicators of demography, economy, trade and transport are shown in Table 2.1-23 to Table 2.1-26

Table 2.1-23 Demography of Zambia

Population dynamics					Population age composition (%)		
Total (millions)	Male (% of total)	Female (% of total)	Annual growth rate (%)	Fertility rate (births per woman)	Age 0-14 (%)	Age 15-64 (%)	Age 65+ (%)
2008	2008	2008	2008	2007	2007	2007	2007
12.6	49.9	50.1	2.5	5.9	46	52	3

Source: WB

Table 2.1-24 Economy of Zambia

Gross domestic product growth			Agriculture	Industry	Manufacturing	Services
Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth
1980-89	1990-99	2000-08	2000-07	2000-07	2000-07	2000-07
1.4	0.4	5.1	2.0	9.4	5.3	6.5

Source: WB

Table 2.1-25 Trade of Zambia

External trade balance (exports minus imports)	Export of goods and services, nominal	Imports of goods and services, nominal	Export of goods and services as a share of GDP	Import of goods and services as a share of GDP
Share of GDP (%)	Current prices ($ millions)	Current prices ($ millions)	Share of GDP (%)	Share of GDP (%)
2000-08	2000-08	2000-08	2000-08	2000-08
-5.1	2,548	2,606	33.6	38.7

Source: WB

Table 2.1-26 Transport of Zambia

Access, supply side		Road density		Road quality		Financing
Road network (km)	Rail lines (km)	Ratio to arable land (road km / 1,000 sq km arable land)	Ratio to total land (road km / 100 sq km arable land)	Road network in good or fair condition (%)	Ratio of paved to total roads (%)	ODA gross disbursements for transportation and storage ($ millions)
2000-07a	2000-07a	2000-07a	2000-07a	2000-08a	2000-07a	2008
91,440	1,273	17.4	12.3	51.6	22.0	77.0

a. Data are for the most recent year available during the period specified.
Source: WB

(4) Malawi

The Republic of Malawi is a landlocked country in southeast Africa that was formerly known as Nyasaland. It is bordered by Zambia to the northwest, Tanzania to the northeast, and Mozambique on the east, south and west. The country is separated from Tanzania and Mozambique by Lake Malawi. Its size is 118,500 km2 with an estimated population of 14,300,000 (2008), making it one of the most densely populated countries in Africa. 90% of the population lives in rural areas. Malawi was first settled during the 10th century and remained under native rule until 1891 when it was colonized by the British, who ruled the country until 1964. Malawi has a democratic, multi-party government and a small military force that includes an army, a navy and an air wing.

Malawi is classified as a least developed country. The economy is heavily based in agriculture, with a largely rural population. Agriculture accounts for more than one-third of GDP and 90% of export revenues. Tobacco, tea, and sugar are Malawi's principal exports; together generating over 70% of export earnings. The performance of the tobacco sector is the key to short-term growth as tobacco accounts for more than half of exports. Mining is becoming an important sector for Malawi. Malawi's first uranium mine was commissioned in late 2008 and reached full production in 2009. The mine is expected to add more than 5 percent to GDP and over 10 percent to export revenue over the next decade. Malawi was a producer of cement, coal, crushed stone, dolomite, kaolin, lime, and limestone for domestic consumption. The country also mined and exported ornamental stone and such gemstones as amethyst, garnet, ruby, sapphire, and tourmaline. Malawi was not a globally significant producer or consumer of minerals. The economy depends on substantial inflows of economic assistance from international organizations and individual donor nations.

The main indicators of demography, economy, trade and transport are shown in Table 2.1-27 to Table 2.1-30.

Table 2.1-27 Demography of Malawi

Population dynamics					Population age composition (%)		
Total (millions)	Male (% of total)	Female (% of total)	Annual growth rate (%)	Fertility rate (births per woman)	Age 0-14 (%)	Age 15-64 (%)	Age 65+ (%)
2008	2008	2008	2008	2007	2007	2007	2007
14.3	49.7	50.3	2.6	5.6	47	50	3

Source: WB

Table 2.1-28 Economy of Malawi

Gross domestic product growth			Agriculture	Industry	Manufacturing	Services
Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth
1980-89	1990-99	2000-08	2000-07	2000-07	2000-07	2000-07
1.7	4.1	3.7	0.2	4.6	2.8	4.0

Source: WB

Table 2.1-29 Trade of Malawi

External trade balance (exports minus imports)	Export of goods and services, nominal	Imports of goods and services, nominal	Export of goods and services as a share of GDP	Import of goods and services as a share of GDP
Share of GDP (%)	Current prices ($ millions)	Current prices ($ millions)	Share of GDP (%)	Share of GDP (%)
2000-08	2000-08	2000-08	2000-08	2000-08
-20.3	690	1,293	25.3	45.6

Source: WB

Table 2.1-30 Transport of Malawi

Access, supply side		Road density		Road quality		Financing
Road network (km)	Rail lines (km)	Ratio to arable land (road km / 1,000 sq km arable land)	Ratio to total land (road km / 100 sq km arable land)	Road network in good or fair condition (%)	Ratio of paved to total roads (%)	ODA gross disbursements for transportation and storage ($ millions)
2000-07a	2000-07a	2000-07a	2000-07a	2000-08a	2000-07a	2008
15,451	710	5.4	16.4	88.5	45.0	33.0

a. Data are for the most recent year available during the period specified.
Source: WB

(5) Zimbabwe

The Republic of Zimbabwe is a landlocked country located in southern Africa, with a total area of 390,757 km² and a population of around 12.5 million. Of that total, around one-fifth lives in and around the capital, Harare. Zimbabwe is bordered by South Africa to the south, Botswana to the southwest, Zambia to the northwest and Mozambique to the east.

Zimbabwe's economy has started to come out of a decade-long decline. In 2009, the economy was estimated to have grown by around 4.7 percent. Against the background of the steep decline in the previous decade, the 2009 and 2010 growth rates are rather small. During the period 1999 to 2008 output had declined by more than 40 percent. Agricultural output declined by more than 60 percent, while manufacturing and mining declined by more than 50 percent each. Starting out on such a low base, potential for high growth would be substantial; however output levels are still considerably lower than the pre-crisis period. For example, the manufacturing sector is estimated to be functioning at a capacity utilization of between 35 and 40 percent, with the exception of food and beverages that is operating at about 70 percent. Similarly, yields in the agriculture sector continue to be much lower than previously attained. At the current pace, the economy could take almost a decade to achieve pre-crisis level of output.

Mineral exports, agriculture, and tourism are the main foreign currency earners of Zimbabwe. Zimbabwe's main exports are tobacco, cotton, gold and other minerals. The mining sector remains very lucrative, with some of the world's largest platinum reserves being mined by Anglo-American and Impala Platinum. Zimbabwe is the biggest trading partner of South Africa on the continent. Zimbabwe's diverse mineral output included about 3% of the world's platinum and vermiculite production, about 2% of the world's lithium and palladium output, and about 1% of the world's asbestos production.

The country's wealth is distributed very unequally. Education standards are good for the region but it faces health challenges, in particular HIV/AIDS affects one-fifth of the population. Erosion of professional skills is a major threat to the future resilience of the economy and its traditionally good infrastructure is in decay and will require rehabilitation in the near future.

The main indicators of demography, economy, trade and transport are shown in Table 2.1-31 to Table 2.1-34

Table 2.1-31 Demography of Zimbabwe

Population dynamics					Population age composition (%)		
Total (millions)	Male (% of total)	Female (% of total)	Annual growth rate (%)	Fertility rate (births per woman)	Age 0-14 (%)	Age 15-64 (%)	Age 65+ (%)
2008	2008	2008	2008	2007	2007	2007	2007
12.5	48.4	51.7	0.1	3.5	38	58	4

Source: WB

Table 2.1-32 Economy of Zimbabwe

Gross domestic product growth			Agriculture	Industry	Manufacturing	Services
Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth
1980-89	1990-99	2000-08	2000-07	2000-07	2000-07	2000-07
5.2	2.6	-5.8	-8.5	-10.0	-12.0	-10.0

Source: WB

Table 2.1-33 Trade of Zimbabwe

External trade balance (exports minus imports)	Export of goods and services, nominal	Imports of goods and services, nominal	Export of goods and services as a share of GDP	Import of goods and services as a share of GDP
Share of GDP (%)	Current prices ($ millions)	Current prices ($ millions)	Share of GDP (%)	Share of GDP (%)
2000-08	2000-08	2000-08	2000-08	2000-08
-5.2	2,141	2,390	32.1	37.3

Source: WB

Table 2.1-34 Transport of Zimbabwe

Access, supply side		Road density		Road quality		Financing
Road network (km)	Rail lines (km)	Ratio to arable land (road km / 1,000 sq km arable land)	Ratio to total land (road km / 100 sq km arable land)	Road network in good or fair condition (%)	Ratio of paved to total roads (%)	ODA gross disbursements for transportation and storage ($ millions)
2000-07a	2000-07a	2000-07a	2000-07a	2000-08a	2000-07a	2008
97,267	-	30.1	25.1	60.0	19.0	0.0

a. Data are for the most recent year available during the period specified.
Source: WB

(6) South Africa

The Republic of South Africa is a country located at the southern tip of Africa, with a 2,798 km coastline on the Atlantic and Indian Oceans. To the north lie Namibia, Botswana and Zimbabwe; to the east are Mozambique and Swaziland; while Lesotho is an independent country wholly surrounded by South African territory. South Africa is a country of about 50 million people that is rich in diverse cultures, people and natural heritage. The country covers 1.22 million square kilometers.

By UN classification South Africa is a middle-income country with an abundant supply of resources, well-developed financial, legal, communications, energy, and transport sectors, a stock exchange that ranks among the top twenty in the world, and a modern infrastructure supporting an efficient distribution of goods to major urban centers throughout the entire region.

South Africa has a large agricultural sector and is a net exporter of farming products. There are almost a thousand agricultural cooperatives and agribusinesses throughout the country, and agricultural exports have constituted 8% of South African total exports for the past five years. The agricultural industry contributes around 10% of formal employment, relatively low compared to other parts of Africa, as well as providing work for casual laborers and contributing around 2.6% of GDP for the nation.

South Africa remained one of the world’s leading mining and mineral-processing countries. In 2008, South Africa’s estimated share of world platinum production amounted to 77%; kyanite and other materials, 55%; chromium, 45%; palladium, 39%; vermiculite, 39%; vanadium, 38%; zirconium, 30%; manganese, 21%; rutile, 20%; ilmenite, 19%; gold, 11%; fluorspar, 6%; aluminum, 2%; antimony, 2%; iron ore, 2%; nickel, 2%; and phosphate rock, 1%. South Africa also accounted for nearly 5% of the world’s polished diamond production by value. Because of South Africa's abundant supplies of cheap coal, liquid fuels only provide 21% of the energy requirements of the country. Oil from coal synfuels plants provides a significant proportion of South Africa’s liquid fuels.

South Africa’s political transition from apartheid during the 1990s has served as a model across

the world. Although the largest African economy, South Africa still faces many development challenges, not least in fighting AIDS, poverty and high unemployment.

The main indicators of demography, economy, trade and transport are shown in Table 2.1-35 to Table 2.1-38.

Table 2.1-35 Demography of South Africa

Population dynamics					Population age composition (%)		
Total (millions)	Male (% of total)	Female (% of total)	Annual growth rate (%)	Fertility rate (births per woman)	Age 0-14 (%)	Age 15-64 (%)	Age 65+ (%)
2008	2008	2008	2008	2007	2007	2007	2007
48.7	49.3	50.7	1.8	2.7	32	64	4

Source: WB

Table 2.1-36 Economy of South Africa

Gross domestic product growth			Agriculture	Industry	Manufacturing	Services
Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth
1980-89	1990-99	2000-08	2000-07	2000-07	2000-07	2000-07
2.2	1.4	4.1	0.4	3.4	3.2	5.0

Source: WB

Table 2.1-37 Trade of South Africa

External trade balance (exports minus imports)	Export of goods and services, nominal	Imports of goods and services, nominal	Export of goods and services as a share of GDP	Import of goods and services as a share of GDP
Share of GDP (%)	Current prices ($ millions)	Current prices ($ millions)	Share of GDP (%)	Share of GDP (%)
2000-08	2000-08	2000-08	2000-08	2000-08
0.2	60,733	62,348	30.1	29.9

Source: WB

Table 2.1-38 Transport of South Africa

Access, supply side		Road density		Road quality		Financing
Road network (km)	Rail lines (km)	Ratio to arable land (road km / 1,000 sq km arable land)	Ratio to total land (road km / 100 sq km arable land)	Road network in good or fair condition (%)	Ratio of paved to total roads (%)	ODA gross disbursements for transportation and storage ($ millions)
2000-07a	2000-07a	2000-07a	2000-07a	2000-08a	2000-07a	2008
364,131	24,487	24.7	30.0	65.0	17.3	0.4

a. Data are for the most recent year available during the period specified.
Source: WB

(7) Swaziland

The Kingdom of Swaziland is a landlocked country in Southern Africa, bordered to the north, south and west by South Africa, and to the east by Mozambique. Swaziland is a small country, no more than 200 km north to south and 130 km east to west. Swaziland has a land area of only 17,364 km^2. Swaziland is one of the world's last remaining absolute monarchies. Its king rules by decree over his subjects. Most of people living in the countryside follow traditional ways of life.

Swaziland's economy is based on sugar exports, forestry, agriculture and mining, and has a small garment manufacturing industry. The Swazi economy is very closely linked to the South African economy, from which it receives over 90% of its imports and to which it sends about 70% of its exports.

The main indicators of demography, economy, trade and transport are shown in Table 2.1-39 to Table 2.1-42.

Table 2.1-39 Demography of Swaziland

Population dynamics					Population age composition (%)		
Total (millions)	Male (% of total)	Female (% of total)	Annual growth rate (%)	Fertility rate (births per woman)	Age 0-14 (%)	Age 15-64 (%)	Age 65+ (%)
2008	2008	2008	2008	2007	2007	2007	2007
1.2	48.8	51.2	1.4	3.6	39	58	3

Source: WB

Table 2.1-40 Economy of Swaziland

Gross domestic product growth			Agriculture	Industry	Manufacturing	Services
Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth	Average annual % growth
1980-89	1990-99	2000-08	2000-07	2000-07	2000-07	2000-07
8.6	3.7	3.4	1.2	1.7	1.6	4.1

Source: WB

Table 2.1-41 Trade of Swaziland

External trade balance (exports minus imports)	Export of goods and services, nominal	Imports of goods and services, nominal	Export of goods and services as a share of GDP	Import of goods and services as a share of GDP
Share of GDP (%)	Current prices ($ millions)	Current prices ($ millions)	Share of GDP (%)	Share of GDP (%)
2000-08	2000-08	2000-08	2000-08	2000-08
-5.0	1,812	1,894	88.1	93.1

Source: WB

Table 2.1-42 Transport of Swaziland

Access, supply side		Road density		Road quality		Financing
Road network (km)	Rail lines (km)	Ratio to arable land (road km / 1,000 sq km arable land)	Ratio to total land (road km / 100 sq km arable land)	Road network in good or fair condition (%)	Ratio of paved to total roads (%)	ODA gross disbursements for transportation and storage ($ millions)
2000-07a	2000-07a	2000-07a	2000-07a	2000-08a	2000-07a	2008
3,594	-	20.2	20.9	-	30.0	0.0

a. Data are for the most recent year available during the period specified.
Source: WB

2.1.3 Major development projects in Mozambique and its neighboring countries

Major development projects on-going or planned in the fields of industry, resources, energy and transport in Mozambique and its neighboring countries are summarized in Table 2.1-43.

Table 2.1-43 Major development projects in Mozambique and its neighboring countries

Country	Major development project
Mozambique	**Industry/Energy Sector** **Matola Industrial Zone:** Development of an industrial zone close to Matola terminal in Maputo port. **Beluluane Industrial Free Zone:** Development of an industrial free zone with total area of approximately 700 hectares located 16 km outside of Maputo City. **Nacala SEZ:** SEZ development including IFZ in Nacala and Nacala-a-Velha District. **Oil Refinery in Nacala:** Establishment of oil refinery in Nacala and pipelines to Malawi. **Distribution network from Cahora Bassa:** Expansion of the distribution network from the Cahora Bassa hydro power plant. **M'panda-Uncua Dam:** Hydro-power development project with a 1,500 MW

capacity in Tete Province, and transmission infrastructure to Maputo.
Cahora Bassa North Power Generation: Hydro-power development project with nominal power capacity of 850–1,250 MW, to be build adjacent to the existing 2.075 MW hydropower station at the Cahora Bassa dam.
Benga Thermal Power Station: Establishment of a coal-fired thermal power station with the capacity of 500MW initially and scaled up to 2,000 MW, to be situated near Riversdale's Benga coal project.
Agriculture in Nampula: Provincial program for agricultural development including Program for Agricultural Productivity, Program for the Expansion of Base Businesses, Program for Tourism Development, and Program for Rural Markets. And international projects such as the agricultural development along Nacala Corridor supported jointly by JICA and the Government of Brazil.
Lurio Green Resources: A eucalyptus growing and processing operation in Ribawe, Mecuburi, and Nampula-Rapale in Nampula Province.
Beira Agricultural Growth Corridor: Project for promoting commercial agriculture in the corridor.
Forestry in Niassa: Forestry development in Niassa Province by foreign firms including Malonda Treefarms, Chikweti Forests of Niassa, and Florestas de Niassa.

Mining Sector
Coal Mines in Tete: Large scale development of coal field in Tete Province, including the country's three largest coal deposits—Moatize-Minjova, Senangoe, and Mucanha-Vuzi.
Pande Gas Field: Further development of the gas field in Inhambane province.
Moma Heavy Sands: Development of heavy sand resources (ilmenite, rutile, and zircon) in the coastal area in Nampula.
Phosphate Deposits in Nampula: Development of phosphate deposits in Nampula by Vale Mozambique.
Evate Iron deposits: Development of iron ore deposits in Nampula by Vale Mozambique, and establishment of an iron concentrate plant and related infrastructure.
Coal Mines in Niassa: Coal mine development planned by various companies.
Ancuabe Graphite Deposits: Development of graphite deposit in Cabo Delgado Province.
Oil and Gas in Cabo Delgado: Off-shore and on-shore oil and gas development in Cabo Delgado.

Transport Sector
Sena Railway: Reconstruction of railway link connecting the southern region of Malawi with Beira Port.
Nacala Corridor: Road and railway improvement connecting Malawi with Nacala Port.
North South Railway: Construction of a new railway linking Cabo Delgado Province in the North and Limpopo line in the South.
Cuamba/Lichinga Road: Improvement of the road connecting Niassa Province with Nacala Corridor.
Tete Bridge: Construction of a bridge across the Zambezi River at Benga in Tete Province, about 6 km downstream from the existing Tete Bridge which has been the major bottleneck in the link between Malawi and Beira.
Friendship Bridge: Construction of a bridge at a missing link between Mozambique and Tanzania.
Pemba Corridor: Improvement of the road connecting Lichinga with

	Pemba Port. **Milange/Mocuba Road:** Improvement of road connecting Malawi with Zambezia Province. **Lebombo/Ressano Garcia One-Stop Border Post:** Establishment of a one stop border post on Maputo Corridor. **Maputo Container Terminal:** Expansion project of the container terminal in Maputo Port including deepening of the basin. **Coal Terminal in Beira:** Expansion of coal terminal in Beira Port serving for exported coal from Tete Province. **Coal Terminal in Nacala:** Construction of a new coal terminal equipped with deep-water quays in Nacala-a-Velha District. **Bulk Terminals in Beira Port:** Construction of bulk terminals dedicated for sugar, grain and fertilizer in Beira Port. **Dredging of Beira Port:** Dredging of basin and access channel of Beira Port up to 8m in order to accommodate larger vessels. **New Port in Ponta Techobanine:** Construction of a new deep-sea port at Ponta Techobanine in Matutuine district, Maputo Province, together with the construction of railway link, which is agreed between GOM and the Government of Botswana. **Shire-Zambezi Waterway:** River transport project connecting Malawi and the Indian Ocean by dredging the river and constructing a port in Chinde. **Nacala Airport:** Construction of a new airport to the north of Nacala Port by converting from the existing air base. **Beira Airport:** Rehabilitation of parts of Beira airport, including the runway, lights, and traffic control tower equipment. **Nsanje/Beira Oil Pipeline:** Construction of an oil pipeline between the port of Beira and Nsanje district in the far south of Malawi. **Maputo/Kendal Pipeline:** Installation of a 500 km fuel pipeline connecting Maputo (Matola) Port with South African pipeline network with the initial capacity of 6 million cubic meters of oil per year.
Tanzania	**Industry/Energy Sector** **Bagamoyo EDZ:** Economic Development Zone (EDZ) development adjacent to the new port in Bagamoyo, 50 km north of Dar es Salaam. **Mtwara EDZ:** EDZ development in the vicinity of Mtwara Port. **Tanga EDZ:** EDZ development in Tanga, which is adjacent to the planned deep-sea port of Mwanbani. **Arusha EDZ:** EDZ development in Arusha located along Tanga Corridor. **Power Transmission in North Western Tanzania:** Strengthen and extend power transmission network to cater for the mineral industry development in the North Western part of Tanzania and neighbouring Burundi and Rwanda. **Oil Refinery in Dar es Salaam:** Establishment of oil refinery in Dar es Salaam and pipelines to Mwanza and Kigoma, with links to neighbouring Burundi, Rwanda and Eastern DRC. **Power Plants in Mtwara Corridor Area:** Development of thermal power from coal in Mchuchuma (1000MW) and Kiwira (200MW), Mnazi Bay gas (300MW) and Stieglers Gorge hydro (2000MW). **Tanzania/Zambia Power Transmission:** Establishment of power interconnector between Tanzania and Zambia, which is a missing link of transmission lines connecting SADC region and EAC region. **Tanzania/Malawi Power Transmission:** Construction of power transmission lines (400Kv) linking with national grid & the Kiwira – Karonga (Malawi) interconnector. **Tanzania/Kenya Power Transmission:** Establishment of Tanzania (Arusha) - Kenya (Nairobi) power interconnector.

	Fertilizer Plant in Mtwara: Establishment of a large fertilizer plant in Mtwara utilizing locally available natural gas. **Wood Chip Plantation in Mtwara Corridor Area:** Establishment of a wood chip plantation by a Japanese firm. **<u>Mining Sector</u>** **Natural Gas in Mtwara:** Further development of natural gas field in Mtwara. **Songo Songo Gas Field:** Development of natural gas on and offshore Songo Songo island 200km south of Dar es Salaam. **Ngaka Coal Deposit:** Development of coal deposit in Southern Tanzania as an alternative to Kiwira - unstable and facing a myriad of problems. **Kabanga Nickel Sulfide Deposit:** Exploration and development of a nickel sulfide deposit in northwestern Tanzania. **Dutwa Nickel-cobalt Deposit:** Exploration and development of nickel and cobalt at Dutwa deposit. **Mchuchuma Coal Deposit:** Development of a coal mine along Mtwara Corridor. **Liganga Iron Ore Deposit:** Development of an iron ore mine along Mtwara Corridor. **<u>Transport Sector</u>** **Burundi-Rwanda-Tanzania Railway:** Upgrading of 982 km of railway line from Dar es Salaam to Isaka from the existing 'meter gauge' to 'standard gauge (dual gauge)' and construction of 694 km of new railway line from Isaka – Kigali (Rwanda) / Keza / Gitega – Musongati (Burundi). **Mtwara Corridor:** Improvement of road between Masasi and Mbamba Bay which is linked to a lakes ferry service to Malawi, and development of mineral rail between Mtwara and Liganga, with spur to Mbamba Bay. **Tanga Corridor Railway:** Upgrading of the Tanga/Arusha railway and extend to Lake Natron and Musoma/Mwanza, bypassing Serengeti National Park. **Urban Transport in Dar es Salaam:** Improvement of urban transport network in Dar es Salaam including the access to Kigamboni side. **Access to Bagamoyo:** Improvement of road access and construction of railway access to Bagamoyo where a new port and SEZ is planed. **Tabora/Kigoma Road:** Paving of the road between Tabora and Kigoma, and subsequent construction of a new road between Tabora and Manyoni which will shorten the distance from Kigoma to Dar es Salaam by approximately 200km. **Roads around Lake Victoria:** Paving of the road around the southern half of Lake Victoria from Nyamashere to Mwanza and Nuanguge to Musoma, for the purpose of reducing dependence on lake transport for local passenger and cargo movements. **Dar es Salaam Container Terminal:** Construction of two additional container berths in Dar es Salaam Port. **Bagamoyo Port:** New port development to cope with the shortage of port capacity in Dar es Salaam. **Mwanbani Port:** New port development including a railway link in the northern part of the country to bolster the regional economy. **Mtwara Port:** Construction of deep-water quays to accommodate larger bulk carriers. **Kigoma Port:** Efficiency improvement of the lake port of Kigoma in order to streamline the cargo flow to/from LLCs such as DRC and Burundi. **Mwanza Port:** Efficiency improvement of the lake port of Mwanza in order to streamline the cargo flow to/from Uganda.

	Mbamba Bay Port: Ferry port development in Southern Tanzania. **Dar es Salaam Airport:** Expansion of Dar es Salaam airport to a regional hub.
Zambia	**Industry/Energy Sector** **Lusaka South Multi-Facility Economic Zone (MFEZ):** Development of an economic zone to the south-east of Lusaka City, aiming at diversifying the domestic industry and attraction of foreign direct investment. **Chambishi MFEZ:** The first MFEZ development in the country on the Copperbelt. **Kafue Gorge Lower Hydropower:** The hydro-power project which could meet as much as a quarter of the country's electricity needs. **Mining Sector** **Konkola Deep Mining:** The project to extend life of Konkola Copper Mine and increase production by accessing the rich ore body that lies beneath what the current operations have been exploiting. **Copper Mines in Domes Region:** Development of copper mines in Domes Region to the west of the Copperbelt. **Zinc and Lead Deposits in Mumbwa:** Development of zinc and lead mines in the northwestern part of Mumbwa. **Transport Sector** **Mchinji/TAZARA Railway:** The extension of the Mchinji Railway from Chipata to join the Tanzania Zambia Railway systems (TAZARA). **Nseluka-Mpulungu Rail Stretch:** Construction of a railway spur to connect the North-South Corridor to the East African Great Lakes Region through Lake Tanganyika. **Chingola-Jimbe Railway Line:** Construction of a railway line which joins Benguela in Angola to service the emerging new Copperbelt of Zambia, and also provides Zambia with the shortest route to sea. **Kafue/Lion's Den Railway:** Construction of a railway line from Kafue to Lion's Den in Zimbabwe, which is located about 24 km north-west of Chinhoyi on the main Harare-Chirundu road. **Mpulungu Branch Line:** Construction of a railway branch from TAZARA in Kasama, the headquarters of the Northern Province, to link Mpulungu, Zambia's only port at the southern tip of Lake Tanganyika. **Njanji Commuter Train:** Rehabilitation and extension of the existing commuter train service in Lusaka. **Nacala Corridor:** Improvement of Zambian section of Nacala Corridor. **Mtwara Corridor:** Improvement of Zambian section of Mtwara Corridor. **Tazara Corridor:** Improvement of the road connecting the country with Dar es Salaam Port, includig bridge construction at Naconde border. **North-South Corridor:** Improvement of the road connecting the country with Johannesburg and Durban Port, including construction of Kazungula Bridge at a missing link between Zambia and Botswana. **Kapiri Mposhi Dry Port:** Construction of a dry port aiming at streamlining trade through Tanzanian Ports.
Malawi	**Industry/Energy Sector** **Chirimba Industrial Estate:** Development of an industrial zone in Blantyre. **Green Belt Initiative:** Agricultural development program seeking to make Malawi independent of rain-fed agriculture. **Viphya Pine Plantation:** Exploitation of pine plantation (100,000 ha) in Northern Malawi.

	Mining Sector **Kayelekera uranium deposit:** Exploration of uranium deposit by Paladin Resources Ltd. of Australia in northern Malawi. **Tundulu phosphate deposit:** Development of phosphate rock resource in the Phalombe District for local production of fertilizer. **Kangankunde rare-earth deposit:** Development of rare-earth elements by Lynas Corp. Ltd. of Australia. **Chenkumbi Hills limestone deposits:** Development of limestone deposits in the Machinga District, which is expected to lower domestic cement price by between 15% and 20%. **Transport Sector** **Nacala Corridor:** Improvement of Malawian section of Nacala Corridor (rail and road). **One Stop Border Posts on Nacala Corridor:** Establishment of One Stop Border Post on Nacala Corridor at Mozambican and Zambian borders. **Railway Access to Moatize:** Construction of a new railway link connecting the countries railway network with Moatize Coal Mine in Mozambique. **Nsanje World Inland Port:** Development of the inland port in the southern extremity of the country to be linked with the planned Shire-Zambezi Water Way.
South Africa	**Industry/Energy Sector** **Coega Industrial Development Zone (IDZ):** IDZ development adjacent to the new port in Ngqura, 20km east of Port Elizabeth, where various factories are expected to be established, including an aluminum smelter of Rio Tinto which would produce around 720 000 tons of aluminum a year. **Richards Bay IDZ:** IDZ development in Richards Bay linked with the deep water sea port. **East London IDZ:** IDZ development in the littoral city of East London. **Mining Sector** **Coal Mines in the Northern Provinces:** Development of coal mines in Limpopo Province and Waterberg Province. **Iron Ore Mines in Kolomela and Khumani:** Development of iron ore mines. **Transport Sector** **Sishen-Saldanha Heavy Haul Railway Line:** Further improvement of the railway line connecting Sishen, in the Northern Cape, and Saldanha Bay Port, transporting iron ore. **Coal Railway Line:** Increase of capacity of Coal Railway Line linking coal mines with Richards Bay Port. **Gauteng Freeway Improvement:** Upgrading and implementing new freeways of an ultimate 560km freeway network. . **N2 Wild Coast Toll Highway:** Construction of a toll highway connecting East London with Durban. **Container Terminal in Durban Port:** Expansion of container terminal in Durban by developing Bayhead area or constructing a new dig-out port at the former airport site. **Liquid bulk Terminal at Richards Bay:** Construction of an additional Bulk Liquid berth increasing the capacity of the existing berth from 1,1mt to 2,8mt. **Port of Ngqura:** Construction of a new container hub port to the east of Port Elizabeth. **Container Terminal in Cape Town Port:** Expansion of container terminal in Cape Town Port.

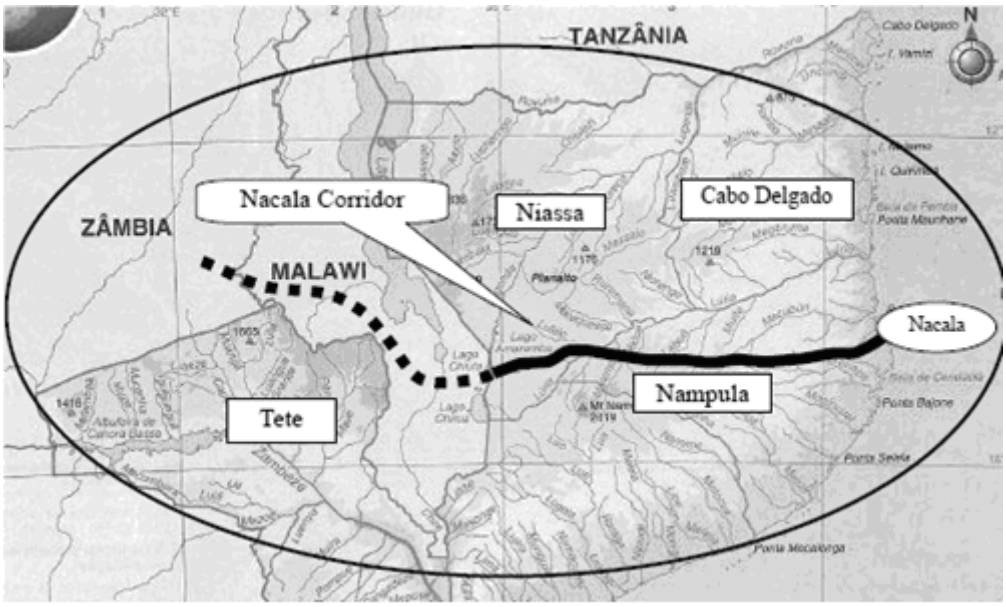
2.2. Present conditions and development trends of Nacala Corridor area

In this section, present conditions and development trends of industry and the transport network in the Nacala Corridor area are analyzed.

2.2.1 Outlines of the Corridor area

In this Study, "Nacala Corridor area" is defined as the area for which Nacala Port has a potential to serve as the principal gate way port. Accordingly, the Corridor area includes the three Northern Provinces as well as Tete Province in Mozambique, Malawi, and Zambia as shown in Figure 2.2-1. Key statistics of the Corridor area are as follows.

1. Population; 36,000 (x1000 habitants)
2. Area; 1,260 (x1000 km^2)
3. GNI total; 18,400 (million USD)



Source: Study Team

Figure 2.2-1 Nacala Corridor area

2.2.2 Industry and investment

(1) Manufacturing industry

1) Northern Mozambique

Northern Provinces, which include the most populated province of Nampula, are less developed than the rest of the country. Therefore industrial development in the Northern Provinces is one of the most important strategies of the nation. Nacala Special Economic Zone (SEZ) Development Project is a key project for the industrial development of the Northern Provinces.

The Government of Mozambique promulgated Decree No.76/2007 on establishment of Nacala SEZ on December 18, 2007. The Decree designated two districts as Nacala SEZ, Nacala district located to east of Nacala Bay and the less developed district of Nacala-a-Velha located to the west of the bay.

According to Law No.4/2009 and the legislation on investment ("Special Economic Zones and Industrial Free Zones") issued by GAZEDA, incentives provided to investors in the SEZ and IFZ are

as follows.

1) Corporate Income Tax for SEZ Enterprise:
   - Exempt for the first three tax years
   - 50% reduction in tax rate from the 4th to the 10th tax year
   - 25% reduction in tax rate from the 11th to the 15th tax year
2) Corporate Income Tax for IFZ developers and enterprises
   - Exempt for the first ten tax years
   - 50% reduction in tax rate from the 11th to the 15th tax year
   - 25% reduction in tax rate for the remaining life of the project
3) Exemption from payment of customs duties on the import of construction materials, machinery, equipment, accompanying spare and accessory parts and other goods used in the carrying out of the licensed activity
4) Exemption includes VAT both on the import and internal acquisitions

The Government established a special organization under the direct control of the Ministry of Planning and Development; GAZEDA (Economic Zone Office for Accelerated Development), on the 24th December, 2007 Decree No.75/2007 in order to accelerate investments into SEZ and IFZ and guarantee the effective management of the SEZ including supervision of the activities.

GAZEDA has approved twenty (20) entities in the SEZ as of December 2010 since 2009. The approved companies, who are enjoying the benefits of tax-exemption and/or tax-deduction based on the Decree, are listed in Table 2.2-1.

Table 2.2-1 List of approved projects in Nacala SEZ in 2009/2010

No	Designation	Certificate Number	Investment amount (USD)	Numbers of employee (men)	Remarks
1	CINAC, S.A.	001/2009	48,433,400.00	142	Cement factory
2	SIMBA STEEL, S.A.	002/2009	898,596.10	500	Shaped Steel factory
3	AVIAM, Lda	003/2009	20,191,369.00	2,500	Plantation
4	DAMODAR FERRO, Lda	004/2009	1,906,000.00	62	
5	Nacala Fishing Charters	005/2009	209,000.00	3	Tourism
6	SANAL SACARIA, Lda	006/2009	3,900,000.00	281	
7	Indo Africa Steel, Lda	007/2009	17,413,379.00	600	Steel factory
8	LIBELULA, Lda	008/2009	300,000.00	10	Tourism
9	Indo Africa Importacao e Exportacao, Lda	009/2009	8,900,000.00	140	Commercial general
10	Grupo Maiaia	010/2009	43,000,000.00	350	Commercial general
11	Terminals do Norte, S.A.	011/2009	1,500,000.00	19	
12	Companhia Industrial de Nacala	001/2010	2,600,000.00	22	
13	Logistic e Comercio do Norte, Lda	002/2010	6,000,000.00	53	Logistic
14	Bakhresa Grain Milling	003/2010	23,000,000.00	100	Construction, etc.
15	IPAN - Industria de Proudtos Alimentares de Nacala	004/2010	6,000,000.00	45	
16	Sociedade G.S. Holding, Limitada	005/2010	25,000,000.00	400	
17	Sociedade Saboeir a de Nacala, Limitada	006/2010	170,000.00	130	
18	REVECENAC - Revestimentos de Cernica de Nacala	007/2010	6,000,000.00	120	Mosaic tile
19	FARINAL - Farinhas de Nacala Lda	008/2010	5,000,000.00	200	
20	OLAM	010/2010	75,000.00	60	
	Total		220,496,744.10	5,737	

Source: Prepared by Study Team, based on the data provided by GAZEDA

Outlines of each company are described below:

1. *CINAC, SA ;*
   Situated along the N12 connecting Nacala and Monapo, this company has manufactured cement since 2008. Total number of employees is 125 and their production capacity is 250,000 tons / year. Cinac was the first company approved by GAZEDA in 2009. Type-I and Type-II cement according to EN (European Norm) standard have been produced in 50kg bags. The products have been transported to Malawi and four provinces of Mozambique (Nampula, Zambezia, Niassa and Cabo Delgado) by truck. Main raw material is imported clinker (210,000 tons/year). In the future, Nakharenghe, to the north of Nacala Port, may produce limestone, and the factory will produce clinker by itself utilizing it and coal from Tete Province. The plant will become a

high valued added plant without imported clinker.

Source: Study Team

Figure 2.2-2 Cement factory in the SEZ (CINAC)

2. *SIMBA STEEL, SA ;*
Manufacture and sale of structural steel for construction, and corrugated galvanized roofing

3. *AVIAM, Lda ;*
Plantation of Jatropha curcas in Nacala-a-Velha district, which will become raw material of bio-fuel

4. *DAMODAR FERRO, Lda ;*
Manufacturing of Secondary steel product from steel scrap

5. *Nacala Fishing Charters ;*
Leisure fishing boat charter company in Naherengue, in the northern part of the city

6. *SANAL SACARIA, Lda;*
Using polymer of polypropylene, woven packing bags are produced in this factory. Annual production is approximately 48 million bags. The raw material (polymer, 150t / month) is shipped from the port of Durban, (about 4 days voyage) to Nacala Port. Stagnation of imported raw materials in Nacala Port occurs occasionally, according to the general manager of the factory. In the worst case, they have experienced a factory shut-down due to lack of raw materials. This was caused by the slow processing of Nacala customs. Manufactured products are exported to Zimbabwe by trucks or are shipped to Maputo city by sea. According to the data provided by GAZEDA, there are 281 male/female employees, and the general manager of this factory is Zimbabwean.

Source: Study Team

Figure 2.2-3 Packing bag factory in the SEZ (SANAL)

7. *Indo Africa Steel, Lda ;*
Indo Africa, Lda is an Indian capital (100%) company, which will operate a factory to produce deformed reinforcement bars from steel scrap ingots. They are building a factory as of the date the Study Team visited the site in 2010. They are planning to produce 150t/day of deformed bar.

Source: Study Team

Figure 2.2-4 Reinforcing bar factory (under construction) in the SEZ (Indo Africa Steel)

8. *LIBELULA, Lda ;*
Diving / Fishing / Tourism

9. *Indo Africa Importacao e Exportacao, Lda ;*
General trading company

10. *Grupo Maiaia*
Grupo Maiaia is a general trading and manufacturing company, which produces flour, steel plate and biscuits. Once every three months, 20,000 tons of wheat are imported from the United States and Pakistan in a chartered bulk-ship. Flour production capacity is equivalent to 300t/day, and a new factory with a capacity 225t/day is planned adjacent to the existing one. Therefore, it is expected that flour production will be increased to 525t/day in the near future. Their factory is located to the south of the Port and along the coast of Nacala Bay.

Source: Study Team

Figure 2.2-5 Flour mill and steel plate factory in the SEZ (Grupo Miaia)

11. *Terminals do Norte, SA ;*
Port cargo handling, / stevedoring services

12. *Companhia Industrial de Nacala ;*
Wheat flour milling industry

13. *Logistic e Comercio do Norte, Lda ;*
Import and export logistics industry

14. *Bakhresa Grain Milling ;*
Grain milling, construction, cereal grains

15. *IPAN - Industria de Proudtos Alimentares de Nacala ;*
Food industry, the production of spaghetti noodles and biscuits

16. *Sociedade GS Holding, Limitada ;*
Edible vegetable oil production, manufacturing plastic containers and paper box, non-alcoholic beverage production

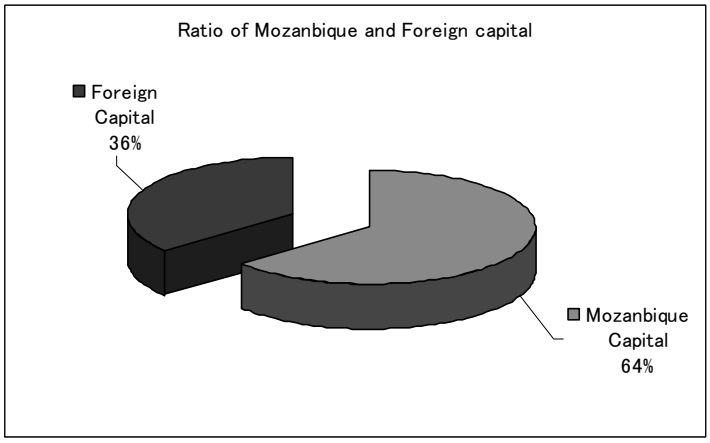
17. *Sociedade Saboeir a de Nacala, Limitada ;*
Soap manufacturing

18. *REVECENAC - Revestimentos de Cernica de Nacala ;*
Mosaic tile manufacturing

19. *FARINAL - Farinhas de Nacala Lda ;*
Threshing and graining of wheat flour

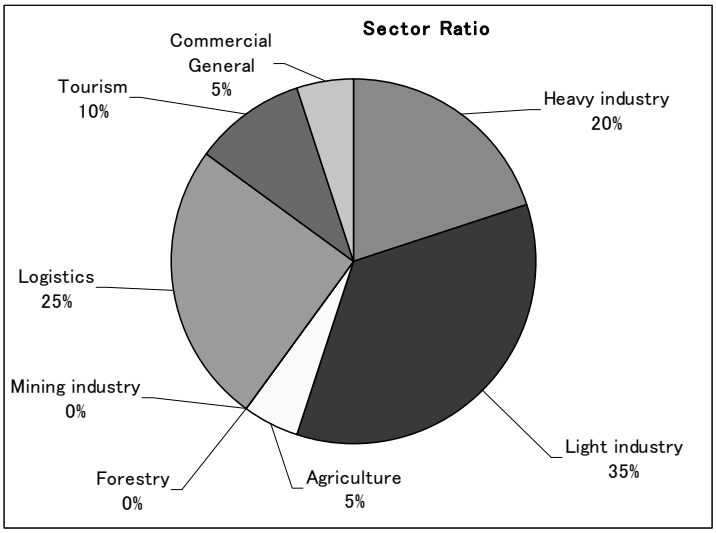
20. *OLAM ;*
Sesame processing and export business

Since 2009, the SEZ has accepted investments from foreign and domestic capital of more than US$ 220 million, which is a remarkable amount for Mozambique. Breakdowns of investment by capital origins and sectors are shown in Figure 2.2-6 to 2.2-8. According to these figures, 64% of the total investment comes from companies and organizations in Mozambique, and only 36% is foreign capital. Heavy industry, though the definition seems to be unclear, is the dominant sector in monetary term.



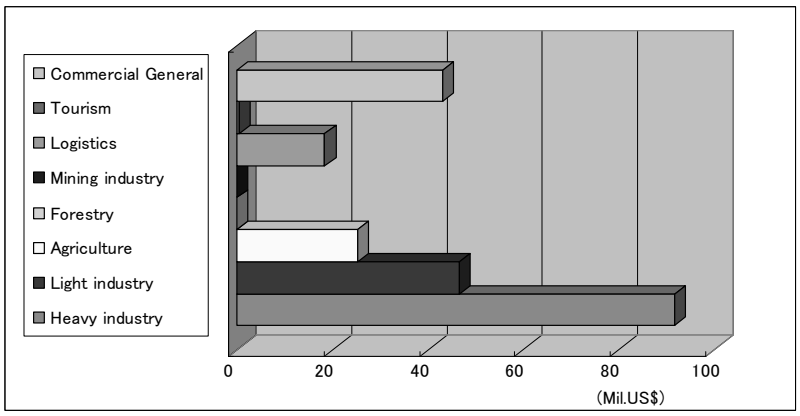
Source: Prepared by Study Team, based on the data provided by GAZEDA

Figure 2.2-6 Ratio of Mozambique and foreign capital of the Nacala SEZ companies



Source: Prepared by Study Team, based on the data provided by GAZEDA

Figure 2.2-7 Sector ratio (company number basis) of the Nacala SEZ companies



Source: Prepared by Study Team, based on the data provided by GAZEDA

Figure 2.2-8 Sector ratio (monetary basis) (mil.US$) of the Nacala SEZ companies

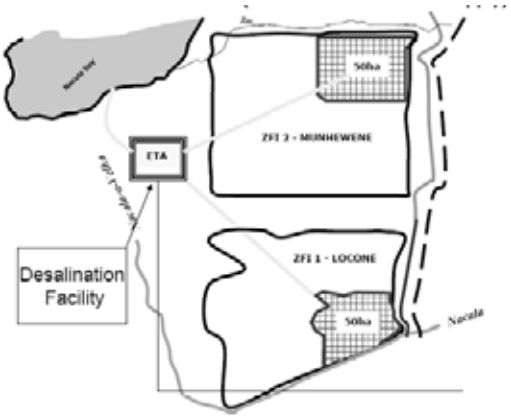
Investment in the SEZ has progressed in various sectors in general. However, the forestry sector lags behind. Sawing and production of wood chip are prospective industries in the SEZ. Further promotion of agro-industry in the SEZ is also expected. Agricultural development in Nampula Province and improvement of the Port and the Corridor would dramatically increase the potential of the SEZ as a center of the agro-industry.

Considering the accessibility to the deep water port, it is clear that the most competitive industry in the SEZ is export processing industry, in which major parts of raw materials are imported and almost all products are exported. However, such industry has not been promoted in the SEZ. For the promotion of the export processing industry, an export processing zone (EPZ), specially designated fenced bonded area, should be established in the SEZ. Mozambique has the legal framework for EPZ, which is called an IFZ (Industrial Free Zone). It is noted that if the low productivity of port operations and red tape of customs clearance remain unchanged, the advantage of the SEZ is completely nullified even though the SEZ is geographically close to the Port. Therefore, streamlining port operation and customs clearance is a precondition for the promotion of the export processing industry. The Port and the SEZ should be integrated physically, institutionally and electronically.

GAZEDA has nominated two areas (shown in Figure 2.2-9) as EPZs in the SEZ, but as of 2010 neither have been developed. Establishment of a long term master plan of the SEZ including detailed

zoning and infrastructure development (roads, water and electric supply, telecommunication, sewage system, etc.) are vital for materializing the EPZ plan. The master plan of the SEZ, urban plans of Nacala and Nacala-a-Velha, and Nacala Port long and medium term shall be harmonized with each other. As an example of well-harmonized development of an industrial park and a port, Hiep Phuoc Industrial Park in Vietnam is presented in Figure 2.2-10 to 2.2-12.

In order to attract more investors, introduction of a trouble-shooting mechanism for investors is also important. The mechanism should be "TOP-DOWN" and be initiated by a Minister, enabling a "PROMPT" solution and minimizing the risk of investment.



Source: GAZEDA

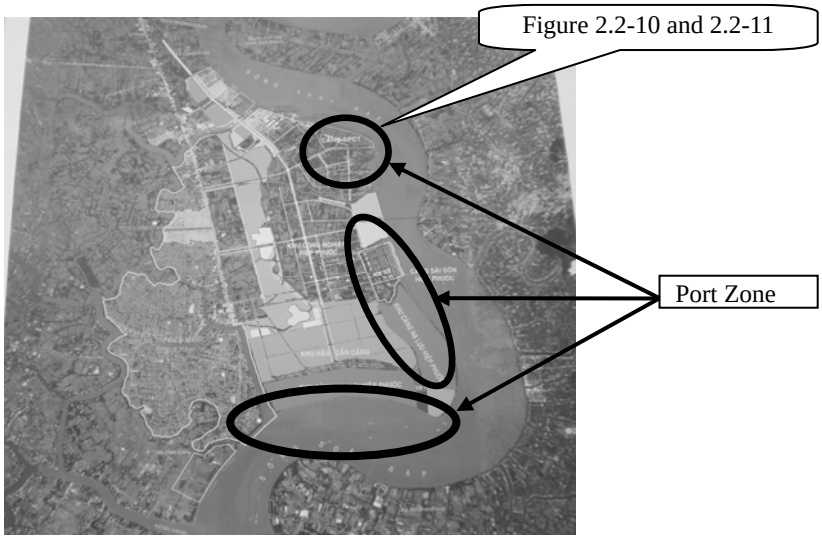
Figure 2.2-9 Planned Industrial Free Zone in Nacala SEZ

Source: taken by a member of the Study Team

Figure 2.2-10 Hiep Phuoc Industrial Park, Ho Chi Minh City, Vietnam (1)

Source; taken by a member of the Study Team

Figure 2.2-11 Hiep Phuoc Industrial Park, Ho Chi Minh City, Vietnam (2)



Source; taken by a member of the survey team

Figure 2.2-12 Zoning of Hiep Phuoc Industrial Park

2) Malawi

Despite remaining one of the poorest and least developed countries in Africa, Malawi is beginning to make real progress in terms of laying the foundations for further industrial growth and more effective poverty reduction. According to the World Bank, Malawi's industrial average growth from 2000 to 2007 was remarkably 4.6 % as shown in the section 2.1.2 (3). Agriculture, the main sector of the Malawi economy, accounts for more than one-third of GDP and 90% of export revenue. Malawi's main industries consist of tobacco, tea, sugar, sawmill products, cement and consumer goods. According to the World Fact Book, Malawi's industrial production growth rate 2009 is estimated at 9.5%.

3) Zambia

Zambia's economy has experienced strong growth in recent years. According to the World Bank, Zambia's industrial average growth from 2000 to 2007 was 9.4%, remarkably higher than other sectors as shown in section 2.1.2 (2). Copper output has increased steadily since 2004 due to higher copper prices and foreign investment. Zambia's main industries consist of copper mining and processing, construction, foodstuffs, beverages, chemicals, textiles and fertilizer. According to the World Fact Book, Zambia's industrial production growth rate 2009 is estimated at 11%.

(2) Agriculture and Fisheries

1) Northern Mozambique

a) Agriculture

According to the data from the National Statistical Office (INE Nampula), 70% of the population is living in agricultural areas in Nampula Province. Most of them are smallholders. Agricultural methods are mainly manual and very little agricultural technology has been introduced. Inland Nampula Province has fertile loamy soil that is perfect for cultivation. In Nampula Province, food crops such as cassava, maize, beans, peanuts, sorghum, millet and cash crops such as cashew, cotton, sesame, tobacco are cultivated.

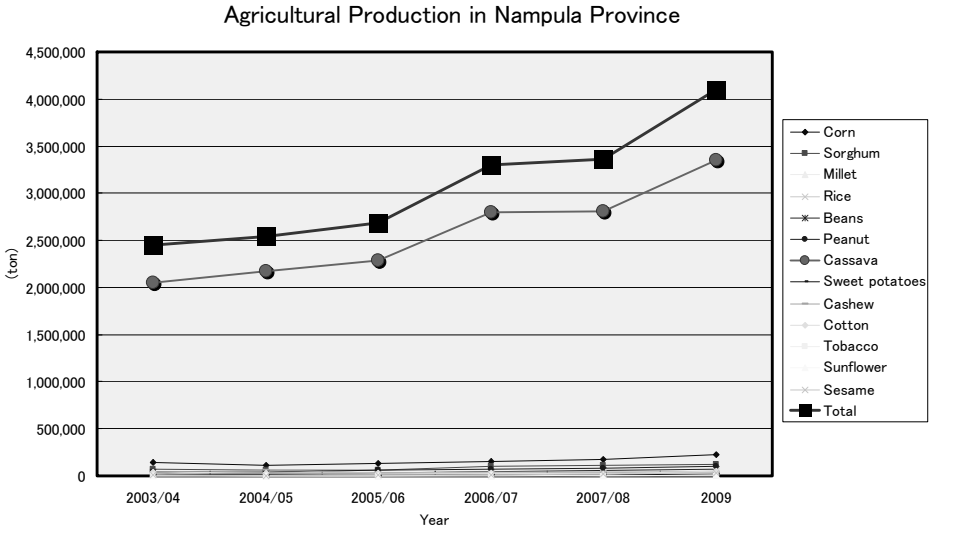
Land area of NampulaProvince is 8,160,600 (ha) and agricultural land under cultivation covers 4,500,000 (ha) within Nampula province land. Only 1.6% of the agricultural land (about 74,000ha) has been irrigated. Annual crops occupy an area of 899,000 hectares, representing 20% of the total agricultural area of the province, and are basically worked by the household sector. Permanent crops occupy an area of about 260,000 hectares, accounting for 6% of the total area. The following table

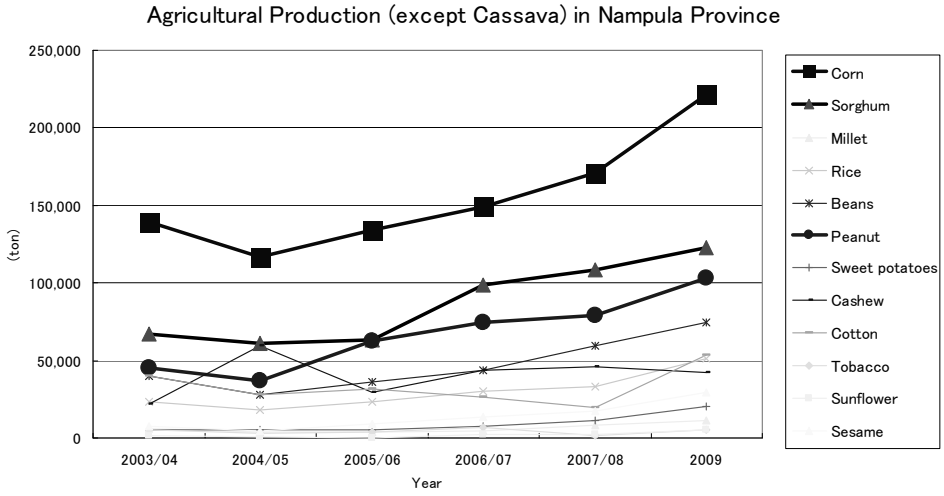
shows the production of food in Nampula province.

Table 2.2-2 Agricultural production in Nampula Province

No	Cultures	Agricultural Production (tones)						Remarks
		2003/04	2004/05	2005/06	2006/07	2007/08	2009	
1	Corn	139,637	116,884	134,069	148,948	170,726	221,094	
2	Sorghum	66,842	60,699	62,880	98,976	108,514	122,889	
3	Millet	5,910	3,876	3,696	4,702	8,143	10,994	
4	Rice	23,305	17,923	23,338	29,835	32,946	51,178	
5	Beans	40,179	27,871	35,873	43,469	59,226	74,500	
6	Peanut	45,357	36,532	62,673	74,386	79,134	103,200	
7	Cassava	2,051,649	2,174,263	2,285,325	2,801,803	2,809,054	3,356,803	
8	Sweet potatoes	5,538	5,236	4,987	7,453	11,290	20,520	
9	Cashew	21,742	59,459	29,352	43,615	46,123	42,000	
10	Cotton	40,100	27,628	31,957	26,637	19,248	53,834	
11	Tobacco	4,965	3,295	3,877	6,474	1,800	4,970	
12	Sunflower	1,588	597	367	1,950	2,069	5,138	
13	Sesame	7,401	4,451	8,715	13,531	17,604	29,428	
	Total	2,454,213	2,538,714	2,687,109	3,301,779	3,365,877	4,096,548	(tones)
	Annual growth rate	100	103	106	123	102	122	compared with the previous year
	Growth rate	100	103	109	135	137	167	100 in 2003/04

Source: INE, Nampula





Source: INE, Nampula

Figure 2.2-13 Agricultural production in Nampula Province

Based on the information provided by Nampula Province and INE, production trends of cash crops in Nampula province are described as below:

Tobacco:

Tobacco was produced by SONIL (Ribaue and Malema) and TNM (Lalaua) over an area of 9,780 hectares (as opposed to 10,245 hectares the previous year, representing a decrease 4.5 %), with an estimated production of 4,970 tons (down from 5,578 tons the previous year or 10.9%). Thus, in the year 2009, there was a production of 1,500 tons, representing a decrease of 16.7% of its turnover in the previous year (1,800 tons) and a compliance plan in the order of 30.2%. The reduction in production was due to the late availability of inputs, poor assistance to producers and abandonment in favor of sesame and beans. The maximum price for commercialization of this crop was fixed at 49.00 MT/kg against 43.00 MT/kg in 2008, representing a growth of 14% and the minimum price was fixed at 18.00 MT/kg versus 14.20 MT/kg the previous year, representing a growth of around 28.6%. According to the production records as shown in Table 2.2-2, production of tobacco is expected to range from 5,000 tons to 6,500 tons per year in Nampula Province.

Cotton:

In 2008/09, production area of 87,894 ha was planned of which 74,099 ha were planted; this compares to 63,306 ha planted in 2007/08, representing an increase of 17% and a compliance plan at 84.4%. According to the production records as shown in Table 2.2-2, production of cotton is expected to range from about 50-60,000 tons per year in Nampula Province.

Cashew:

Nampula Province sold 28,473 tons of cashew nuts, against 46,123 tons achieved in the previous year, representing a decrease of 38.3% and achieving only 67.8% of their targeted 42,000 tons. The low trade was due to various factors such as cyclone, uncontrolled fires, and climatic conditions not favorable for their development. According to the production records (see Table 2.2-2), production of cashew is expected to range from 60-70,000 tons per year in Nampula Province since cashew processing factories have been inaugurated in Nampula Province along national roads.

Long-term strategic policies for agriculture in Nampula province are summarized as follows:

- Establishment of a center for agricultural mechanization (including irrigation equipment)
- Securing raw materials / seeds, chemicals (pesticide and fertilizer)
- Technical assistance for agriculture
- Providing financial services for agriculture, such as low-interest loans
- Provision of research services, such as establishment of advanced agriculture institute
- Creation of associations of producers of specialty products for domestic and foreign markets

Based on the above agricultural production program issued by the Nampula Province, Aviam project has been commenced in Nampula Province. Jatropha curcus and a substantial amount of seeds have been produced in the plantation farms in Nampula Province through the project. In addition, program for the acceleration of food production such as cash crops, livestock and fisheries to ensure food security in the Northern Provinces has been started.

International development partners including JICA have been assisting the agricultural development in the Province.

b) Fisheries

Fisheries are one of most important sectors in Nampula Province.

In 2007, the artisanal component had 357 associations, operating 7,880 fishing vessels (3,810 vessels in 2003). In recent years greater emphasis is being placed on the capture of shrimp due to the introduction of new production technologies in this area. In 2009, 17,854.4 tons of fishing products were caught against 13,224 tons caught in the previous year 2008, representing an increase of 35% which exceeded the target of 16,555.7 tons by 129.9%.

Currently, Nampula has sustainable fish production by artisanal farms. About 39,000 fishermen

reside in the coastal districts of Moma, Angoche, Mossuril, Mozambique Island, Mogincual, Nacala-a-Velha and Memba, assisted by two major projects in support of their development, including Artisanal Fisheries Project Sofala Bank (PPABAS) and Artisanal Fisheries Project in Nampula and Cabo Delgado (PPANCD), which rely on a network of 27 fisheries extension officers. The assistance resulted in the construction of five demonstration centers and 48 fish processing units in the districts of Memba, Mozambique Island and Mossuril and rehabilitation of access roads to allow the connection of the main fishing centers and marketing centers, mainly in the south.

Table 2.2-3 Fisheries production in Nampula Province

Species	Plan 2009	Unit	Actual Production		Actual/Plan 2009	Annual Growth
			2008	2009		
Shrimp	848.7	ton	437.3	401.5	47%	-8%
Fish	15,515.0	ton	12,629.4	16,763.4	108%	33%
Cephalopods	64.2	ton	35.7	393.1	612%	1001%
Crab	23.5	ton	107.4	94.0	400%	-12%
Lobster	23.5	ton	0.0	130.2	554%	-
Shark	54.0	ton	9.0	7.8	14%	-13%
Other	26.8	ton	5.6	64.4	240%	1050%
Total	16,555.7	ton	13,224.4	17,854.4	108%	35%

(*) This report presents information about the activities undertaken by the Provincial Government during the peíodo January to December 2009. The activities undertaken during this period is limited to the fulfillment of the last year of implementation of Government's Five Year Program (2005-2009), the Plan of Action for the Reduction of Absolute Poverty (PARPA 2006-2009) and Plan Economic, Social and Provincial Budget (PESOP) in the year 2009.

Source: Yearly report 2009, provided by Nampula Province (*)

Through strengthening technical knowledge such as shipbuilding and improved methods of fishing, technological development and rational exploitation of fishery resources can be achieved. According to representatives from Nampula Province, they have continued to improve infrastructure to support and commercialize fisheries, including the construction and rehabilitation of the market, and the training of 24 members of the management committee of the market, which included the participation of local authorities.

2) Malawi

Agriculture sector is the main impetus of Malawi economic development. This sector shared 32.6% of GDP by sector in 2006. Agricultural products consist of tobacco, sugarcane, cotton, tea, corn, potatoes, cassava (tapioca), sorghum, groundnuts, macadamia nuts and livestock such as cattle and goats. Cotton production increased by 5.6 % to 62,000 tons. Illovo Sugar produced 295,000 tons of sugar in Malawi in 2009/10. The company is regarded as a major African sugar producer with total production in Africa reaching 1,685,000 tons in 2009/10.

3) Zambia

In Zambia, agriculture sector shared 19.7% of GDP by sector according to the World Fact Book issued by the Central Intelligence Agency. Agricultural products of Zambia consist of corn, sorghum, rice, peanuts, sunflower seed, vegetables, flowers, tobacco, cotton, sugarcane, cassava (tapioca), coffee and livestock such as goats, pigs and cattle.

(3) Forestry

1) Northern Mozambique

Northern provinces of Mozambique, consisting of Niassa, Cabo Delgado and Nampula Province,

are covered with forests ideal for sawed timber production. Areas of forests are listed below.

Niassa	;	9,400,000 ha
Cabo Delgado	;	4,800,000 ha
Nampula	;	2,800,000 ha
Total	;	17,000,000 ha (42%)
Overall Mozambique's forest area	;	40,600,000 ha

Northern Provinces have favorable natural conditions, such as rainfall of 1,100mm to 1,500mm per year, suitable temperature range, well-drained soil condition and suitable altitude. Therefore, forestry-related industries are prospering in Northern Mozambique compared with those in the middle and southern parts of Mozambique. Foreign capital has been pouring into the forestry sector of these regions as listed below, especially into Niassa Province.

1. Malonda Treefarms Mozambique, S.A. (Niassa), by Norway fund
2. Chikweti Forests of Niassa, S.A. (Niassa), by Swedish fund
3. Florestas de Niassa Lda, (Niassa), by German and Norway funds
4. New Forests Malonda (Niassa), by UK fund
5. Florestal de Massangulo, Lda (Niassa), Swedish fund
6. Malonda Foundation (Niassa)
7. UPM Florestal (Niassa)
8. Green Resources (Nampula and Cabo Delgado)
9. Aviam (Nampula)

2) Malawi

In Malawi, forests and woodlands cover an estimated 2.6 million ha, or 27% of the land area. Natural forests are in the high-altitude regions and the Forestry Department is engaged in a softwood forestation program. However, Malawi's annual rate of deforestation was 2.4% during 1990–2000. Sizable plantations of pine, cypress, and cedar have been established.

3) Zambia

In Zambia, 66.5% or about 49 million ha is forested, according to FAO. National forests are extensive as annual precipitation ranges from 800mm to 1400mm. Forestry sector in Zambia has a lower share compared to other industrial sectors such as mining.

(4) Mining

1) Northern Mozambique and Tete Province

Heavy sand mining in Moma is the most important mining project in Northern Mozambique. The project produced a total of 492.141 tons of ilmenite, zircon and rutile as listed in Table 2.2-4. The project belongs to Kenmare Resources PLC, a mining company based in Ireland. The Moma deposit, located on the southern coast of Nampula, was discovered in 1996. In April 2004, Kenmare signed a contract to construct the mine with MBJV, a joint venture between Bateman of South Africa and Multiplex of Australia. In 2007 the construction was completed and the production started. The products are conveyed overland for 2 km to a jetty. The conveyor system crosses an area of wetland on a raised roadway. The jetty extends for approximately 350m out to sea where the product is loaded onto a purpose built self propelled barge. This barge has a carrying capacity of 4,000 tons and proceeds some ten kilometers offshore to a transshipment mooring point where the product is transferred to an ocean going vessel for transport on to its final destination.

Besides heavy sand in Moma, around 790 thousand tons of minerals were produced in Nampula Province in 2009, though they were dominated by sand for construction as shown in Table 2.2-5.

Table 2.2-4 Production of heavy sand in Moma

Indicator	Unit	Plan 2009	Actual production 2008	Actual production 2009	Act/Plan 2009	Annual Growth
Ilmenite (FeTiO3)	Ton	666.000	246.156	468.975	70%	91%
Zircon (ZrSiO4)	Ton	44.000	5.835	19.102	43%	227%
Rutile (TiO2)	Ton	15.000	1.598	4.064	27%	154%
Total	Ton	725.000	253.589	492.141	68%	94%

(*) This report presents information about the activities undertaken by the Provincial Government during the peíodo January to December 2009. The activities undertaken during this period is limited to the fulfillment of the last year of implementation of Government's Five Year Program (2005-2009), the Plan of Action for the Reduction of Absolute Poverty (PARPA 2006-2009) and Plan Economic, Social and Provincial Budget (PESOP) in the year 2009.
Source: Yearly report 2009, provided by Nampula Province (*)

Table 2.2-5 Mining production in Nampula Province in 2009

INDICATOR	Unit	Plan 2009	Actual Production 2008	Actual Production 2009	Act/Plan 2009	Growth. 2008/2009
Quartz	t	109.220	109.215	23.432	21%	-79%
Gold	t	0.006	0.005	0.001	24%	-71%
Limestone	t	14.500	14.346	31.720	219%	121%
Sand Construction	t	1,019.000	1,019.000	735.000	72%	-28%
Granite	t	2.800	2.793	4.302	154%	54%
Granite Gneiss	t	3.296	3.195	2.641	80%	-17%
Beryl Industrial	t	0.003	0.003	0.002	68%	-32%
Total	t	1,148.825	1,148.557	797.099	69%	-31%

(*) This report presents information about the activities undertaken by the Provincial Government during the peíodo January to December 2009. The activities undertaken during this period is limited to the fulfillment of the last year of implementation of Government's Five Year Program (2005-2009), the Plan of Action for the Reduction of Absolute Poverty (PARPA 2006-2009) and Plan Economic, Social and Provincial Budget (PESOP) in the year 2009.
Source: Yearly report 2009, provided by Nampula Province (*)

At present, the amount of mineral production in Northern Mozambique and Tete is rather small as described above; however, the production is expected to grow rapidly.

Vale is interested in mining phosphate deposits in Nampula Province. An economic feasibility study will be carried out in 2011 although mining of the deposits is not expected to begin before 2014. Phosphates have many industrial and agricultural applications, namely production of fertilizers, but their mining is expensive due to having to prevent heavy metals, such as cadmium and lead, from reaching waterways. Vale will also annually produce 1 million tons of iron concentrate when it begins exploiting mines in the Monapo District of Nampula Province. Iron deposits located at Evate in Monapo district are sufficient to be exploited for an estimated 28 years. Vale's Monapo project includes the construction of various infrastructures comprising processing plants, a dam to ensure water supply and an electric power plant, among others.

In Tete province, large scale coal mining projects are progressing. The projects include the development of the country's three largest coal deposits - Moatize-Minjova, Senangoe, and Mucanha-Vuzi. Some of the coal is high-value coking coal used in steel production. A considerable amount is also thermal coal of rather low quality that may not be economical to export but is useful for generating electricity for domestic use.

According to Vale Mozambique, they will produce 12,000,000 tons of coking and thermal coal

annually in Phase-1 from year 2011. The coal will be transferred to Beira and shipped onto an off-shore self loading vessel. In Phase-2, Vale will use Nacala Bay since Beira Port will reach full capacity. Accordingly, the branch railway to Nacala-a-Velha and a coal loading jetty will be constructed by the year 2014 at the earliest. In addition, the Revuboe project is progressing in Tete province adjacent to Vale's Moatize project. About 5 million tons of coal will be produced in 2014 from the Revuboe. The Benga project is also progressing. They will commence to produce 6 million tons of coal in 2011 in Tete. Furthermore, exploration activities of Zambeze project are ongoing by Riversdale in Tete. Coal resources here are estimated at 9 billion tons.

In Niassa Province, coal explorations are being carried out by various companies. A Chinese mining company, Huo Qinghua, sent a team of technicians to the district of Lago to assess the coal reserves in the region and they have expressed an interest in investing in coal mining.

In Cabo Delgado Province, the Ancuabe project is being carried out by a German company. Graphit Kropfmuhl is interested in exploiting graphite deposits in the Ancuabe District of Cabo Delgado Province, 120 km from the provincial capital Pemba. The German company also wants to develop a parallel research and prospecting project at the Mazeze administrative post in Chiure district, where deposits of that mineral are confirmed in two areas. Graphit Kropfmuhl will submit the feasibility study to the government in 2011, which will make the final decision. Furthermore, according to Wentworth Resources Limited, they have partnered with Anadarko Petroleum Corporation in an exchange of interests agreement over the onshore and offshore exploration blocks in Cabo Delgado. The agreement provides Wentworth with a major international partner in its exploration and production operations over its onshore concession, as well as an overriding royalty interest in Rovuma Basin Offshore Area One Block. Wentworth has an 11.59% working interest in production from the Rovuma Onshore Block and a 0.42% overriding royalty interest in production.

2) Malawi

Apart from industrial mineral production, Malawi does not have a well-developed minerals industry. However, Malawi does have potential heavy mineral sand, bauxite, phosphate, uranium and rare earth element deposits. Several carbonatites have been investigated for potential phosphate, niobium and rare earth potential. Several mineral deposits exist in Malawi which can be mined on a small scale. The Malawi Government has embarked on an economic empowerment programme aimed at promoting and supporting small-scale mining in areas of import substitution and value-adding services.

3) Zambia

Copper and cobalt are the key commodities produced by Zambia, with the Zambian copper-belt remaining the focus of mining and development activities. The area contains the world's highest grade copper and cobalt deposits, with tailings dumps often containing grades greater than that of most hard rock mines. Zambia is ranked as the world's seventh largest producer of copper, generating 3.3% of the western world's production, and the world's second largest producer of cobalt (19.7%). It also has significant quantities of selenium and silver together with minor gold and platinum group elements which are produced as important by-products of the copper mining and processing.

2.2.3 Transport

(1) Road

1) Mozambique

The road network in northern Mozambique is relatively feeble compared with that in the southern region of the country. Its conditions also have remained poor as gravel surface is mainly observed except the N1 and some sections which have been improved by international funds from AfDB, EU and Japan. This has been one of the obstacles for economic and commercial development in this area.

ANE (National Road Administration) is a public institution responsible for development and

maintenance of all classified roads in Mozambique. Large scale projects of road and bridge developments have been funded by international partners such as AfDB, EU and foreign countries including Japan.

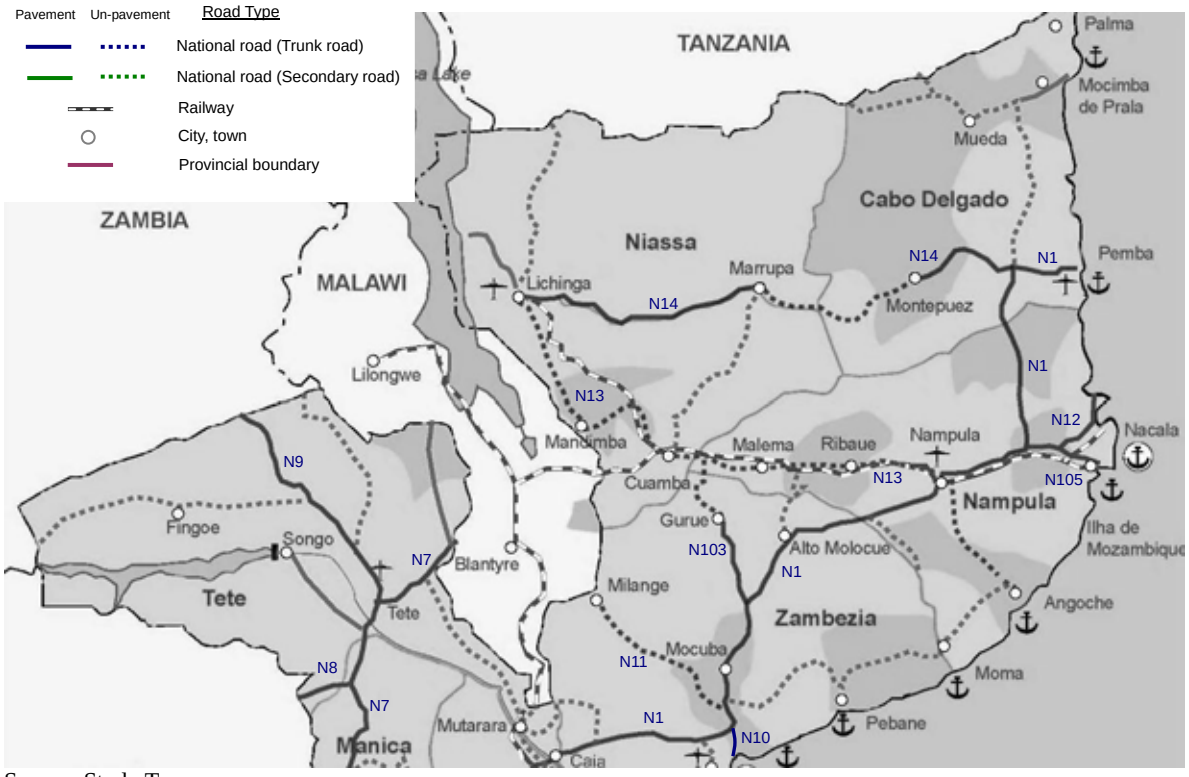
The national roads, N1 from Nacala to Nampula and N13 from Nampula to Mandimba, the border with Malawi, are the core routes of Nacala Corridor in Mozambique. N1 constructed by EU fund is a paved road and well maintained, while N13 is still a gravel surface and in poor condition. The road condition on N13 becomes so bad during the rainy season that vehicles are forced to drive slowly or divert to other roads. In the worst case, some vehicles get stuck in the ditch formed by the flashing water or drift to the road side due to muddy soil. It is said to take more than 10 hours to travel the approximately 300km between Nampula and Cuamba in the rainy season, which means that average travel speed is less than 30km/h. The road of Nacala Corridor in Malawi is in better condition than Mozambique, but there are some sections that need to be rehabilitated.

Consequently, despite being the shortest way to Nacala Port from/to landlocked Malawi, the Nacala Corridor has hardly been used as an international road transportation route due to the above conditions.

Table 2.2-6 National roads in northern Mozambique

No.	Province	Section	Distance (km)	Condition
N1	Zambezia	Caia-Namacurra-Mocuba-Alto Ligonha	500	Paved
	Nampula	Murrupula-Nampula-Namialo-Namapa	400	Paved
	Cabo Delgado	Ocua-Metoro-Pemba	150	Paved
N7	Tete	Luenha-Tete-Zobue	262	Paved
N8	Tete	Chucamano-Changara	48	Paved
N9	Tete	Moatize-Nsadzu	300	-
N10	Zambezia	Quelimane-Nicoalara	46	-
N11	Zambezia	Nalei-Milange	208	Unpaved
N12	Nampula	Namialo-Monapo-Nacala	102	Paved
N13	Nampula	Nampula-Ribaue-Mutuali	310	Unpaved
	Niassa	Lurio-Cuamba-Mandima-Lichinga	340	Unpaved
N14	Niassa	Lichinga-Marrupa	280	Paved
	Niassa	Marrupa-Rio Luaza	70	Unpaved
	Cabo Delgado	Rio Luaza-Montepuez	180	Unpaved
	Cabo Delgado	Montepuez-Metoro	67	Paved
N103	Zambezia	Ile-Gurue	100	Paved
	Zambezia	Gurue-Lioma	60	Unpaved
N105	Nampula	Monapo-Ilha de Mozambique	60	Paved

Source: Study Team



Source: Study Team

Figure 2.2-14 Road network in Northern Mozambique

2) Malawi

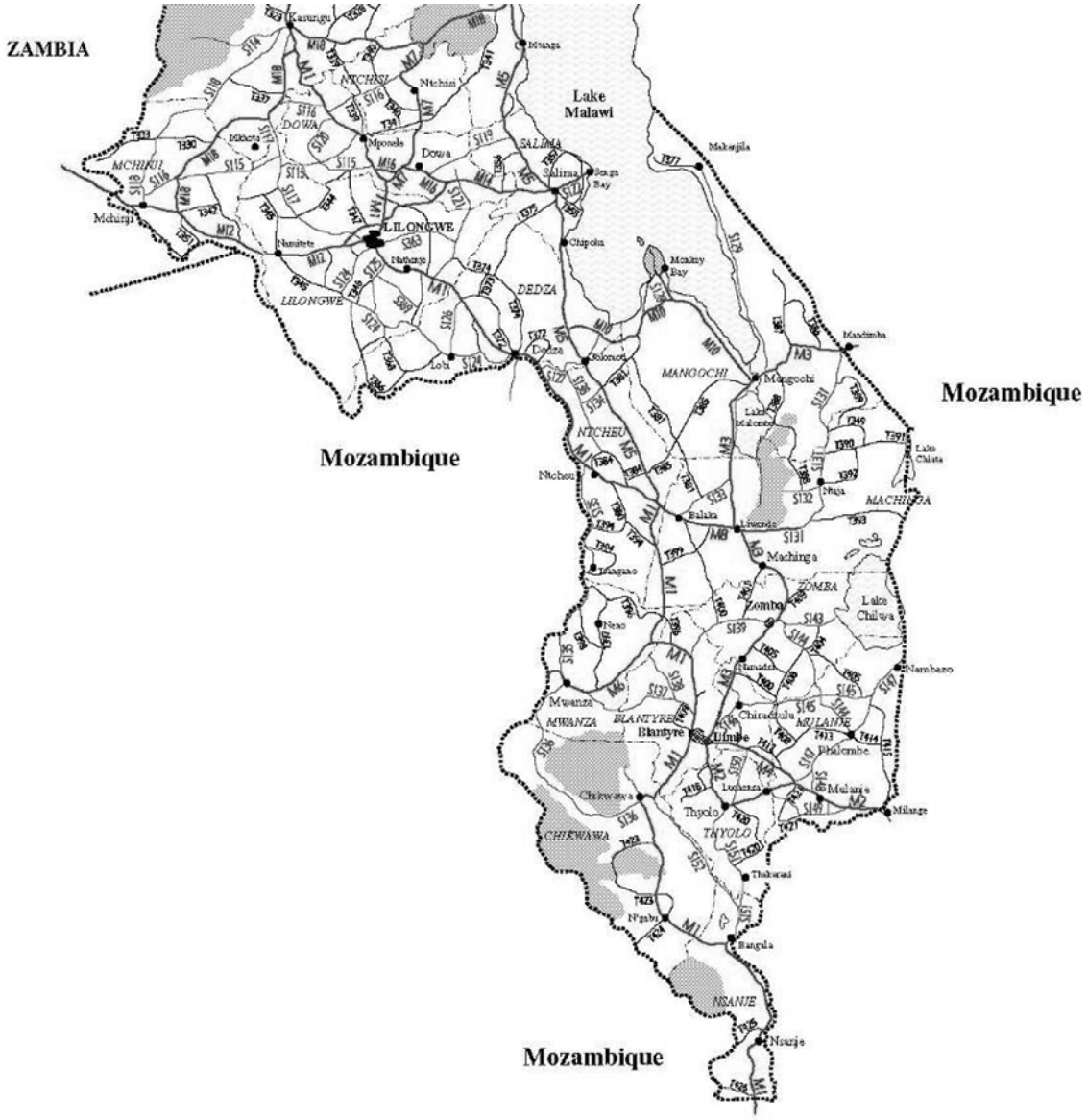
Malawi Road Authority (MRA) has administrated the road development and maintenance based on the Malawi Growth and Development Strategy (MGDS), the National Transport Policy (NTP), the Roads Sector Programme (RSP), and the RA Five Year Business and Strategic Plan.

Total length of roads in Malawi reaches 24,929km as of April 2008 and the road condition in Malawi is better than Mozambique. The national road from Chiponde to Mchinji via Lilongwe, a part of Nacala Corridor, is totally paved. The road length and network in Malawi are shown in Table 2.2-7 and Figure 2.2-15.

Table 2.2-7 Road length in Malawi

Road Type	Paved (km)	Unpaved (km)	Total (km)
Main	2,809	548	3,357
Secondary	442	2,683	3,125
Tertiary	44	1,077	4,121
District	8	3,498	3,500
Community Road	0	9,478	9,478
Total	4,073	20,856	24,929

Source: Malawi Road Authority (MRA)



Source: Malawi Road Authority (MRA)

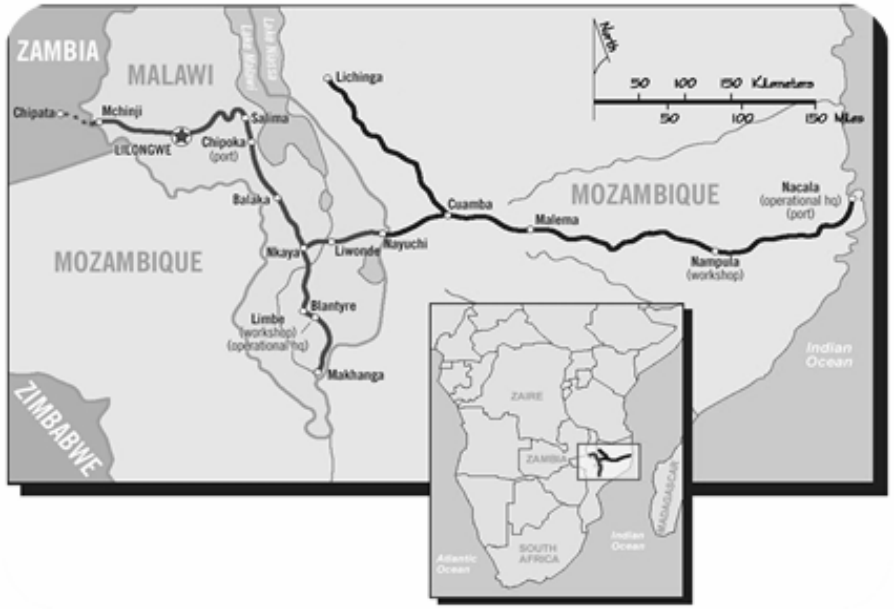
Figure 2.2-15 Road network in Malawi (South)

(2) Railway

The railway along the Nacala Corridor, consisting of Malawi's railway and the railway in Mozambique, was concessioned in stages, beginning with the creation of Central East African Railways (CEAR) in 1999 in Malawi and continuing with the concessioning of Mozambican railway to Corredor de Desenvolvimento do Norte (CDN) in 2005.

Vale, a Brazilian mining company, purchased a 51% stake in Sociedade de Desenvolvimento do Corredor do Norte SA (SDCN) owned by the Mozambican company Insitec SGPS SA in 2010. SDCN in turn holds 51% of CDN and CEAR. Since Nacala Port is concessioned to CDN, these represented the first private sector integration of an international port and multi-national railways for general cargo in the region.

In addition to rail freight service, the Nacala Corridor railway provides passenger service in selected markets in both Mozambique and Malawi.



Source: CDN

Figure 2.2-16 Railway along Nacala Corridor

1) Mozambique

The railway lines of the Nacala Corridor consist of three different lines in Mozambique.

- The Nacala – Cuamba – Entre Lagos line, 610 km, to the border of Malawi, fully rehabilitated in 1996
- The Cuamba – Lichinga Line, 262 km
- The Lumbo – Monapo line, 42 km, not operational

Following is a brief explanation of the major links of the Nacala railways:

Nacala – Cuamba (533 km)

This section was completely rehabilitated with funds from France, Portugal and the European Union. This undertaking was also financed, in local currency, by the Government, the Bank of Mozambique and CFM. In the section, normally three trains run each day in both directions.

Cuamba – Entre Lagos (77 km)

CDN has done some maintenance work on this section to improve safety and avoid derailments. Wooden sleepers are being replaced by steel sleepers to increase its efficiency. However, as the maintenance work has not been sufficient, the railway operation for passenger is not operated and railway for cargo travels at a considerably slow speed.

Due to the poor financial performance of CDN-railway, it had been difficult to rehabilitate it. However, it can be expected that this section will be fully rehabilitated and upgraded before 2014 now that Vale is participating in the management of CDN.

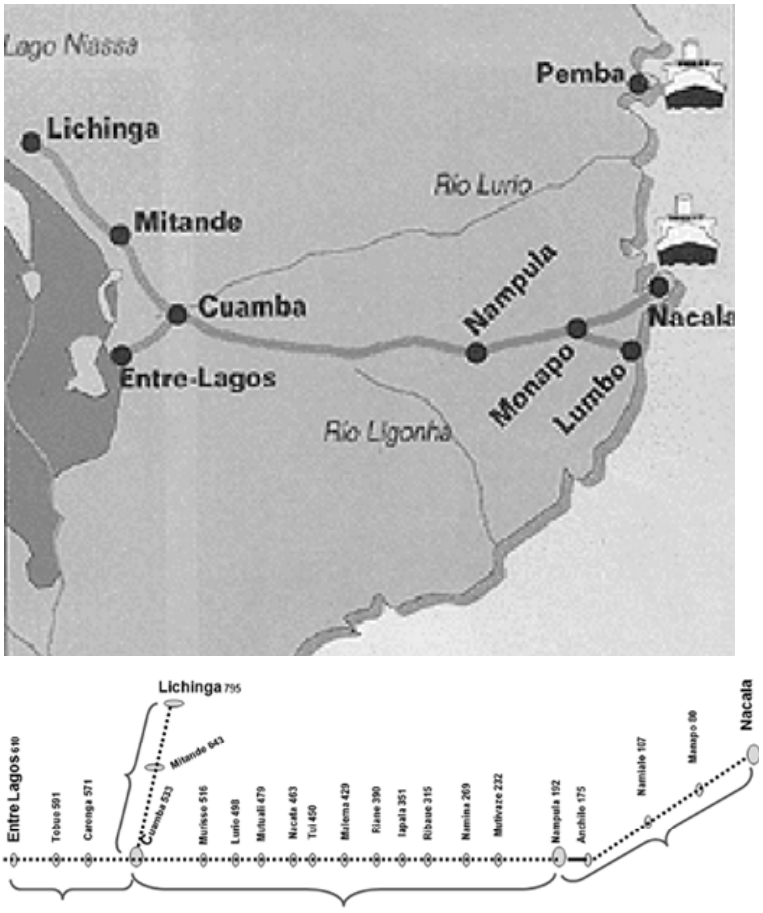
Cuamba – Lichinga (262 km)

Mixed passenger/cargo trains circulate regularly once or twice a month. This track is essential for the development of the Niassa Province and it is now undergoing consolidation works.

CDN possesses 5 material motors but only 3 of them are currently in operation. There are three diesel locomotives in operation. There are 12 dollies owned by CDN but only 4 are in operation at present.

The operation of this line is susceptible to flooding. The railway line was closed from 31 December 2007 to 7 January 2008 following flood damage and was disrupted again on 26 January when heavy rains washed out a 30 meter stretch of track and destroyed a culvert. The line was cut in the district of Nampula-Rapale, west of the provincial capital Nampula, halting all trains.

The delay is seriously affecting Malawian farmers, who import fertilizer through Nacala - a commodity especially needed in the planting season. Container loads of Malawian tobacco for export are also held up, as are produce consignments for markets in Nampula and Nacala. The disruption of agricultural traffic from the districts of Ribaue and Malema to Nampula results in shortages of tomatoes, potatoes, cabbage and other vegetables.



Source: CDN

Figure 2.2-17 Railway along Nacala Corridor (Mozambican side)

Source: the Study Team

Figure 2.2-18 Iapala Station (Riabaue District, Nampula Province)

The current train transit is as follows:

Table 2.2-8 Current train transit data

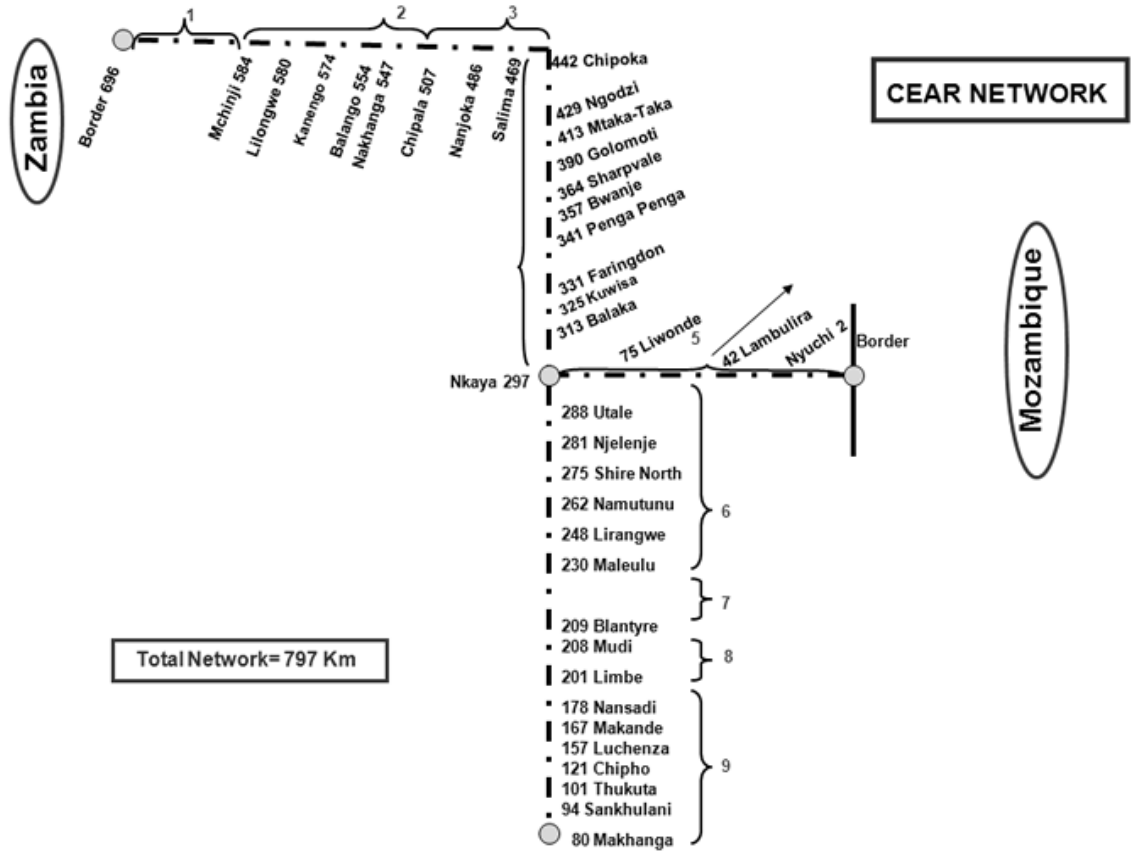
Line	Distance (km)	Speed (km/h)	Time (hours)	Max. practical train weight (ton)
Nacala - Nampula	180	40	4.5	800
Nampula- Cuamba	353	40	9.0	800
Cuamba - Border	77	20 (15 in rainy season)	3.9	800
Cuamba - Lichinga	262	-	7days	-

Source: CDN

The current freight transport volume is around 0.3 million tons per year, which is broadly equivalent to the transport volume by one train per day. However, the demand is not distributed evenly, and 3 or 4 trains per day are required during harvest season.

Total travel time between Nacala and major cities in Malawi is 8 to 20 days. Passenger trains run only once every two days and are mixed with freight due to the availability of locomotives.

2) Malawi



Source: CDN
Note: The rail link between Chipata in Eastern Zambia and Mchinji was commissioned in 2010.,

Figure 2.2-19 Railway network in Malawi

In Malawi, CEAR operates the whole of the 797 km railway line, whereas the railway infrastructure is owned by the government. CEAR is a private company owned by SDCN which also owns a 51% share of CDN. In 2010, Vale Mozambique purchased a 51% share of SDCN.

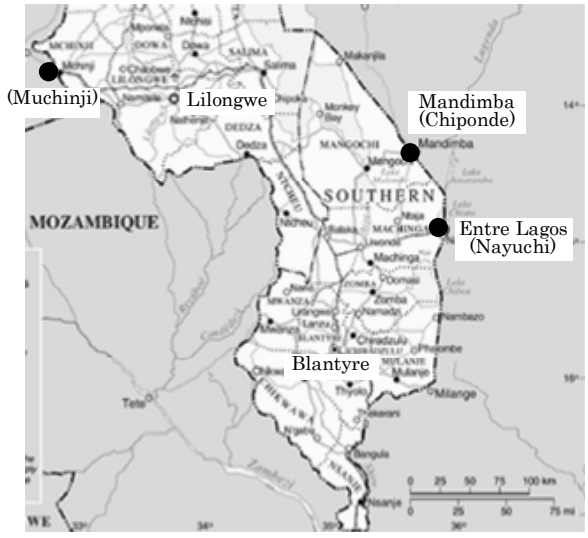
The network spreads from Mandimba in the Nacala Corridor to Chipata in Eastern Zambia through the Mchinji border in the west side, and Maruka in the south side, however, the bridge was washed out because of flood, and thus the railway is operated only to Luchneza for cargo and Makhanga for passenger at this moment. The rail link between Chipata and Mchinji, of which Zambian section is also operated by CEAR, was commissioned in 2010 aiming at facilitating transport of import and export goods from landlocked Zambia through the port of Nacala.

CEAR has now 12 locomotives, however, 4 are under repair and only 5 locomotives can be used for cargo, 1 for passenger. As for wagons, there are 182 container carrying types, 95 ballast wagons, 46 high sided wagons for clinker and 64 oil tank cars.

Freight trains are operated based on client's requests rather than a regular schedule. Normally, there are 2 trains per day bound for Blantyre, and 2 or 3 trains per week for Lilongwe from Nayuchi. Annual tonnage reached 213,000 tons in 2009 and major goods transported are maize, fuels, fertilizer, cement, tobacco, sugar and the general goods in container. It is necessary to improve the efficiency of railway operation by procuring locomotives and wagons and rehabilitating the decrepit rail.

(3) Cross border post

There are two (2) cross border posts on the Nacala Corridor between Mozambique and Malawi. One is at Mandimba for vehicles and another one, Entre Lagos, is used mainly for the railway crossing. In addition, the Mchinji border post between Malawi and Zambia is also located in the Nacala Corridor. The current condition at each border is described below:



Source: Study Team

Figure 2.2-20 Border posts on Nacala Corridor

1) Mandimba border post

Mozambique side

Mandimba border post is located 4km from Mandimba town in Niassa Province. The border facility is open 12 hours from 6 a.m. to 6 p.m. 365 days a year, and five officers work in the customs office. The road from Mandimba town to the border on the Malawi side is still not paved, so the road condition is considerably rough. The border office consists of customs, immigration and an insurance company which sells third-party insurance. The current main office was constructed about 10 years ago and the previous office is used as housing quarters in the town. The accommodations for the custom officers are behind the main office, but no public parking for visitors is available. The national border is along the river in the middle of no-man's land between the two border's gates. As the traffic

volume is very small due to the road condition, it does not take a long time to pass the border. In cases of importing, it takes a maximum of half an hour.

Source: Study Team

Figure 2.2-21 Main office of the border post in Mandimba

Source: Study Team

Figure 2.2-22 Inside the main office in Mandimba

Malawi side

The border post of Malawi side, called Chiponde, is located 60km east of Mangochi town, south of Malawi Lake. The border facilities and gate are put next to the national road. The border office, buildings for clearing agents and insurance companies are located in the border facility. As there is no public parking, the vehicles for crossing the border from Mozambique park in the school yard next to the main office and the vehicles from Malawi park along the national road. There is open space in front of the border facility for improving the alignment of the national road, but vendors squat there and a market is opened there on every Sunday.

The processing time for customs clearance is generally short due to the small traffic volume. It normally takes around one hour for imports with tax payment at the border post and 30 minutes for exports or transit.

Source: Study Team

Figure 2.2-23 National road in front of the border post in Chiponde

Source: Study Team

Figure 2.2-24 Main border office in Chiponde

The issue of upgrading Mandimba and Chiponde border posts as a One Stop Border Post (OSBP) has been addressed between two counties. They have mutually discussed the issues such as the integration of regulations, data capturing program and facility model. In 2009, delegates from both countries visited Lessano Garcia between Mozambique and South Africa and Chilundo border between Zambia and Zimbabue which already started operation as OSBP. The installation of OSBP at Mandimba (Chiponde) border is listed in phase 3 of the Project for Nacala Corridor Development funded by AfDB, Japan and Korea jointly.

Note that OSBP is the facility where persons, vehicles and goods make a single stop to exit one country and enter another, whereas an ordinary border post requires two stops to exit-entry at each of

the adjacent countries. To enable clearing procedures with a single stop, the Common Control Area is to be established inside the facility, where bilateral customs and immigration officers sit side by side and jointly work.

2) Entre Lagos border post

Entre Lagos border post is located 50km (30min.) from Mecanhelas along R721, which is unpaved but comparably well developed, to the north. This border is mainly intended for railway use and the station is located on both sides of the border. One train contains about 20 wagons and takes almost one hour for customs declaration. Regularly, one train is operated per day. Due to the lack of locomotives in Malawi, wagons have to stay at the border for at least one day.

The number of laden wagons passing the border is 390 from Mozambique to Malawi and 102 from Malawi to Mozambique (25 of them to Nampula) in April 2009. The imported goods to Malawi are mainly fertilizer, salt, diesel and general cargo while the exported goods are sugar, soya and timbers. A few wagons carrying potatoes and timber go to Nampula.

The number of vehicles passing is quite small, about 10 – 20 per day (Jan: 18, Feb: 12, Mar: 24, Apr: 35); bikes also pass sometimes. Freight vehicles and trailers hardly crossed in 2009.

Source: Study Team

Figure 2.2-25 Border facility in Entre Lagos

Source: Study Team

Figure 2.2-26 Border gate in Entre Lagos

3) Mchinji border post

Mchinji border between Malawi and Zambia is located 90km to the west of Lilongwe and 12km from Mchinji town. The current border facility was constructed in October 2006 and the previous facility which is presently used as the accommodation for the staff of customs still remains 3km from the town.

On the Malawi side, the main border office, consisting of the customs and immigration, is located next to the gate. Parking for 10 passenger cars is available in front of the main office but there is no parking for large vehicles, so they park along the main road. There are a few container houses for agents and insurance companies around the border facility. The weighbridge and the Road Authority Office, which is responsible for collecting the toll, are still next to the previous border post. The distance between two border facilities is only 200m. The weighbridge for Zambia is located between the border posts.

The processing time for customs clearance is generally short due to the small traffic volume. It normally takes more or less 1 hour for the case of import with tax payment at the border and 30 minutes for the export or transit.

Source: Study Team

Figure 2.2-27 Border main office in Mchinji

Source: Study Team

Figure 2.2-28 Around gate in Mchinji

(4) Airport

In the Nacala Corridor area, developed international airports are quite limited. In northern Mozambique, although there are five international airports such as Pemba, Lichinga, Nampula, Quelimane and Tete, they are not sophisticated and advanced for frequent passengers. Malawi has one major international airport outside its capital, Lilongwe. The country's commercial capital, Blantyre, also has an airport used primarily for regional flights. Zambia has one major international airport outside its capital, Lusaka and a smaller airport in Livingstone, which is used for regional flights.

In order to improve accessibility to the northern area of Mozambique, the Nacala International Airport will be constructed by 2013 by transforming the current Nacala military air base built in 1962. The work involves the construction of passenger and cargo terminals, a new control tower, and repaving the runway, bringing the airport up to the standards demanded by international civil aviation (see image below). The runway will be extended from 2,400 meters to 3,400 meters enabling the airport to handle large aircrafts for international flights.

Source; Nacala Municipality Office

Figure 2.2-29 Image of Nacala International Airport

2.3. Trends of inland goods distribution in/around Mozambique

In this section, the trends of inland goods distribution in/around Mozambique will be discussed mainly focusing upon those of Nacala Corridor.

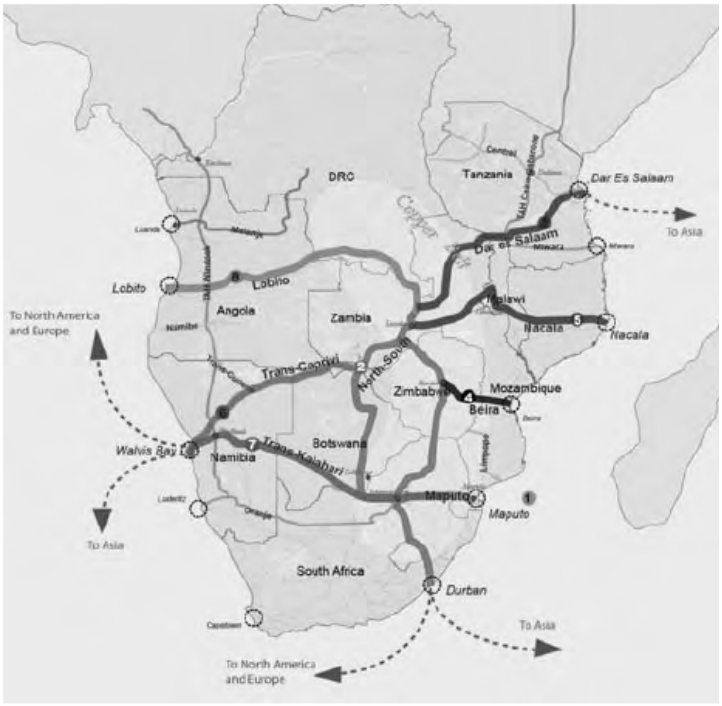
2.3.1 Corridors connecting Mozambique and LLCs

Figure 2.3-1 shows 10 of the international corridors in the southern Africa region which are prioritized as a result of the analysis in the "Preparatory Survey for Southern Africa, Integrated Regional Transport Program (JICA 2010)". These corridors connect landlocked countries (LLCs; DRC, Zambia, Malawi, Zimbabwe and Botswana) with international ports in littoral countries.

Major corridors connecting Mozambican ports with LLCs are Nacala Corridor, Beira Corridor and Maputo Corridor. Nacala Corridor irrigates Malawi by road and railway though they are in poor condition at present. Further, the Corridor reaches Zambia but there is virtually no through traffic between Zambia and Nacala.

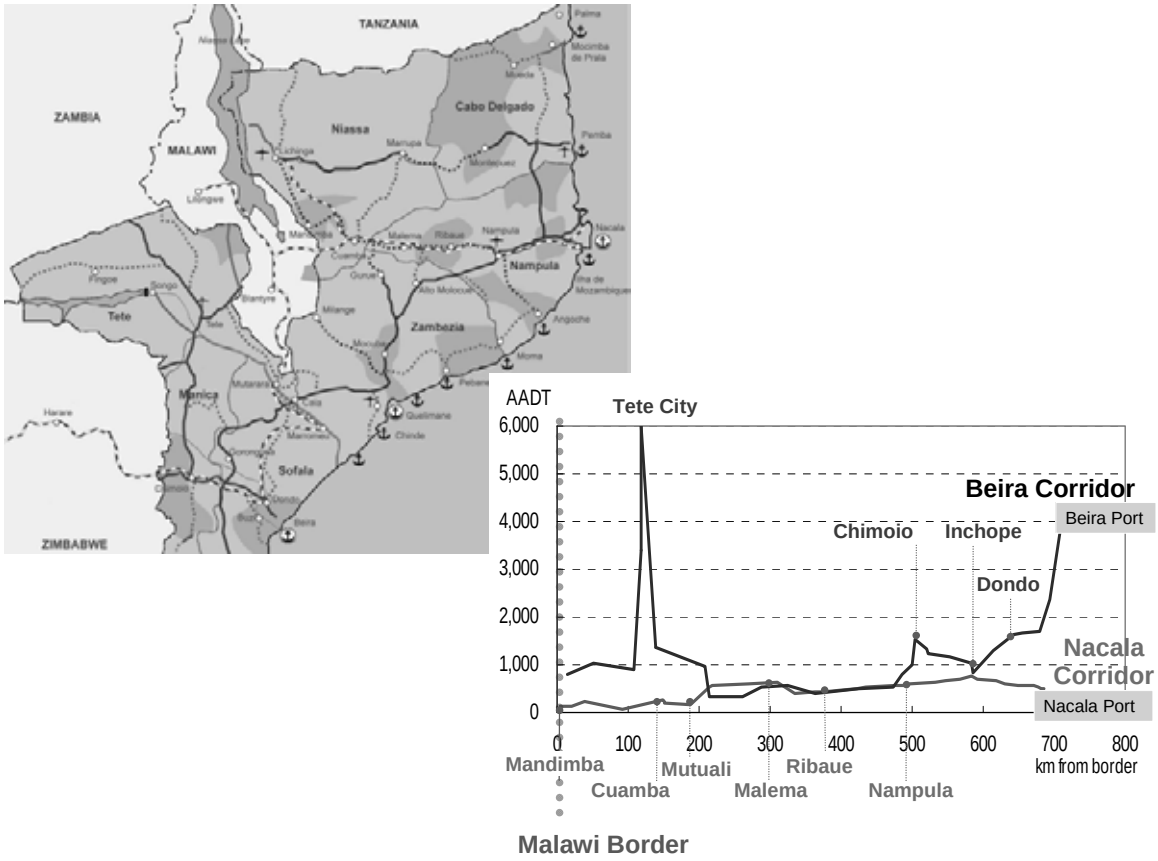
Zambia is connected to Tanzania by Tazara Corridor, to South Africa by the North and South Corridor, to Namibia by the Trans-caprivi Corridor, and to Mozambique by the Beira Corridor as well as the Nacala Corridor. Among them the North and South Corridor and Tazara Corridor are the principal logistics routes for the country.

Malawi is mainly served by the Sena Corridor which connects the country with Beira Port, though this is not included in the above mentioned ten corridors. North and South Corridor connecting with South Africa and the Nacala Corridor connecting Mozambique are also important logistics routes to/from Malawi. Figure 2.3-2 shows the inland network between Malawi and Mozambique. The distances between the Malawi border and each port in Northern Mozambique are also indicated in the figure. The distance from Malawi to Nacala and to Beira is almost the same: approx. 700km.



Source: Final Report of the Preparatory Survey for Southern Africa, Integrated Regional Transport Program Report, JICA (2010)

Figure 2.3-1 Selected priority corridors



Source: JICA, Study Team

Figure 2.3-2 Cross border transport network between Mozambique and Malawi

2.3.2 Cargo flow on road/railway network

(1) Methodology of data investigation

The results of the OD survey at three (3) border posts between Mozambique and Malawi and one (1) between Malawi and Zambia conducted from July to August 2009 in "the Preparatory Survey on Road Improvement Plan in Nacala Development Corridor (JICA)" is referred to in order to grasp the trend of cross border transport by road. In addition, the result of cross sectional traffic count survey conducted by ANE is analyzed to obtain the cargo volume on the road network.

According to Mozambican customs, the customs data at border posts such as Mandimba, Entre Lagos and Milange was supposed to have become computerized by the end of 2009, and the Study Team had expected to be able to acquire it. However, as the work was delayed, the customs data was still compiled under a paper based system as of the date of the Study Team's visit in August 2010. Therefore, the information on the traffic volume counted by customs at border posts was not obtained.

For the railway cargo transportation including cross border transportation through Entre Lagos, the Study Team used the record of railway operation given by CDN.

(2) Cargo flow on road network

Cargo volume on Nacala Corridor

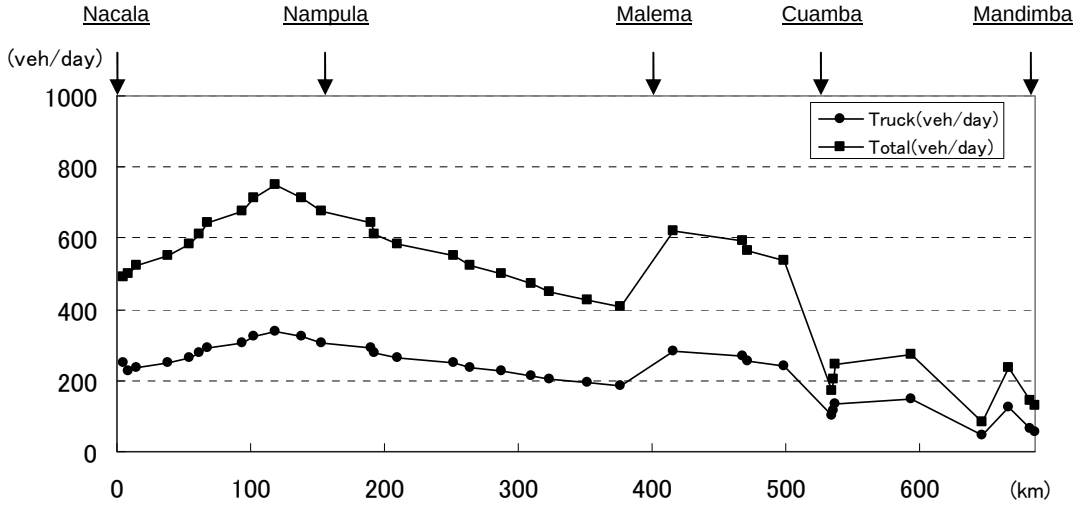
As described above, cargo flow on the road network in the Nacala Corridor which connected with "N13 (from Mamdimba border to Nampula)", "N1 (from Nampula to Namialo)" and "N12 (from Namialo to Nacala Port)" is examined by the ANE's traffic volume data.

According to Average annual daily traffic (AADT) calculated by ANE, the traffic volume in Northern Mozambique is considerably low. In terms of the Nacala Corridor, the traffic volume in 2007

exceeds 700 vehicles/day around Nampula city, but in other sections it is less than 600 vehicles/day. Especially beyond Cuamba to the inland, only around 200 vehicles/day of traffic are counted.

Trucks account for about 45-50 % of the total volume throughout the entire section of the Nacala Corridor.

The traffic volume on the Nacala corridor in 2007 is shown in Figure 2.3-3.



Source: Study Team

Figure 2.3-3 Traffic volume on Nacala Corridor in 2007

Cross-border cargo flow

In 2009, the OD survey at the following 4 border posts was conducted by JICA in order to grasp cross-border cargo transportation. The locations of the border posts surveyed by JICA are indicated in Figure 2.3-4.

- Zobue/ Mwanza (Mozambique/ Malawi)
- Milange/ Muloza (Mozambique/ Malawi)
- Mandimba/ Chiponde (Mozambique/ Malawi)
- Mchinji (Malawi/ Zambia)

Source: Study Team

Figure 2.3-4 Locations of the border posts surveyed by JICA

This survey was conducted in one day between July to August, with counting for each vehicle type, interviewing to driver for their origin and destination of the trip, cargo on board and elapsed time for border passing. Based on the results of this survey, i) Number of vehicles crossing each border, ii) Characteristics of cargo OD, iii) Freight volume, iv) Elapsed time for border crossing are described below. In addition, based on the volume and weight of freight loaded on heavy trucks, the annual cargo volume around the hinterland area of Nacala Port is estimated.

i) Number of vehicles crossing each border

Regarding all types of vehicle passing through the border post, there were over 200 vehicles for both directions counted at Zobue/Mwanza (Beira Corridor) border while less than 100 vehicles were recorded at the other borders.

At Zobue/Mwanza border, over half of the vehicles were commercial trucks and some international buses were also included. At Milange/Muloza border, the proportion of passenger cars in the total traffic volume was relatively low. On the other hand, more passenger cars go across Mchinji border rather than trucks.

The Mandimba/Chiponde border, which is located in the Nacala Corridor, had the least traffic volume with less than 30 vehicles per day per direction. It is noted that more trucks come from Malawi than from Mozambique. The traffic volume by vehicle type was as follows.

Table 2.3-1 Number of border passing by vehicle type

Vehicles/day

Border	Direction	Passenger car	Bus	Truck	Motor cycle	Total	
Zobue/ Mwanza	From Malawi	38	1	54	2	95	223
	To Malawi	40	7	79	2	128	
Milange/ Muloza	From Malawi	13	0	32	4	49	79
	To Malawi	14	0	13	3	30	
Mchinji	From Malawi	35	3	15	0	53	97
	To Malawi	30	1	13	0	44	
Mandimba/ Chiponde	From Malawi	7	1	16	4	28	52
	To Malawi	6	1	9	8	24	

Source: Final Report of the Preparatory Survey on Road Improvement Plan in Nacala Development Corridor, JICA (2009)

ii) Characteristics of cargo OD

OD pattern obtained from the Origin-Destination survey has different characteristics at each border due to factors such as location and capacity. The analysis of the survey focuses on in particular the international transportation by trucks. The characteristics and OD pattern of trucks for each border post are as follows.

Zobue/Mwanza

The travel distance for vehicles passing through Zobue/Mwanza border tends to be longer than that through other borders. For going into Malawi, the origin of 37% of trucks is Beira port and 28% is from South Africa. For coming from Malawi, the destination of almost half of trucks is Beira port. This border is used by the trucks which travel between Tete and Niassa Province as the transit traffic.

Milange/Muloza

Milange/Muloza border is mainly used by the vehicles engaged in a short trip around the border area. There are some trucks going to the ports in Nacala and Quilimane for exportation to overseas. It is considered that the route to Nacala Port through Milange/Muloza is more convenient than the route through Mandimba due to the road condition.

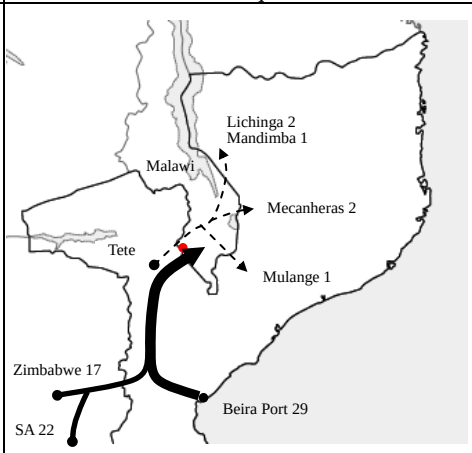
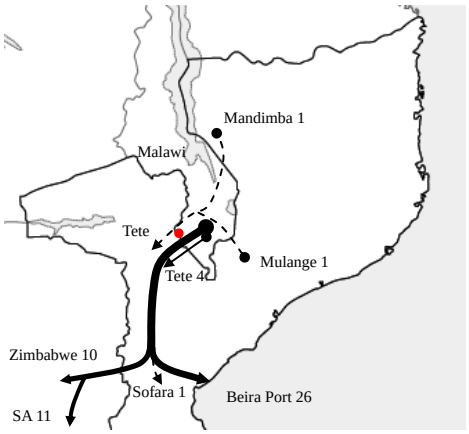
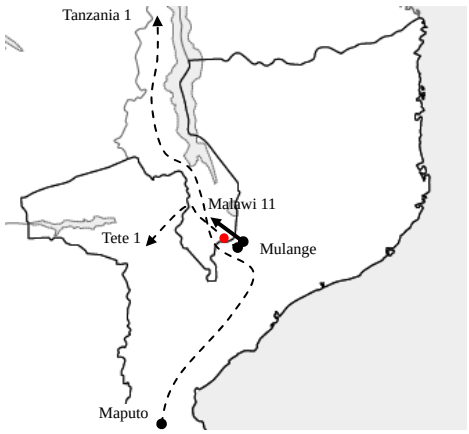
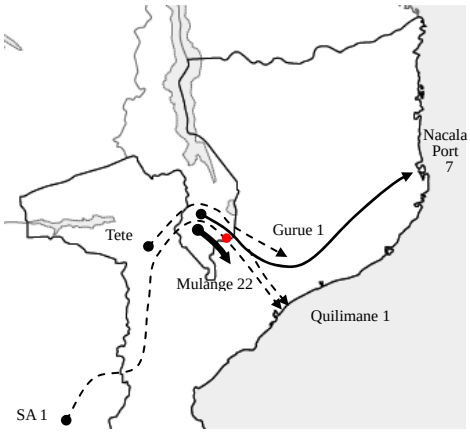
Mchinji

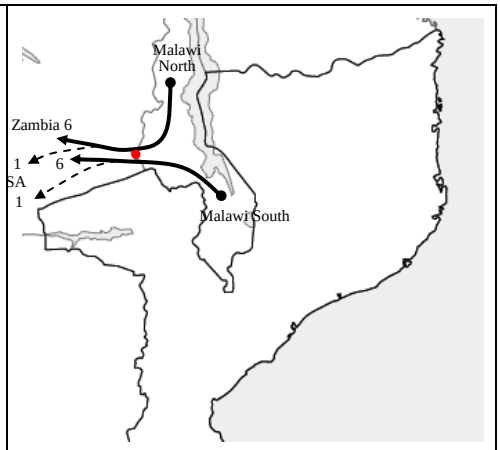
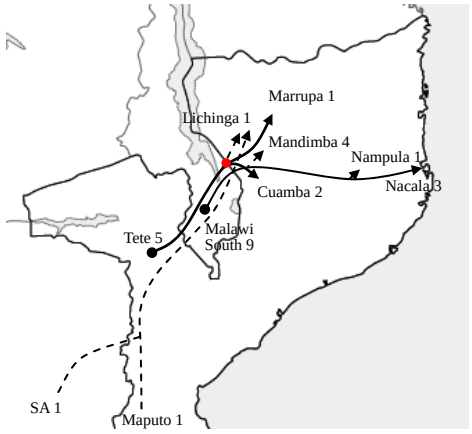
Almost all trucks through the Mchinji border are driven between Malawi and Zambia. No trucks coming from or going to Mozambique's ports such as Beira and Nacala were counted during the survey. In terms of passenger cars, it seems that the tourist cars, visiting South Luangwa National Park, the east of Zambia, from Lilongwe in Malawi, are largely included in this traffic.

Mamdinba/Chiponde

The traffic volume at the Mandimba/Chiponde border is least among surveyed borders. Most of trucks are provided from the tobacco company to transport tobacco leaf to Tete which is grown in Niassa Province. Although trip length is relatively short to go out from Mozambique, some trucks traveling a long distance such as from South Africa to Namplula and Nacala are included going into Mozambique.

Table 2.3-2 OD pattern of trucks at each border

	From Mozambique To Malawi	From Malawi to Mozambique
Zobue/ Mwanza	 Main traffic comes from Beira port, SA and Zimbabwe. A few trucks pass through Malawi as transit.	 Beira Port is main destination through border. The transit traffic through Malawi is relatively low.
Milange /Muloza	 Border is mainly used by the short trip traffic. A few truck pass at this border for transit.	 Border is mainly used by the short trip traffic. Some trucks pass the border to go to Nacala Port for exportation.

Mchinji	 There is only one type of trip from Zambia to Southern of Malawi.	 Most of traffic is coming from Malawi to Zambia. No traffic coming from Mozambique.
Mandimiba /Chiponde	 Main traffic is between Niassa and Tete. There are some trucks to go to Nampula and Nacala Port.	 Most of vehicles carry the tobacco from Niassa to Tete. There is no truck driving further distance at this border.

Source: Final Report of the Preparatory Survey on Road Improvement Plan in Nacala Development Corridor, JICA (2009)

iii) Freight volume

The rate of loaded truck shows that the majority of trucks entering into Malawi carry some kind of goods but there are many empty trucks exiting Malawi. The average weight of freight is heavier on Zobue and Milange borders comparing to the Mchinji border.

Based on the survey data, the annual freight volume at the Zobue border is 577 thousand tons to Malawi and 146 thousand tons from Malawi. The volume at other borders is considerably lower and the volume at the Mandimba border remains less than 50 thousand tons.

Table 2.3-3 Volume of cargoes closing borders to Malawi

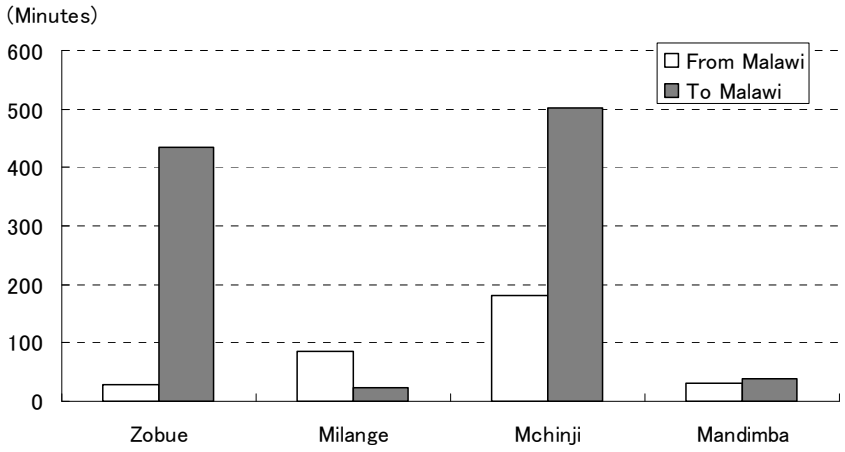
Vehicle/day

Border	Direction	Nos. of heavy truck	Nos. of loaded heavy truck	Rate of loaded truck (%)	Average weight of freight (t)	Estimated annual freight volume (t)
Zobue/	From Malawi	49	16	32.7	**25.0**	**146,000**
Mwanza	To Malawi	68	64	94.1	**24.7**	**577,000**
Milange	From Malawi	13	5	38.5	**30.3**	**55,300**
/Muloza	To Malawi	5	4	80.0	**24.5**	**35,700**
Mchinji	From Malawi	10	2	20.0	**18.0**	**13,100**
	To Malawi	8	7	87.5	**15.8**	**40,300**
Mandimba	From Malawi	11	5	45.5	**26.1**	**47,632**
/Chiponde	To Malawi	7	6	85.7	**17.2**	**37,600**

Source: Final Report of the Preparatory Survey on Road Improvement Plan in Nacala Development Corridor, JICA (2009)

iv) Elapsed time for border crossing

Figure 2.3-5 shows the elapsed time for the border crossing at surveyed border posts. It normally takes a few hours in each border post but it takes 1 or 2 days for some trucks if their required documentation is not in order. In general, the elapsed time to Malawi takes more time than the opposite direction. Accordingly, the delay in crossing the border is not significant at present on the border posts in the Nacala Corridor. However, more efficient procedures will be necessary when the traffic volume increases.



Source: JICA study team, 2009

Figure 2.3-5 Time for border crossing at each border post

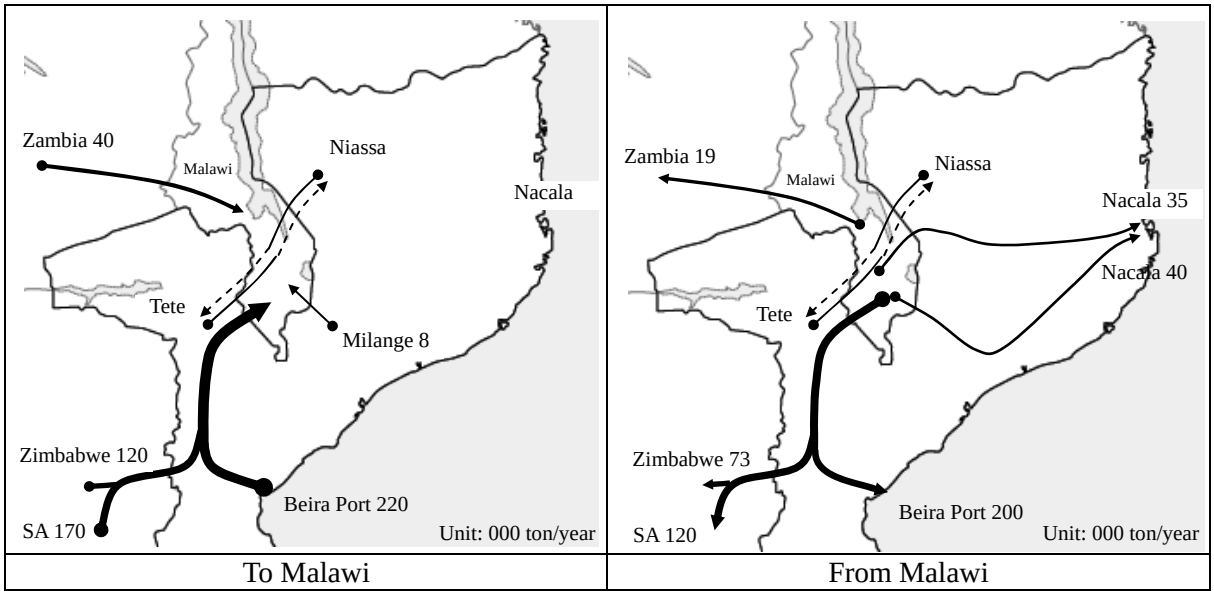
v) Cargo flow in the hinterland of Nacala Port

The cargo flow in the hinterland of Nacala Port on the road network is analyzed based on the traffic volume, origin and destination of trip and freight volume which are contained in the traffic survey data at Malawi border.

Concerning the cargo flow into Malawi, about 220 thousand tons per year of cargo are transferred from Beira Port which is the largest volume among all origin places. South Africa and Zimbabwe also have a large number of cargoes that are conveyed to Malawi. On the other hand, Nacala Port hardly deals with the cargoes transferred to Malawi on the road network. There are a few heavy trucks passing through the Mandimba and Milange border but they are mainly used for short trips between Malawi and Milange or empty trucks returning from Nacala Port.

A similar trend is seen in the cargo flow from Malawi. Cargo is mainly destined for Beira Port, South Africa and Zimbabwe. Although the volume is smaller compared to the above destinations, the cargoes flow from Malawi to Nacala Port. Nacala Corridor is the shortest route between Nacala Port and Malawi but the route via Milange is also used for cargo transportation due to the road condition in the Nacala Corridor.

The cargo flow of the hinterland of Nacala Port is shown in Figure2.3-6.



Source: Study Team

Figure 2.3-6 Cargo flow by road in the hinterland of Nacala Port

(3) Cargo Flow on Railway Network

To date, the cargoes through the Nacala Corridor has been largely conveyed by railway due to the poor road condition. According to the record for 2009 regarding the railway operated by CDN, 403 freight trains, consisting of 228 trains to Malawi and 175 trains to Mozambique, have been operated for the international transport annually. In terms of the haulage volume, almost three hundred thousand tons were transferred by railway in total. The international transit, meaning the import and export of Malawi through Nacala Port, accounts for 72% of the total haulage. The haulage volume by railway in the Nacala Corridor per month in 2009 is shown in Table 2.3-4. Note that “Domestic” and “Regional” in the table denote transport within Mozambique and export/import between Mozambique and Malawi respectively.

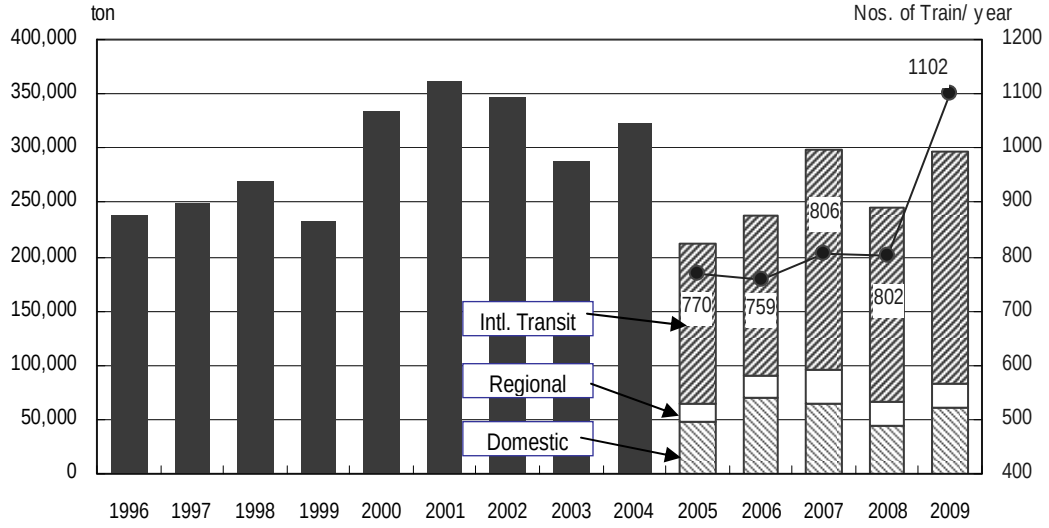
According to the historical data from 1996, it is clear that the haulage volume has not increased steadily as shown in Figure 2.3-7. This would be because of the poor condition of infrastructure, lack of locomotives and inefficient management.

Table 2.3-4 Haulage volume by railway on Nacala corridor in 2009

Unit: ton

	Jan	Feb	Mar	Apr	May	Jun
Total	11,418	13,712	22,143	22,582	21,987	29,893
Domestic	2,899	2,626	4,799	5,333	5,095	4,089
Regional	1,163	1,229	2,290	2,609	1,350	1,553
Intl. Transit	7,356	9,857	15,054	14,640	15,542	24,251

	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
Total	28,439	31,096	32,328	31,037	28,067	23,660	**296,362**
Domestic	5,490	4,919	6,566	6,815	5,554	6,646	**60,831**
Regional	1,559	2,735	2,198	2,020	2,188	1,157	**22,051**
Intl. Transit	21,390	23,442	23,564	22,202	20,325	15,857	**213,480**



Source: CDN (1999-2009), CFM-Norte (1996-1998)

Figure 2.3-7 Cargo transportation on Nacala Railway (1996-2009)

Table 2.3-5 shows the cargo volume by direction for last 5 years. International transit accounts for 60-75% of the total volume.

Table 2.3-5 Cargo transportation by Nacala Railway by destination (ton)

Year	Domestic	Regional	International Transit	Total
2005	47,023	17,262	147,640	211,925
2006	69,650	20,354	147,826	237,830
2007	65,179 *Asc: 41,088* *Des: 24,091*	31,449 *Asc: 17,244* *Des: 14,202*	201,073 *Asc:107,924* *Des: 93,149*	297,701 *Asc:166,256* *Des: 131,442*
2008	44,910 *Asc:34,478* *Des:10.432*	21,177 *Asc: 11,558* *Des: 9,619*	178,847 *Asc: 122,508* *Des: 56,339*	244,934 *Asc: 168,544* *Des: 76,390*
2009	60,831 *Asc:43,618* *Des:17,213*	22,051 *Asc: 9,512* *Des: 12,539*	213,480 *Asc: 145,360* *Des: 68,120*	296,362 *Asc: 198,490* *Des:97,872*

Note: Asc.: Ascending (e.g. Import for Malawi), Des.: Descending (e.g. Export from Malawi)
Source: CDN

The transported volume by items in 2009 is shown in Table 2.3-6. General container is the main cargo type at 49,845 tons, followed by sugar exported from Malawi at 37,213 tons and fertilizer imported to Malawi at 33,800 tons.

According to an interview with CDN, only 25% of the total demand for international transit with Malawi is currently being handled by the railway along the Nacala Corridor.

Table 2.3-6 Transported items and volume in 2009

Type	Direction	Items	Volume (ton)
Domestic 60,831	Ascending 43,618	Cement	3,752
		Fuel	11,906
		Wheat flour	4,005
		Salt	1,196
		Others	22,759
	Descending 17,213	Cotton fiber	3,426
		Cotton seed	1,728
		Bean	760
		Maize	1,040
		Others	10,229
Regional 22,051	Ascending 9,512	Cement	708
		Maize	72
		Salt	8,632
		Others	100
	Descending 12,539	Potato	7,464
		Containers	10
		Others	5,065
International Transit 213,480	Ascending 145,360	Fertilizer	33,800
		Fertilizer, Containers	1,357
		Clinker	5,502
		Fuel	21,592
		Various containers	49,845
		Soybean oil/Girasol oil	229
		Bulk wheat	28,648
		Others	4,387
	Descending 68,120	Sugar	8,959
		Containers sugar	37,213
		Containers tea	76
		Containers various	465
		Containers pea	14,476
		Containers tobacco	2,326
		Scrap	273
		Others	4,332

Source: CDN

2.3.3 Hinterland transport of seaborne cargoes

(1) Transport route of seaborne cargoes to/from LLCs

In this sub-section, the Study Team analyzes how much seaborne cargo is imported/exported to/from Malawi and Zambia through 5 gate ports of Nacala, Beira, Durban, Dar es Salaam and Walvis Bay.

1) Container cargoes

As the first step to analyze the transport route of seaborne container cargoes to/from Malawi and Zambia, it is necessary to estimate the total seaborne containers generated in these countries. However, this is not an easy task because Durban Port which handles a substantial amount of cargoes to/from these countries doesn't disclose the cargo origin. Accordingly the Study Team estimated the total volume of containers from trade statistics by eliminating regional trade, dividing container cargoes and bulk cargoes, and converting from monetary data to metric tons. Then, the ton figures are converted to TEU as per the Table 2.3-7.

Table 2.3-7 Total volume of seaborne containers generated in Malawi and Zambia in 2008

LLC	Traffic	Cargo net weight (metric ton)	Ton→TEU conversion rate (ton/TEU)	TEU
Malawi	Export	192,000	11.53	16,652
	Import	328,000	13.00	25,231
Zambia	Export	246,000	14.75	16,678
	Import	529,000	12.54	42,185

Source: Study Team

Based on the total TEU figures given above and various statistical data sources, the Study Team compiled the cargo distributions to the 5 gateway ports as per the Table 2.3-8 below.

56.2% of containers to/from Malawi are moving through Beira, while only 14.8% are through Nacala. Dar es Salaam handles 11.9%, while Walvis Bay has NIL. Major gate port for Zambia is Dar es Salaam which handles 56% of its import/export container cargoes moving through Tazara Corridor. 8.1% are via Walvis Bay through Trans Caprivi Corridor which is being developed rapidly. Beira handles 12.2%, while Nacala is not functioning as a gate port of Zambia at this moment. More than 20% of containers to/from both countries are presumed to be moving through Durban, while exact figures of those transit cargoes are not available at Transnet nor South Africa Revenue Service. At Durban, Dar es Salaam and Walvis Bay, substantial volume of container cargoes are stuffed/destuffed by the freight forwarders at their consolidation facilities near the port, which enables the shippers/consignees in Malawi/Zambia to save inland transportation cost for empty containers and deposit thereof required by shipping lines.

Table 2.3-8 Container cargo volume in 2008 by gateway port

			Nacala	Beira	Durban	Dar es Salaam	Walvis Bay	Total
Malawi	Export	TEU	3,244	8,500	4,701	208	0	16,652
		Share	19.5%	51.0%	28.2%	1.3%	0.0%	100.0%
	Import	TEU	2,969	15,046	4,215	3,000	0	25,231
		Share	11.8%	59.6%	16.7%	11.9%	0.0%	100.0%
	Total	TEU	6,213	23,546	8,916	3,208	0	41,884
		Share	14.8%	56.2%	21.3%	7.7%	0.0%	100.0%
Zambia	Export	TEU	0	753	3,220	12,000	705	16,678
		Share	0.0%	4.5%	19.3%	72.0%	4.2%	100.0%
	Import	TEU	0	6,411	10,702	20,989	4,083	42,185
		Share	0.0%	15.2%	25.4%	49.8%	9.7%	100.0%
	Total	TEU	0	7,164	13,922	32,990	4,788	58,864
		Share	0.0%	12.2%	23.7%	56.0%	8.1%	100.0%
Total	Export	TEU	3,244	9,252	7,921	12,208	705	33,330
		Share	9.7%	27.8%	23.8%	36.6%	2.1%	100.0%
	Import	TEU	2,969	21,458	14,917	23,989	4,083	67,416
		Share	4.4%	31.8%	22.1%	35.6%	6.1%	100.0%
	Total	TEU	6,213	30,710	22,838	36,197	4,788	100,747
		Share	6.2%	30.5%	22.7%	35.9%	4.8%	100.0%

Source: Nacala, Beira, Maputo : CFM "Informação Estatística Annual 2009"
Dar es Salaam : TPA web site
Durban, Walvis Bay : JICA "Preparatory Survey on the Walvis Bay Port Container Terminal Development Project in the Republic of Namibia
All reorganized by the Study Team

2) Bulk cargoes

Port selection for bulk cargoes to/from Zambia and Malawi were estimated in the same way as the container cargoes. The result is shown in Table 2.3-9.

The result has the same tendency as containers basically. As for Malawi, the share of Durban is smaller compared with the container share, because the maritime network has little significance in bulk transport unlike in container transport, and Durban has less advantage. A large amount of imported fuel oil through Beira Port pushes up the port's share.

The result of Zambian cargoes is somewhat unexpected. A large amount of mineral products exported through Durban Port thrust up the port's share. Since the Tanzanian port statistics do not record such a large amount of export flow from Zambia, the Study Team inferred that the major part of mineral products is exported through Durban. However the accumulation of errors in the course of the estimation may affect the result. Imported crude oil through the Tazara pipeline helps the share of Dar es Salaam remain high.

Table 2.3-9 Bulk cargo volume in 2008 by gateway port

			Nacala	Beira	Durban	Dar es Salaam	Walvis Bay	Total
Malawi	Export	Metric tons	28,300	11,300	28,613	0	0	68,213
		Share (%)	41.5%	16.6%	41.9%	0.0%	0.0%	
	Import	Metric tons	134,600	467,200	25,903	65,942	0	693,645
		Share (%)	19.4%	67.4%	3.7%	9.5%	0.0%	
	Total	Metric tons	162,900	478,500	54,515	65,942	0	761,857
		Share (%)	21.4%	62.8%	7.2%	8.7%	0.0%	
Zambia	Export	Metric tons	0	55,600	503,108	20,421	0	579,129
		Share (%)	0.0%	9.6%	86.9%	3.5%	0.0%	
	Import	Metric tons	0	26,600	187,122	558,227	0	771,949
		Share (%)	0.0%	3.4%	24.2%	72.3%	0.0%	
	Total	Metric tons	0	82,200	690,229	578,648	0	1,351,077
		Share (%)	0.0%	6.1%	51.1%	42.8%	0.0%	
Total	Export	Metric tons	28,300	66,900	531,721	20,421	0	647,342
		Share (%)	4.4%	10.3%	82.1%	3.2%	0.0%	
	Import	Metric tons	134,600	493,800	213,024	624,169	0	1,465,593
		Share (%)	9.2%	33.7%	14.5%	42.6%	0.0%	
	Total	Metric tons	162,900	560,700	744,745	644,590	0	2,112,935
		Share (%)	7.7%	26.5%	35.2%	30.5%	0.0%	

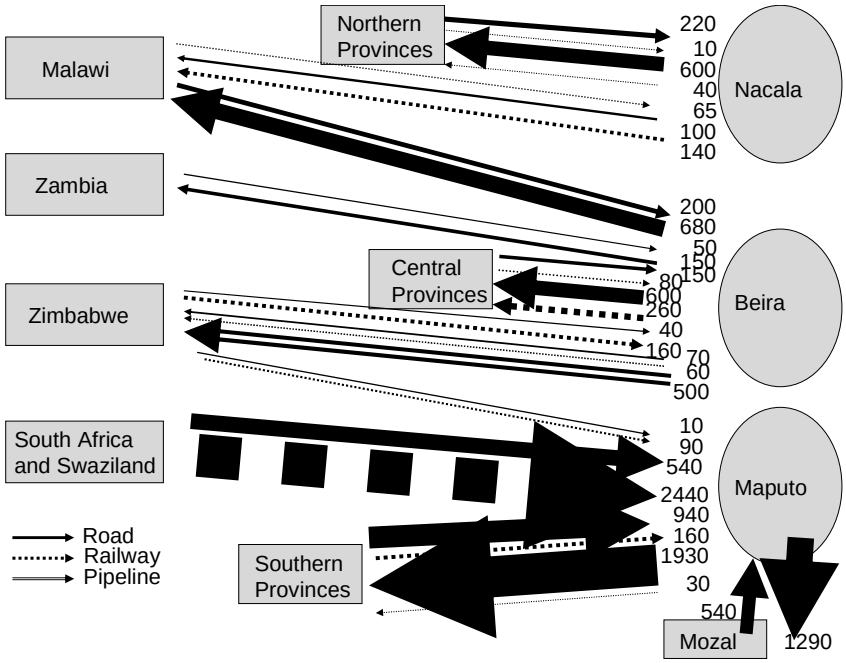
Source: Nacala, Beira, Maputo : CFM "Informação Estatística Annual 2009"
Dar es Salaam : TPA web site
Durban, Walvis Bay : JICA "Preparatory Survey on the Walvis Bay Port Container Terminal Development Project in the Republic of Namibia
All reorganized by the Study Team

(2) Hinterland transport of seaborne cargoes loaded or discharged in Mozambican ports

In this sub-section, the hinterland transport of ocean cargo from/to the three major international ports in Mozambique, namely Nacala, Beira and Maputo, is analyzed. There is no comprehensive statistical data on hinterland cargo flow to/from Mozambican ports. Accordingly, the Study Team estimated it by analyzing port statistics and railway statistics. Regarding transit cargoes via Nacala Port or Beira Port, accurate hinterland traffic data are prepared by CFM and CDN. Besides these data, there is little information on hinterland transport. The estimation was conducted by comparing export data in port statistics with descending railway transport data by commodities, and import data with ascending railway transport data.

The result of the estimation is shown in Figure 2.3-8. The links from South Africa to Maputo and from Maputo to its domestic hinterland are the busiest routes. Except cargoes via Maputo port, inbound cargo traffic is heavier than outbound flow. The transit traffic volume via Nacala Port is rather

small comparing with the cargo volume to/from its domestic hinterland due to unfavorable conditions of the Corridor. Malawi and Zimbabwe are the principal destinations of transit cargoes via Beira Port. Transit cargoes to Malawi are mainly transported by road since railway is not operational due to deterioration, whereas the major part of transit cargoes to Zimbabwe is transported via pipeline with an annual transport capacity of 1.2 million tons. The railways carry more cargoes than road transport in the links from Malawi to Nacala, Nacala to Malawi, Zimbabwe to Beira, Zimbabwe to Maputo, and South Africa to Maputo.



Source: Study Team

Unit: 1000 tons

Figure 2.3-8 Estimated hinterland cargo flow to/from Mozambican major ports in 2009

2.4. Trends of maritime transport in/around Mozambique

2.4.1 Container transport network in Southern Africa

In this sub-section, the Study Team will analyze the present situation of the container transport network covering the major ports in the Southern African region from the viewpoint of the connection with Mozambican ports.

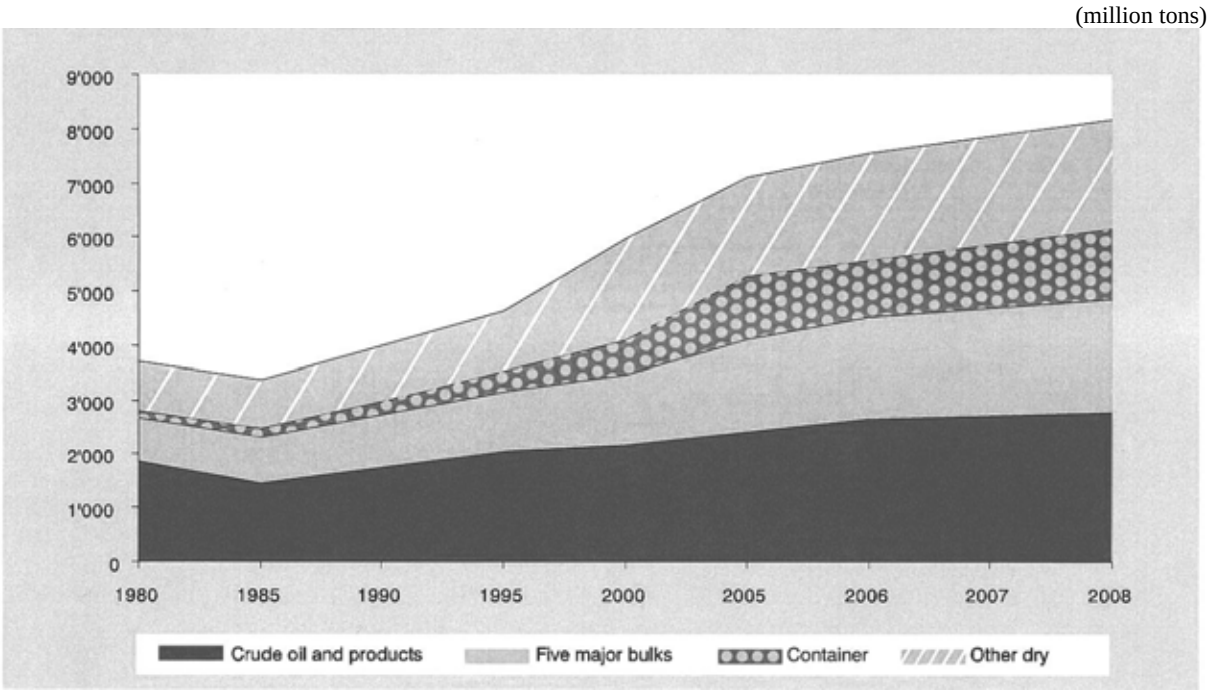
(1) Overview on international seaborne trade

1) Trend of total commodities

A global economy increases the opportunities for international trade. Under the globalized economy, manufacturers of a country procure raw materials from overseas suppliers and sell their products to consumers in the global market.

International trade is moved in the web of global supply chains by utilizing various transportation modes. Carrying over 80% of the world merchandise trade, maritime transport has long been a growing industry and will continue to be essential to world trade.

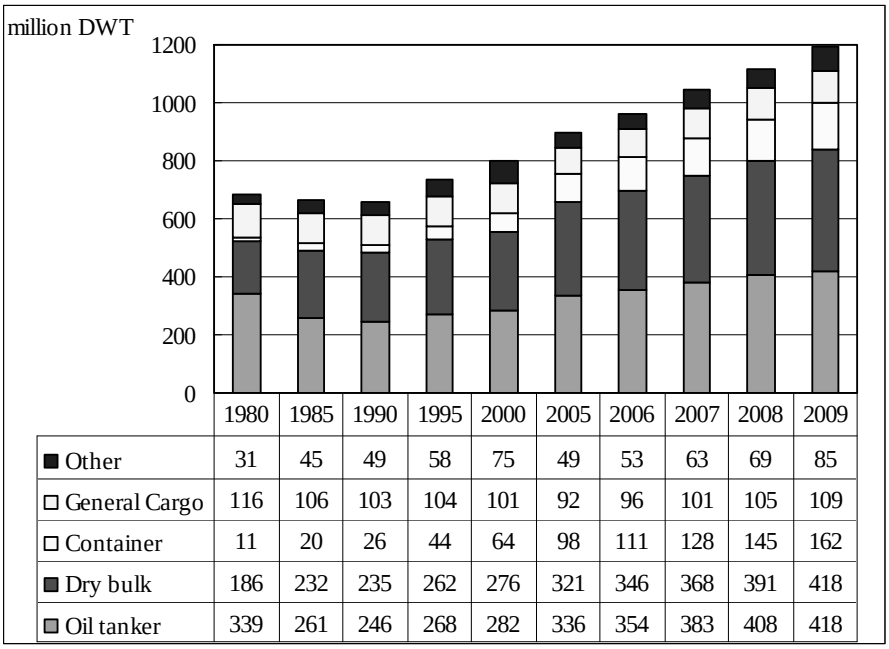
For the international seaborne trade, significant growth has been seen for all major commodities with the total volume having almost doubled during the past 20 years (Figure 2.4-1).



Note: * 5 major bulks include iron ore, coal, grain, bauxite/alumina and phosphate.
Source: UNCTAD "Review of Maritime Transport 2009"

Figure 2.4-1 World seaborne trade by commodities

Looking at the supply side of maritime transport, vessel tonnage has increased in line with the growth of cargo volume (Figure 2.4-2).



	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009
Other	31	45	49	58	75	49	53	63	69	85
General Cargo	116	106	103	104	101	92	96	101	105	109
Container	11	20	26	44	64	98	111	128	145	162
Dry bulk	186	232	235	262	276	321	346	368	391	418
Oil tanker	339	261	246	268	282	336	354	383	408	418

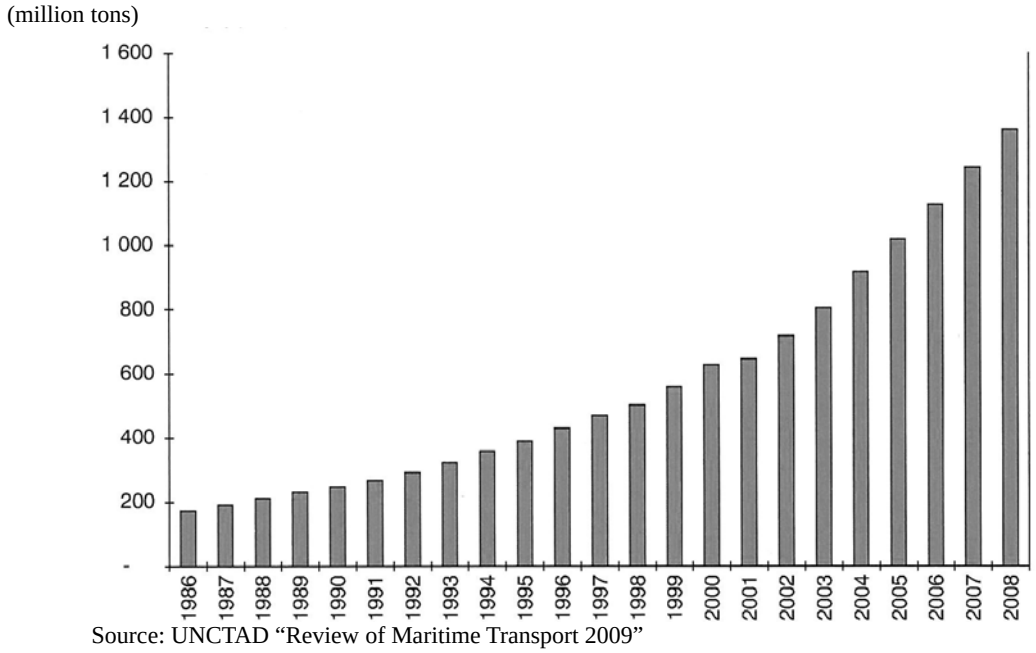
Source: UNCTAD "Review of Maritime Transport 2009"

Figure 2.4-2 World fleet by vessel types

2) Trend of container trade

a) Overview of world container trade

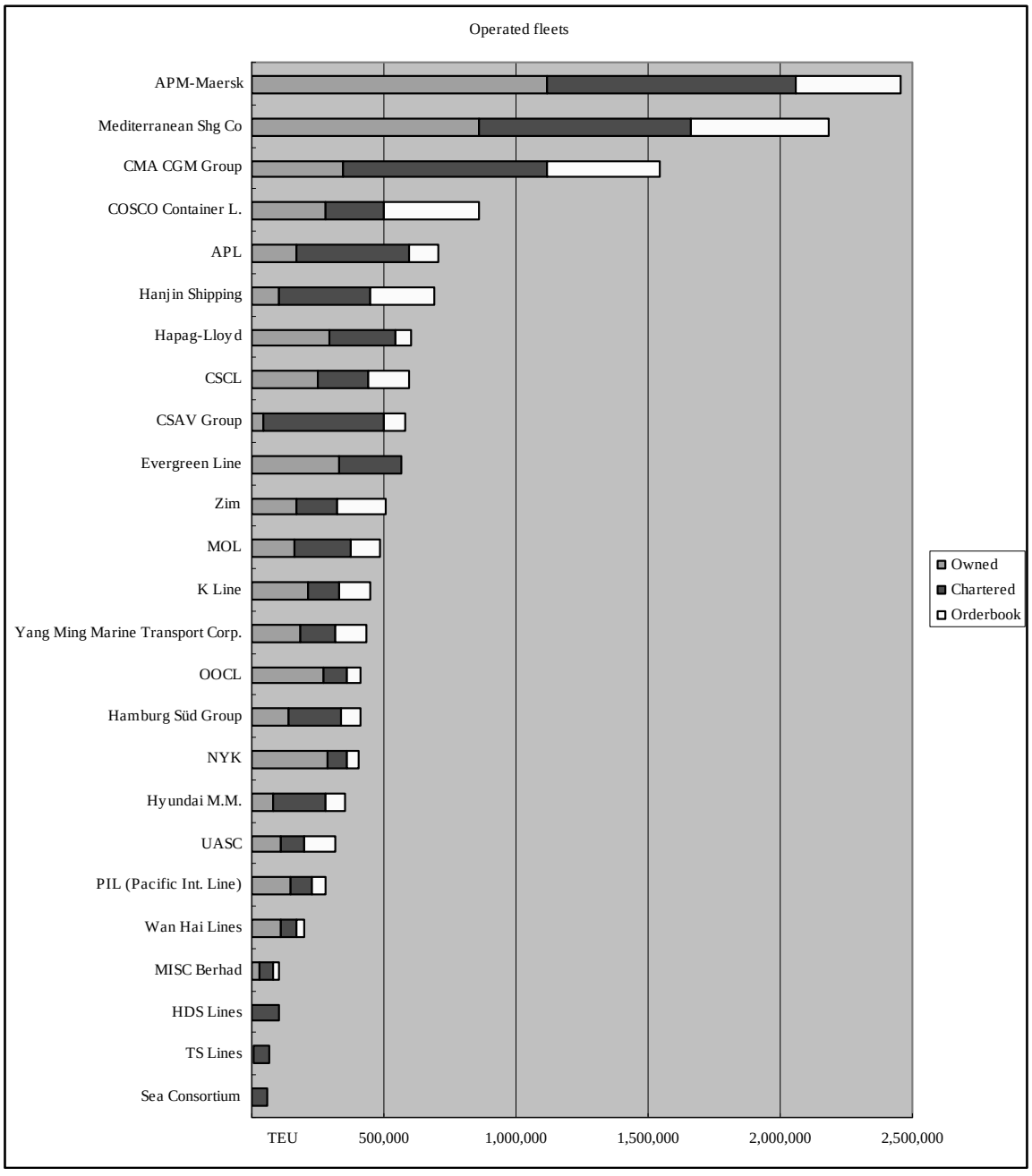
Container trade has made the most remarkable growth among all commodities of world seaborne trade. The volume has increased nearly 7 times in the past 20 years (Figure 2.4-3).



Source: UNCTAD "Review of Maritime Transport 2009"

Figure 2.4-3 World containerized trade growth

The market of maritime container transport is quite oligopolistic. Substantial volume is being carried by a small number of "Mega Carriers" such as Maersk Line, MSC, CMA CGM. Figure 2.4-4 shows the fleet capacity of Top 25 carriers. Top 10 carries' share in the world fleet amounts to 60%.



Source: Alphaliner web site

Figure 2.4-4 Top 25 container carriers' fleet as of June 2010

Table 2.4-1 shows the recent 6-year trend of container movements carried by major container carriers. Most of those carriers are engaged in the trades related to Mozambique.

Table 2.4-1 Container volume carried by major container carriers

(loaded TEU)

	2003	2004	2005	2006	2007	2008	2003-2008 CAGR %	% Growth 2007/08
Maersk Line	10,750,000	11,500,000	12,200,000	12,200,000	13,600,000	14,000,000	6.8%	2.9%
MSC	4,410,000	5,600,000	6,500,000	8,250,000	10,000,000	10,500,000	24.2%	5.0%
CMA CGM	2,800,000	3,891,000	4,675,000	5,980,000	7,683,000	8,879,000	33.4%	15.6%
CSCL	2,834,000	3,655,000	4,597,000	5,657,955	7,298,827	6,942,148	25.1%	-4.9%
Evergreen Group	4,750,000	5,100,000	5,200,000	5,700,000	6,300,000	6,400,000	7.7%	1.6%
Cosco	3,019,000	3,788,000	4,535,000	5,110,000	5,708,550	5,792,593	17.7%	1.5%
Hapag-Lloyd	2,156,500	2,415,000	4,800,000	5,004,000	5,454,000	5,546,000	26.6%	1.7%
APL	3,032,000	3,580,000	3,891,000	4,194,000	4,716,000	4,940,000	13.0%	4.7%
OOCL	2,687,545	3,268,055	3,523,218	3,894,204	4,601,625	4,834,689	15.8%	5.1%
NYK	3,411,885	3,750,000	4,000,000	4,120,000	4,000,000	3,600,000	1.4%	-10.0%
Hanjin	2,594,340	2,686,653	2,850,000	3,274,000	3,620,000	3,426,000	7.2%	-5.4%
MOL	2,161,500	2,250,000	2,351,000	2,733,000	3,159,000	3,300,000	11.2%	4.5%
K Line	2,280,700	2,463,156	2,600,000	2,900,000	3,219,000	3,103,000	8.0%	-3.6%
Yang Ming	2,028,000	2,318,344	2,415,701	2,719,834	3,146,170	3,080,000	11.0%	-2.1%
Regional Container Lines	1,740,000	2,100,000	2,200,000	2,470,000	2,700,000	2,900,000	13.6%	7.4%
Wan Hai	2,150,000	2,339,039	2,377,240	2,587,000	2,700,000	2,800,000	6.8%	3.7%
Hamburg Sud	1,150,000	1,400,000	1,525,000	1,839,000	2,140,000	2,700,000	23.8%	26.2%
HMM	1,864,302	2,091,190	2,137,000	2,160,000	2,400,000	2,654,000	9.2%	10.6%
PIL				2,000,000	2,500,000	2,600,000	n/a	4.0%
Zim	1,807,123	1,987,000	2,041,000	2,071,000	2,379,000	2,520,000	8.7%	5.9%
CSAV	1,338,000	1,607,000	2,075,000	2,213,000	2,129,040	2,191,000	13.1%	2.9%
Sinotrans				1,524,788	1,682,062	1,809,410	n/a	7.6%
Samudera Shipping Lines			1,320,000	1,430,000	1,423,000	1,510,000	n/a	6.1%
UASC	943,000	1,000,000	1,125,000	1,131,000	1,394,000	1,307,000	8.5%	-6.2%
TS Lines				790,000	1,070,000	1,180,000	n/a	10.3%
SITC				720,000	820,000	1,080,000	n/a	31.7%
Total				**92,672,781**	**105,843,274**	**109,594,840**		

Source: Drewry "Container Market 2009/10"

b) Region-to-region traffic

Table 2.4-2 shows the Origin / Destination-wise container movements in the world in 2008. The imports to Africa amount to 5,024 thousand TEUs, while the export from Africa is just 2,416 thousand TEUs; less than half of the imports. Such an imbalance between imports and exports is common in most African countries.

Table 2.4-2 Region-to-region container traffic in 2008

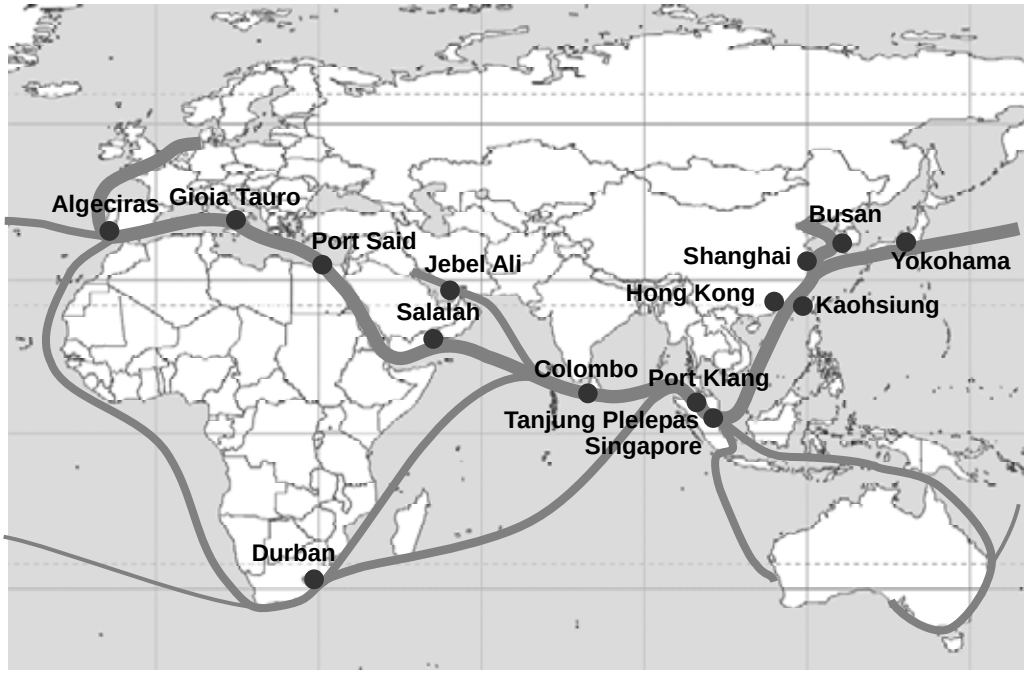
(Unit: 1,000TEU carried onboard in 2008)

from \ to	N.America	East Asia	Europe	S.America	Middle East	South Asia	Africa	Oceaia	Total
N.America	266	6,294	2,606	2,338	466	362	316	294	12,942
East Asia	13,307	16,140	12,932	2,552	1,298	1,853	1,797	1,679	51,558
Europe	2,836	5,150	5,138	1,450	2,920	827	950	379	19,650
S.America	1,973	949	1,925	1,726	223	40	444	57	7,337
Middle East	62	245	1,852	24	540	315	495	23	3,556
South Asia	645	750	1,153	131	466	300	218	38	3,701
Africa	120	478	615	116	174	127	745	41	2,416
Oceania	199	1,016	228	51	91	57	59	545	2,246
Total	19,408	31,022	26,449	8,388	6,178	3,881	5,024	3,056	103,406

Note: * The volume to/from North Africa is counted in Europe.

Source: Mitsui O.S.K. Lines Research Office

Those major regions are connected with each other by the busy trunk lines on which large container vessels are deployed. The hub ports are placed along the trunk lines. Smaller ports are connected with those hub ports by feeder lines on which smaller vessels are deployed. Figure 2.4-5 shows the major trunk lines and hub ports.



Source: Study Team

Figure 2.4-5 Major trunk lines and hub ports

c) Mega carriers and alliances

As stated in the previous section, container carriers intend to increase their market shares by deploying a larger fleet in order to seek the economy of scale in both service coverage and cost competitiveness. A carrier's set-up can be enlarged not only on its own but also with other carriers as a unit. It is a common behavior among middle-scale carriers to form a "global alliance" teaming up with other carriers. The momentum to form global alliances started to grow in 1994. Carriers united their fleets and restructured trade lanes on a global scale so that they can increase the service frequency, obtain additional areas of service coverage, and reduce unit-costs for operations. Currently the following alliances are formed:

- Grand Alliance — Hapag, NYK, OOCL
- The New World Alliance — APL, MOL, Hyundai
- CHKY Group — COSCO, Hanjin, K Line, Yang Ming
- Evergreen Group — Evergreen, Hatsu, Italia Marittima
- (Independent) — Maersk, MSC, CMA CGM, China Shipping

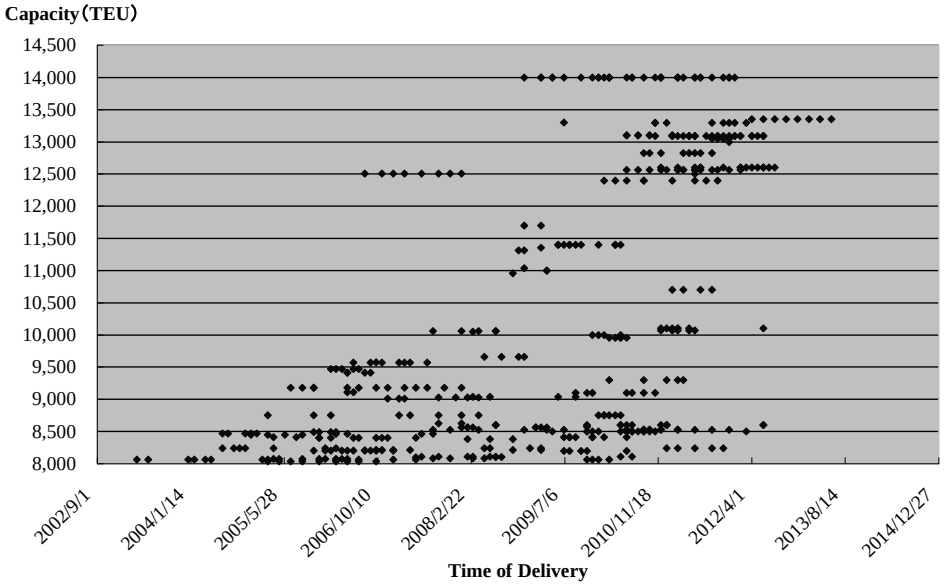
Some carriers went for M&A to enhance their set-ups for the same objectives. The movement began in 1997 and the following actions have been taken until now:

- In 1997 P&O and Nedlloyd merged → P&O Nedlloyd
  NOL acquired APL
- In 1999 Maersk (APM) acquired Sealand Maersk also acquired Safmarine → Maersk Sealand
  Evergreen acquired LT
- In 2005 Maersk Sealand (APM) acquired P&O Nedlloyd → Maersk

Hapag (TUI) acquired CP Ships
- In 2006 CMA CGM acquired Delmas

d) Mega container vessels

Larger vessels need to be deployed in response to the unification of carriers' trade lanes through the formation of alliances and M&A. The largest container vessel currently in operation or on order books has as large as 14,000 TEUs of capacity. Figure 2.4-6 shows the recent trend on the buildings and order books of container vessels with over 8,000 TEUs capacity.



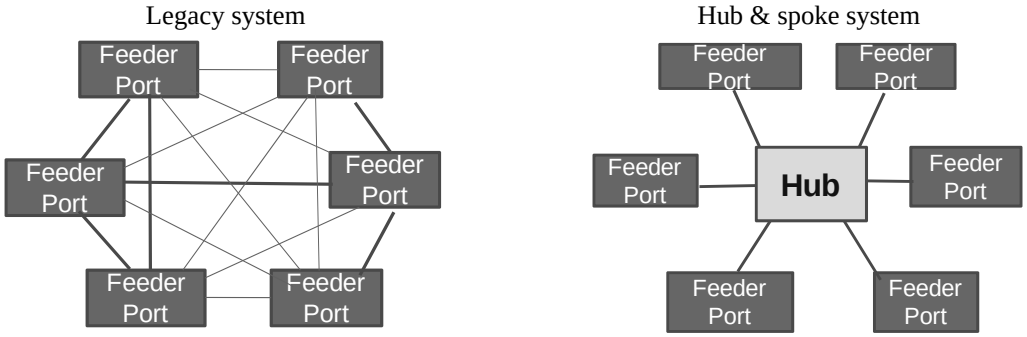
Source: Lloyd's, rearranged by the Study Team

Figure 2.4-6 Capacity / delivery time of mega container vessels

e) Hub & spoke system

Large vessels are too costly to call at multiple ports under the traditional trade lane operations and thus an innovative trade lane management system suitable for mega vessels has been invented by mega carriers. The "hub & spoke system" originally invented in the airborne industry in the US is now broadly adopted by mega container carriers in the world.

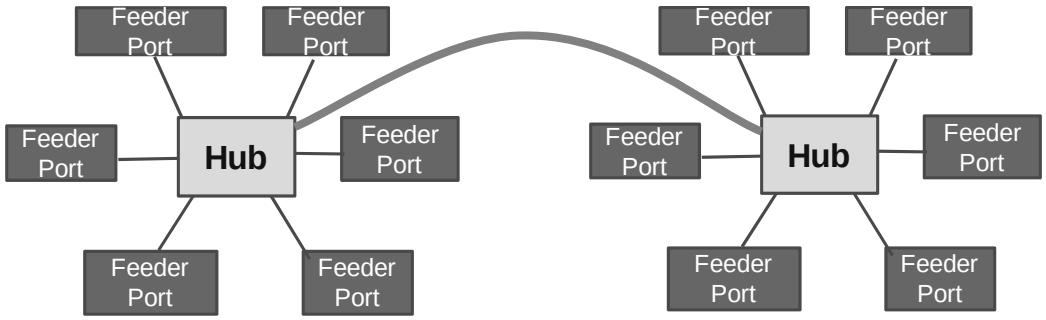
The "hub & spoke system" can save operational costs (Figure 2.4-7). In case of a region with 6 feeder ports to cover, a total of 15 feeder lines are required to cover all port pairs under the traditional multiple-calling system. However, under the hub & spoke system, 6 feeder lines are enough to cover all those port pairs, which will bring a substantial saving of feeder costs to the carrier.



Source: Tokai University Press "Global Intermodal Transportation" modified by the Study Team

Figure 2.4-7 Hub & spoke system in a single region

The hub & spoke system is more advantageous when a region is connected with another region. Since new port pairs are created, new business chances emerge for carriers (Figure 2.4-8).



Source: Tokai University Press "Global Intermodal Transportation" modified by the Study Team

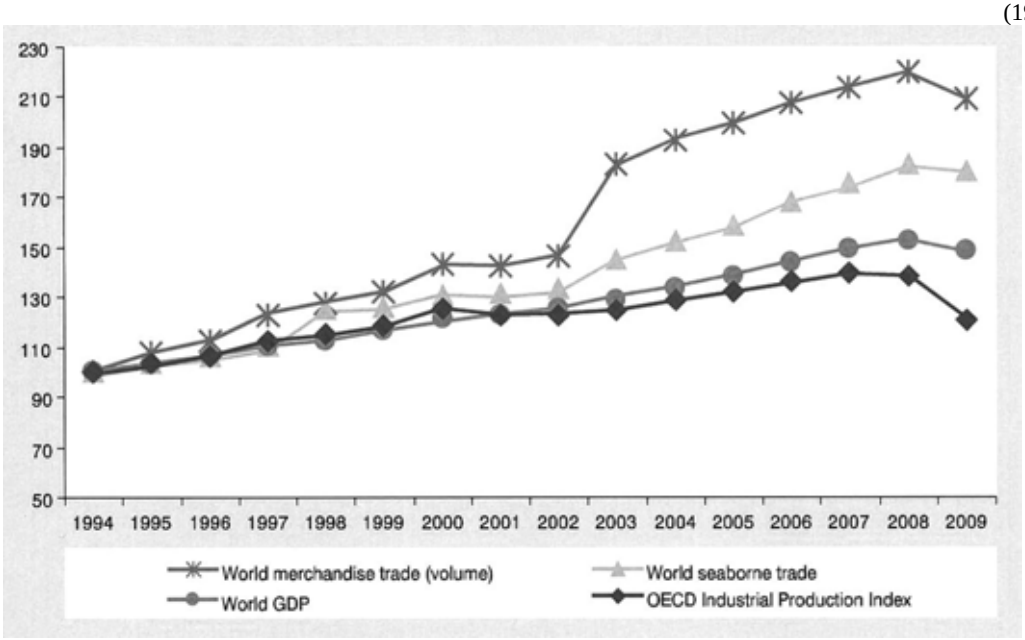
Figure 2.4-8 Hub & spoke system connecting different regions

Hub ports are selected by carriers in consideration of a geographical advantage, operational efficiency of the port, and total costs for feeder networks. A hub port doesn't need to have a cargo source in its own hinterland. It can be built even at a quiet village without any industrial area nearby, if only the factors mentioned above can be optimized.

f) Countermeasures against the global financial crisis

The global financial crisis started in September 2008, marking a historical turning point in world trade and maritime transport. Collapse of the US financial sector seriously impacted on the real economy throughout the world. Severe contraction of demand had a negative multiplier effect on worldwide production and trade. Being inter-dependent in the global supply chains, the world merchandise trade fell into a broad and simultaneous downturn of the largest magnitude since World War 2 (Figure 2.4-9).

(1994=100)



Source: UNCTAD "Review of Maritime Transport 2009"

Figure 2.4-9 World GDP, merchandise trade and seaborne trade

The world-wide over-tonnage caused by the sudden contraction of cargo movement had a huge negative impact on the container carriers. In order to adjust the vessel supply down to the shrunk cargo

demand, the carriers have been taking various measures since the last quarter of 2008 (Table 2.4-3).

Table 2.4-3 Counter measures against the over-tonnage

Counter measures	Present circumstances regarding container trade
Cancellation of new vessel orders	22.5% of vessels on shipyards' order books will be cancelled in 2010-2013.
Delays of new vessel orders	40% of vessels on the current order books will be delayed
Demolition of aging vessels	Approx.370,000 TEU of vessels have been scrapped in 2009,
Slow steaming	Reduction of the navigation speed down to 14 knots or less
Deviation	Short cuts through the Malacca Straits or Suez Canal will be avoided
Lay-up	10% of the world operational fleet is laid up

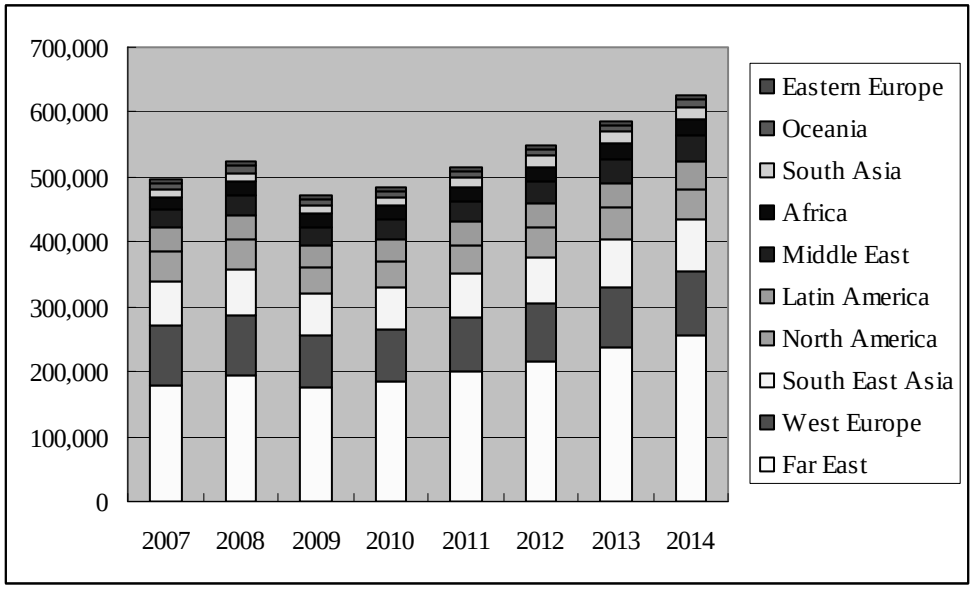
Source: the Study Team

The volume of world container movement has already hit the bottom and is now beginning to recover. According to the latest announcements of industry analysts, the cargo movement will regain the pre-Lehman Shock level in 2011 or 2012 (Figure 2.4-10, 2.4-11).

However, the vessel tonnage of container carriers still substantially exceeds the demand. With all their attempts to adjust the size of the fleet down to the decreased demand, it will take some more years until the supply and demand become balanced. The shipping industry's forecast on the growth of world container fleet shows that the downward trend will continue till 2014 (Figure 2.4-12).

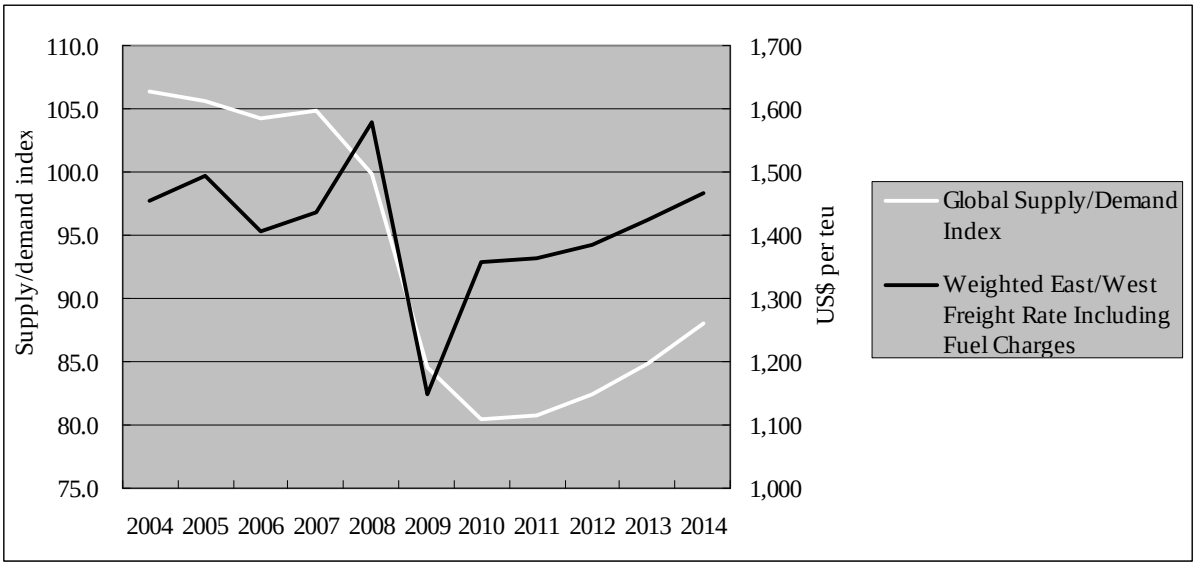
In the course of that recovery period, the container carriers will seek cost-competitiveness more desperately than ever, which may be revealed in their severe selection of ports or in the demanding requests to the container terminal operators for the improvement of service qualities.

(1,000TEU of port handling, including empty & transshipment)



Source: Drewry "Container Market 2009/10"

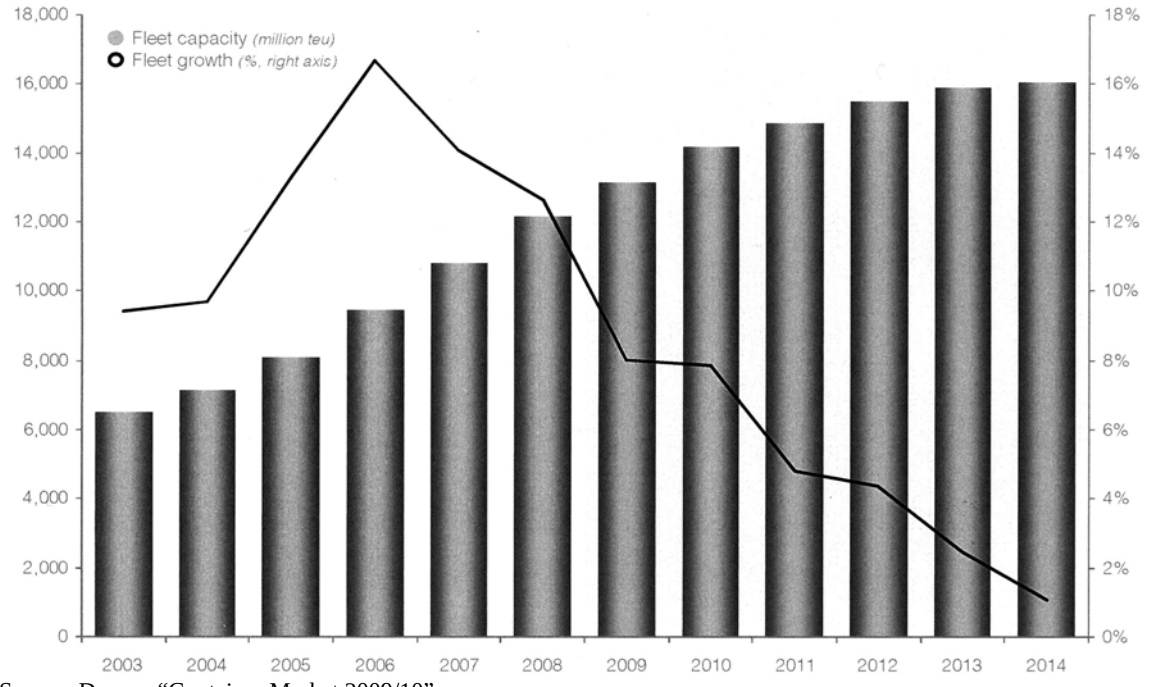
Figure 2.4-10 Mid-term forecast of container handling by region



Global Supply Demand Index: Score of 100.0 represents "balanced".
Source: Drewry "Container Market 2009/10"

Figure 2.4-11 Forecast of global supply / demand balance up to 2014

(for bar graph: million TEU, left axis / for line graph: %, right axis)



Source: Drewry "Container Market 2009/10"

Figure 2.4-12 Containership fleet development

(2) Container transport network in Southern Africa

1) Area classification

The container trade lanes serving Mozambican ports also cover some adjacent areas. Those areas are classified into 4 port groups; 1) Mozambican ports, 2) South African ports and Walvis Bay, 3) Tanzanian ports and 4) Indian Ocean Islands (IOI) Ports.

2) Container throughput of each area

Container throughputs by area/port are shown in Table 2.4-4 below.

3) Throughput and vessel deployment of the ports

South Africa/Walvis Bay area has 3.9 million TEUs of throughput in total, which is far larger than the other areas. Being the busiest hub port of the Southern African region, Durban has the dominant share among the 6 ports in the area, handling 65 % of the total.

IOI area has a substantial throughput of 844,055 TEUs which amounts to 3.5 times of the total throughput in Mozambican ports. Around 40% of the area's containers are handled at Port Louis which is the region's largest hub port.

Tanzanian ports' throughput of 364,000 TEUs is still 1.5 times larger than Mozambique's.

Table 2.4-4 Container throughput of the areas surrounding Mozambique

(Unit : TEU)

Mozambique (2009)

Port	Inbound /Outbound	Tranship	Total
Maputo	85,851		85,851
Beira	92,236		92,236
Nacala	52,620	3,824	56,444
Pemba	7,846		7,846
Quelimane	4,426		4,426
Total	242,979	3,824	246,803

South Africa (2009) & Walvis Bay (2008)

Port	Inbound /Outbound	Tranship	Total
Durban	1,901,988	617,478	2,519,466
Cape Town	620,045	122,705	742,750
Port Elizabeth	345,953	48,149	394,102
East London	54,981		54,981
Richards Bay	8,139	132	8,271
Walvis Bay	99,772	82,847	182,619
Total	3,030,878	871,311	3,902,189

Indian Ocean Islands (2008)

Port	Inbound /Outbound	Tranship	Total
Longoni	34,441	960	35,401
Moroni	10,031		10,031
Mutsamudu	21,863	8,025	29,888
Port Victoria	12,216	617	12,833
Toamasina	141,857	1,450	143,307
Other Madagaskar	22,300		22,300
Port Louis	214,634	120,290	334,924
Reunion	234,866	20,505	255,371
Total	692,208	151,847	844,055

Tanzania (2007)

Port	Inbound /Outbound	Tranship	Total
Dar es Salaam	305,000	29,000	334,000
Tanga	10,000		10,000
Zansibar	15,000		15,000
Mtwara	5,000		5,000
Total	335,000	29,000	364,000

Source: Transnet Port Terminals (for South Africa), Agence Française de Développement (IOI), JICA (Walvis Bay), WB (Tanzania)

4) Vessel deployment by area

The details of vessel deployment for each area are shown in the following tables. Number of vessel callings is based on the shipping lines' gazetted service profiles as of August 2010.

Table 2.4-5	:	Mozambican ports
Table 2.4-6 to 2.4-8	:	South African ports and Walvis Bay
Table 2.4-9	:	Indian Ocean Island ports
Table 2.4-10	:	Tanzanian ports

Table 2.4-5 Vessel deployment for Mozambican ports

Shipping line	Service name	Main line or feeder	Frequency	Number of vessels	Fleet capacity (TEU)	Average vessel size (TEU)	Number of voyages /year	Capacity /year (TEU)	Calling ports	Number of callings /year					
										Maputo	Beira	Nacala	Pemba	Queli mane	Durban
Maersk, Safmarine	Safari 2	M	weekly (fixed day)	5	8,425	1,685	52	87,861	Tanjung Pelepas-Port Louis-Toamasia-**Maputo**-Tanjung Pelepas	52					
CMACGM, Delmas	AFEX	M	every 10 days	8	17,200	2,150	37	78,475	Xingang-Shanghai-Shantou-Hong Kong-Nansha-Chiwan-Port Klang-Abidjan-Cotonou-Tincan-Douala-**Maputo**-Port Klang-Xingang	37					
CMACGM, Delmas	MOZEX	M	every 11 days	4	4,478	1,120	33	37,147	Port Klang-Reunion-**Maputo-Beira-Nacala**-Port Klang	33	33	33			
MOL	MZX	M	weekly (fixed day)	5	12,525	2,505	52	130,618	Singapore-Durban-**Maputo**-Port Klang-Singapore	52					52
PIL	EAS	M	every 8 days	9	15,018	1,669	46	76,133	Xingang-Dalian-Qingdao-Shanghai-Ningbo-Singapore-Mombasa-Dar es Salam-**Pemba**-Singapore-Davao-Manila-Shanghai-Xingang				46		
PIL	IOM	M	every 9 days	4	4,802	1,201	41	48,687	Singapore-Port Louis-Reunion-Toamasina-**Beira-Nacala**-Singapore		41	41			
PIL	ALS	M	2 sailings /month	3	3,642	1,214	24	29,136	Singapore-**Maputo**-Durban-Cape Town-Luanda-**Maputo**-Pasir Gudang-Singapore	48					24
East Asia Total				38	66,090	1,739	284	488,056		222	74	74	46		76
CMACGM, Delmas	Swahili Express	M	every 8 days	6	9,980	1,663	46	75,890	Nhava Sheva-Bandar Shahid-Jebel Ali-Khor Fakkan-Mombasa-Zanzibar-Dar es Salam-**Nacala**-(Longoni)-Nhava Sheva *( ): alternate calling			46			
Emirates Shipping	Gulf India Africa	M	2 sailings /month	3	5,100	1,700	24	40,800	Nhava Sheva-Karachi-Jebel Ali-Mombasa-Zanzibar-Dar es Salam-**Nacala-Beira**-Nhava Sheva		24	24			
Middle East/South Asia Total				9	15,080	1,676	70	116,690			24	70			
MACS	Saf-Europe	M	every 10 days	6	9,408	1,568	37	57,232	**Maputo**-Richards Bay-Durban-East London-Cape Town-Walvis Bay-Lisbon-Vigo-Rotterdam-Tilbury-Immingham-Hamburg-Antwerp-Aarhus-Bilbao-Bremen-Copenhagen-Cork-Dublin-Gothenburg-Grangemouth-Helsingborg-Helsinki-Kotka-Kristiansand-Oslo-Stockholm	37					37
Ignazio Messina	Red Sea /east-south Africa	M	bi-weekly	4	5,200	1,300	26	33,893	Marseilles-Genoa-Naples-Aqaba-Jeddah-Dar es Salam-Mombasa-**(Nacala)**-Durban-**Maputo**-Dar es Salam-Mombasa-Jeddah-Marsellies *( ): irregular calling	26		2			26
Europe Total				10	14,608	1,461	63	91,125		63		2			63
Main Line Total				57	95,778	1,680	416	695,871		285	98	145	46		139
MSC	Saf-Moz 1	F	every 11 days	1	1,025	1,025	33	34,011	Durban-**Maputo-Nacala**-Durban	33		33			33
MSC	Saf-Moz 2	F	every 8 days	1	1,025	1,025	46	46,766	Durban-**Beira**-Durban		46				46
MACS	African Coastal	F	every 10 days	2	838	419	37	15,294	Durban-**Maputo-Beira-Quelimane-(Nacala)**-Monbasa-Durban	37	37	2		2	37
OACL, [Mozline]	East Coast 1	F	2 sailings /month	1	1,012	1,012	24	24,288	Durban-**Maputo-Nacala-Maputo**-Durban	48		24			24
OACL, [Mozline]	East Coast 2	F	weekly (not fixed day)	2	2,324	1,162	52	60,590	Durban-**(Maputo)-Beira-(Maputo)**-Durban *( ): alternate calling	26	52				26
UAFL	Island Express	F	monthly	1	713	713	12	8,556	Durban-Toliara-Tolagnaro-Toamasina-Port Louis-Reunion-Port Victoria-Antsiranana-Longoni-Mutsamudu-Nosy Be-Mahajunga-**Maputo**-Durban	12					12
UAFL	Moroni Shuttle	F	every 10 days	3	1,105	368	37	13,444	Mutsamudu-(Moroni)-**Quelimane-Pemba**-Mutsamudu				12	37	
Feeder Total				11	8,042	731	240	202,949		156	134	59	12	39	177
Total 18 services by 13 shipping lines				68	103,820	1,527	656	898,820		440	232	205	58	39	316

Source: Study Team

Table 2.4-6 Vessel deployment for South African ports (including Walvis Bay) – part 1

Shipping line [slot charterer]	Service name	Main line or feeder	Frequency	Number of vessels	Fleet capacity (TEU)	Average vessel size (TEU)	Number of voyages /year	Capacity /year (TEU)	Calling ports	Number of callings /year						
										Durban	Richards Bay	East London	Port Elizabeth	Ngqura	Cape Town	Walvis Bay
Maersk, Safmarine, [Hamburb Sud]	Safari 1	M	weekly	5	30,247	6,049	52	315,433	Shanghai-Ningbo-Yantian-Tanjung Pelepas-**Durban-Port Elizabeth-Cape Town**-Port Louis-Tanjung Pelepas-HongKong-Shanghai	52			52		52	
Maersk Line	FEW2	M	weekly	9	30,849	3,428	52	178,728	PortKlang-Tanjung Pelepas-**Walvis Bay**-Abidjan-Tema-Apapa-**Walvis Bay**-PortKlang-Tanjung Pelepas							104
MSC	Cheetah	M	weekly	6	28,861	4,810	52	250,816	**Durban**-Port Louis-Singapore-Xiamen-Kaohsiung-HongKong-Chiwan-Singapore-Port Louis-**Durban**	52						
CMA CGM, China Shipping, [Maruba]	SEAS	M	weekly	11	45,040	4,095	52	213,501	Busan-Shanghai-Ningbo-Chiwan-PortKlang-Rio de Janeiro-Santos-Buenos Aires-Rio Grande-Itajai-Paranagua-Santos-Rio de Janeiro-**Durban**-PortKlang-HongKong-Busan	52						
CMA CGM, Hanjin	WAX	M	weekly	11	31,632	2,876	52	149,944	Qingdao-Shanghai-Ningbo-Fuqing-Chiwan-PortKlang-**Durban-Walvis Bay**-Tema-Apapa-Lome-Abidjan-**Port Elizabeth**-Colombo-PortKlang-Qingdao	52			52			52
China Shiping, Hapag, [Kline]	WSX	M	1-2 sailings /week	8	20,068	2,509	70	174,400	Shanghai-Ningbo-Xiamen-Shekou-PortKlang-**Durban**-Tema-Lome-Tincan-**Durban**-PortKlang-Shanghai	139						
Kline, PIL, [MISC]	ASA	M	weekly	7	26,625	3,804	52	198,329	Shanghai-Ningbo-Kaohsiung-Shekou-HongKong-Singapore-PortKlang-**Durban-Cape Town**-PortKlang-**Durban-Cape Town**-PortKlang-Singapore-HongKong-Shanghai	104					104	
Evergreen, Cosco	FAX	M	weekly	7	23,840	3,406	52	177,584	Shanghai-Ningbo-Kaohsiung-HongKong-Yantian-Singapore-Tanjung Pelepas-**Durban-CapeTown**-Singapore-Kaohsiung-Shanghai	52					52	
NYK, Nile Dutch	SWAX	M	every 12 days	6	14,966	2,494	30	75,869	Shanghai-Ningbo-Shekou-Singapore-**Durban**-Lome-Tema-Lagos-**Durban**-Singapore-Shanghai	30						
MOL	MZX	M	weekly	5	12,525	2,505	52	130,618	Singapore-**Durban**-Maputo-Port Klang-Singapore	52						
PIL	ALS	M	2 sailings /month	3	3,642	1,214	24	29,541	Singapore-Maputo-**Durban-Cape Town**-Luanda-Pasir Gudang-Singapore	24					24	
PIL	CST&SWS	M	weekly	8	13,381	1,673	52	87,215	Singapore-**Cape Town**-Tema-Cotonou-Apapa-Douala-Singapore						52	
PIL	SW2	M	weekly	8	13,764	1,721	52	89,712	HongKong-Kaohsiung-Taichung-Dongguan-Huangpu-Nansha-Singapore-**Durban**-Onne-Apapa-Lome-Abidjan-**Durban**-Port Louis-Singapore-HongKong	104						
Compania Sud Americana de Vapores	New Dicovery Service	M	weekly	7	18,448	2,635	52	137,419	Xingang-Shanghai-Ningbo-Chiwan-HongKong-Singapore-**Durban-Cape Town**-Singapore-Xingang	52					52	
Nile Dutch Africa Line	FE-Af	M	bi-weekly	5	11,058	2,212	26	57,660	Xingang-Qingdao-Shanghai-(Ningbo)-Shenzhen-Singapore-**Durban-Cape Town**-Pointe Noire-Luanda-(Lobito)-(Namibe)-**Durban**-Singapore-Xingang	26					26	
Gold Star Line	FAX	M	every 9 days	8	14,782	1,848	41	74,937	PortKlang-Singapore-Colombo-Reunion-**Durban**-Tema-Lome-Lagos-Cotonou-Takoradi-Abidjan-Colombo-PortKlang	41						
East Asia Total				114	339,728	2,980	764	2,341,706		834			104		285	156

Source: Study Team

Table 2.4-7 Vessel deployment for South African ports (including Walvis Bay) – part 2

Shipping line [slot charterer]	Service name	Main line or feeder	Frequency	Number of vessels	Fleet capacity (TEU)	Average vessel size (TEU)	Number of voyages /year	Capacity /year (TEU)	Calling ports	Number of callings /year						
										Durban	Richards Bay	East London	Port Elizabeth	Ngqura	Cape Town	Walvis Bay
Maersk, Hamburg Sud, Alianca	ASAS	M	weekly	12	47,201	3,933	52	205,100	Nagoya-Yokohama-Busan-Shanghai-HongKong-TanjungPelepas-Singapore-**Durban**-Itaguai-Santos-Buenos Aires-Rio Grande-Navegantes-Paranagua-Santos-**Port Elizabeth**-**Durban**-Singapore-HongKong-Nagoya	104			52			
Hapag, Hanjin, CCNI, Wan Hai, Zim	ASE	M	weekly	11	47,016	4,274	52	222,868	Busan-Shanghai-Ningbo-Yantian-HongKong-Shekou-Singapore-**Durban**-Rio Grande-Santos-Buenos Aires-Montevideo-Rio Grande-Itajai-Santos-**Durban**-Singapore-HongKong-Busan	104						
NYK, Kline, PIL, Hyundai	NHX	M	weekly	10	42,379	4,238	52	220,976	Shanghai-Ningbo-HongKong-Shekou-Singapore-Santos-Buenos Aires-Montevideo-Navegantes-Paranagua-Santos-Rio de Janeiro-**Cape Town**-Singapore-HongKong-Shanghai						52	
MOL	CSW	M	weekly	12	48,208	4,017	52	209,475	Xingang-Dalian-Qingdao-Busan-Shanghai-HongKong-Singapore-**Ngqura**-Santos-Buenos Aires-Montevideo-Paranagua-Sao Francisco do Sul-Santos-Rio de Janeiro-Cape Town-**Ngqura**-Singapore-Hong Kong-Xingang					104		
Compania Sud Americana de Vapores	Marco Polo	M	weekly	9	18,961	2,107	52	109,853	Jebel Ali-Bandar Abbas-Nhava Sheva-**Durban**-Itajai-Santos-Paranagua-Rio Grande-**Durban**-**Cape Town**-Jebel Ali	104					52	
South America Total				54	203,765	3,773	261	968,273		313			52	104	104	
Maersk, MOL, DAL, Safmarine	SAECS	M	weekly	7	30,087	4,298	52	224,117	Rotterdam-Tilbury-Bremerhaven-Las Palmas-**Cape Town**-**Port Elizabeth**-**Durban**-**Cape Town**-Las Palmas-Rotterdam	52			52		104	
MSC, [Hapag], [Hugo]	SAX	M	weekly	7	46,404	6,629	52	345,662	Felixstowe-Hamburg-Antwerp-Le Havre-**Cape Town**-**Ngqura**-**Durban**-**Ngqura**-**Cape Town**-Las Palmas-Canaria-Felixstowe	52				104	104	
Maersk	WAF 5	M	weekly	7	10,092	1,442	52	75,175	Luanda-**Walvis Bay**-San Pedro-Algeciras-Vigo-Leixoes-Lisbon							52
MACS	Saf-Europe Container Service	M	every 10 days	6	9,408	1,568	37	57,232	Maputo-**Richards Bay**-**Durban**-**East London**-**Cape Town**-**Walvis Bay**-Lisbon-Vigo-Rotterdam-Tilbury-Immingham-Hamburg-Antwerp-Aaarhus-Bilbao-Bremen-Copenhagen-Cork-Dublin-Gothenburg-Grangemouth-Helsingborg-Helsinki-Kotka-Kristiansand-Oslo-Stockholm	37	37	37			37	37
Conti-Lines	Conti-Gulf/Asia/Saf	M	monthly	3	2,120	707	12	8,480	Antwerp-Limassol-Suez-Jeddah-Sohar-Karachi-Mundra-Hazira-Mumbai-Mombasa-Dar es Salaam-Beira-**Durban**-Saldanha Bay-Vigo-Bilbao-Antwerp	12						
Ignazio Messina	Red Sea /east-south Africa	M	bi-weekly	4	5,200	1,300	26	33,893	Marseilles-Genoa-Naples-Aqaba-Jeddah-Dar es Salam-Mombasa-(Nacala)-**Durban**-Maputo-Dar es Salam-Mombasa-Jeddah-Marsellies *( ): irregular calling	26						
Seatrade Reefer Chartering NV	Saf-Euro	M	every 7-10 days(May - Sep only)						Maputo-**Durban**-**Port Elizabeth**-**Cape Town**-Sheerness-Rotterdam-Flushing-Tarragona-Vado-Maputo							
Europe Total				34	103,311	3,039	231	744,560		179	37	37	52	104	245	89
Maersk	MESA	M	weekly	6	13,440	2,240	52	116,800	**Durban**-Salalah-Jebal Ali-Nhava Sheva-**Durban**	52						
MSC	Saf-ME-IndSub	M	weekly	4	11,427	2,857	52	148,959	**Durban**-Mombasa-Nhava Sheva-Mundra-Karachi-Jebel Ali-Mombasa-**Durban**	52						
CMA CGM, Maruba	MIDAS	M	weekly	10	18,240	1,824	52	95,109	Mundra-Nhava Sheva-Khor Fakkan-Jebel Ali-**Walvis Bay**-Luanda-Pointe Noire-Apapa-Tincan-Lome-Tema-Abidjan-Mundra							52
PIL, Gold Star	AMI	M	every 12 days	6	6,608	1,101	30	33,499	Karachi-Nhava Sheva-Jebel Ali-**Durban**-Apapa-Tema-Cotonou-**Durban**-Mombasa-Karachi	61						
Zim Integrate Shipping Srvcs	EAS	M	every 24 days	2	3,499	1,750	15	26,607	**Durban**-Dar Es Salaam-Mombasa-Djibouti-Suez-Port Said-Haifa-Suez-Djibouti-Mombasa-**Durban**	30						
Middle East/South Asia Total				28	53,214	1,901	202	420,974		196						52

Source: Study Team

Table 2.4-8 Vessel deployment for South African ports (including Walvis Bay) – part 3

Shipping line [slot charterer]	Service name	Main line or feeder	Frequency	Number of vessels	Fleet capacity (TEU)	Average vessel size (TEU)	Number of voyages /year	Capacity /year (TEU)	Calling ports	Number of callings /year						
										Durban	Richards Bay	East London	Port Elizabeth	Ngqura	Cape Town	Walvis Bay
Maersk, MSC, Safmarine	AMEX	M	weekly	8	19,650	2,456	52	128,076	Newark-Baltimore-Norfolk-Charleston-Freeport-**Cape Town-Port Elizabeth-Durban-Cape Town**-Newark	52			52		104	
Canada States Africa Line, [Hapag]	NAA	M	monthly	3	2,184	728	12	8,736	Montreal-Baltimore-Savannnah-**Walvis Bay-Cape Town-Durban-Richards Bay-Durban-Cape Town-Walvis Bay**-Montreal	24	12				24	12
Galborg	Gulf/Africa	M	every 3 weeks	4	3,908	977	17	16,981	Houston-New Orleans-Jacksonville-**Walvis Bay-Cape Town-Durban-Maputo-Richards Bay-Durban**-(Altamira)-Houston	35	17				17	17
North America Total				15	25,742	1,716	82	153,793		111	29		52		146	29
Main Line Total				245	725,760	2,962	1,539	4,629,305		1,632	66	37	261	209	780	327
Maersk Line	SAfWAf	F	every 19 days	2	3,429	1,715	19	32,936	**Durban-Cape Town**-Abidjan-Apapa-Tema-**Durban**	19						19
MSC	Saf-Angola	F	weekly (not fixed day)	2	2,692	1,346	52	70,184	**Durban-Cape Town-Walvis Bay**-Luanda-Lobito-**Durban**	52					52	52
MOL	AOS	F	every 21 days	1	1,133	1,133	17	19,693	**Ngqura-Cape Town-Walvis Bay**-(Lobito)-Luanda-**Ngqura**					17	17	17
MOL	SWX	F	bi-weekly	3	4,824	1,608	26	41,923	**Durban-Ngqura-Cape Town-Walvis Bay**-Abidjan-Tema-Lome-Cotonou-Douala-**Ngqura-Durban**	26				52	26	26
Kline	Saf-Waf	F	weekly	4	4,000	1,000	52	52,143	**Cape Town**-Tema-Lagos-Cotonou-**Cape Town**						52	
Safmarine	SAfWAf Combo	F	monthly	2	1,044	522	12	6,264	**Durban-Cape Town-Walvis Bay**-Sonil-Pointe Noire-Matadi-Libreville-**Durban**	12						
OACL	West Coast 1	F	2 sailings /month	1	1,156	1,156	24	27,744	**Durban-Cape Town**-Luderitz-**Walvis Bay**-Namibe-Lobito-Luderitz-**Cape Town-Durban**	24					48	24
OACL	West Coast 2	F	1-2 sailings /month	1	1,162	1,162	18	20,916	**Durban-Cape Town**-Luanda-**Cape Town-Durban**	18					36	
West Africa Feeder Total				16	19,440	1,215	221	271,803		151				70	232	139
MSC	Saf-Eaf Shuttle	F	weekly	4	3,196	799	52	41,662	**Durban**-Dar es Salaam-Mombasa-**Durban**	52						
MSC	Saf-Moz 1	F	every 11 days	2	2,050	1,025	33	34,011	**Durban**-Maputo-Nacala-**Durban**	33						
MSC	Saf-Moz 2	F	every 8 days	1	1,025	1,025	46	46,766	**Durban**-Beira-**Durban**	46						
MACS	African Coastal	F	every 10 days	2	838	419	37	15,294	**Durban**-Maputo-Beira-Quelimane-Nacala-Monbasa-**Durban** *irregular calling	37						
OACL, [Mozline]	East Coast 1	F	2 sailings /month	1	1,012	1,012	24	24,288	**Durban**-Maputo-Nacala-Maputo-**Durban**	24						
OACL, [Mozline]	East Coast 2	F	weekly (not fixed day)	2	2,324	1,162	52	60,590	**Durban**-(Maputo)-Beira-(Maputo)-**Durban** *( ): alternate calling	52						
UAFL	Island Express	F	monthly	1	713	713	12	8,556	**Durban**-Toliara-Tolagnaro-Toamasina-Port Louis-Reunion-Port Victoria-Antsiranana-Longoni-Mutsamudu-Nosy Be-Mahajunga-Maputo-**Durban**	12						
UAFL	Seychelles Exp.	F	monthly	1	713	713	12	8,556	**Durban**-Port Victoria-**Durban**	12						
East Africa Feeder Total				14	11,871	848	268	239,723		268						
Feeder Total				30	31,311	1,044	489	511,526		419				70	232	139
Total 52 services by 35 shipping lines				275	757,071	2,753	2,028	5,140,830		2,051	66	37	261	278	1,011	465

Source: Study Team

Table 2.4-9 Vessel deployment for Indian Ocean Islands ports

Shipping line [slot charterer]	Service name	Main line or feeder	Frequency	Number of vessels	Fleet capacity (TEU)	Average vessel size (TEU)	Number of voyages /year	Capacity /year (TEU)	Calling ports	Number of callings /year								
										Moroni	Mutsamudu	Longoni	Toamasina	Madagascar others	Port Victoria	Port Louis	Mauritius others	Reunion
Maersk, Safmarine	Safari 2	M	weekly (fixed day)	5	8,425	1,685	52	87,861	Tanjung Pelepas-**Port Louis-Toamasia**-Maputo-Tanjung Pelepas				52			52		
MSC	Cheetah	M	weekly	6	28,861	4,810	52	250,816	Xiamen-Kaohsiung-HongKong-Chiwan-Singapore-**Port Louis**-Durban-**Port Louis**-Singapore-Xiamen							104		
CMACGM, Delmas	MOZEX	M	every 11 days	4	4,478	1,120	33	37,147	Port Klang-**Reunion**-Maputo-Beira-Nacala-Port Klang									33
MOL	IOX	M	every 10 days	3	3,606	1,202	37	43,873	Singapore-**Port Louis-Reunion-Toamasina**-Singapore				37			37		37
MOL, Delmas	ASEA	M	bi-weekly	5	8,451	1,690	26	44,066	Loop1: PortKlang-Singapore-Colombo-**Port Victoria**-Mombasa-Tanga-Dar es Salaam-Colombo-PortKlang Loop2: PortKlang-Singapore-Colombo-**Port Victoria**-Mombasa-Dar es Salaam-**Port Victoria**-Colombo-Portklang						39			
PIL	IOM	M	every 9 days	4	4,802	1,201	41	48,687	Singapore-**Port Louis-Reunion-Toamasina**-Beira-Nacala-Singapore				41			41		41
Gold Star Line	FAX	M	every 9 days	8	14,782	1,848	41	74,937	PortKlang-Singapore-Colombo-**Reunion**-Durban-Tema-Lome-Lagos-Cotonou-Takoradi-Abidjan-Colombo-PortKlang									41
East Asia Total				35	73,405	2,097	281	587,386					129		39	233		151
Maersk, Safmarine	Zanzibar-Tanga Service	M	weekly	4	6,112	1,528	52	79,674	Jebel Ali-Zanzibar-**Mutsamudu**-Tanga-Mombasa-Karachi-Jebel Ali		52							
CMACGM, Delmas	Swahili Express	M	every 8 days	6	9,980	1,663	46	37,945	Nhava Sheva-Bandar Shahid-Jebel Ali-Khor Fakkan-Mombasa-Zanzibar-Dar es Salam-Nacala-**(Longoni)**-Nhava Sheva *( ): alternate calling			23						
UAFL	ME Exp.	M	every 12 days	3	4,588	1,529	30	46,517	Karachi-Jebel Ali-Zanzibar-**Mutsamudu-Longoni**-Tanga-Mombasa-Karachi		30	30						
Middle East/South Asia Total				13	20,680	1,591	128	164,136			83	53						
Main Line Total				48	94,085	1,960	409	751,522			83	53	129		39	233		151
Maersk, Safmarine	IOI	F	weekly	4	6,800	1,700	52	88,643	Salalah-**Reunion-Port Louis-Toamasina-Port Victoria**-Salalah				52		52	52		52
CMACGM, Delmas	IOFeed	F	every 10 days	1	713	713	37	26,025	**Longoni-Moroni-Antsiranana-Nossi Be-Mahajanga-Longoni**	37		37		37				
MSC	IO Relay	F	every 5-8 days	2	1,760	880	56	49,415	**Port Louis-Longoni-Diego Suarez-Toamasina-Port Louis**			56	56	56		56		
UAFL	Island Express	F	monthly	1	713	713	12	8,556	Durban-**Toliara-Tolagnaro-Toamasina-Port Louis-Reunion-Port Victoria-Antsiranana-Longoni-Mutsamudu-Nosy Be-Mahajunga**-Maputo-Durban		12	12	12	12	12	12		12
UAFL	Moroni Shuttle	F	every 10 days	3	1,105	368	37	13,444	**Mutsamudu-(Moroni)**-Quelimane-Pemba-**Mutsamudu**	18	37							
Mauritius shipping, [Maersk]	Coraline	F	every 2 days	2	244	122	183	22,265	**Port Louis-Reunion-(Mathurin)-(Toamasina)-Port Louis** *( ):irregular call				91			183	46	183
Feeder Total				13	11,335	872	376	208,348		55	49	105	212	105	64	303	46	247
Total 16 services by 10 shipping lines				61	105,420	1,728	785	959,870		55	131	158	341	105	103	536	46	397

Source: Study Team

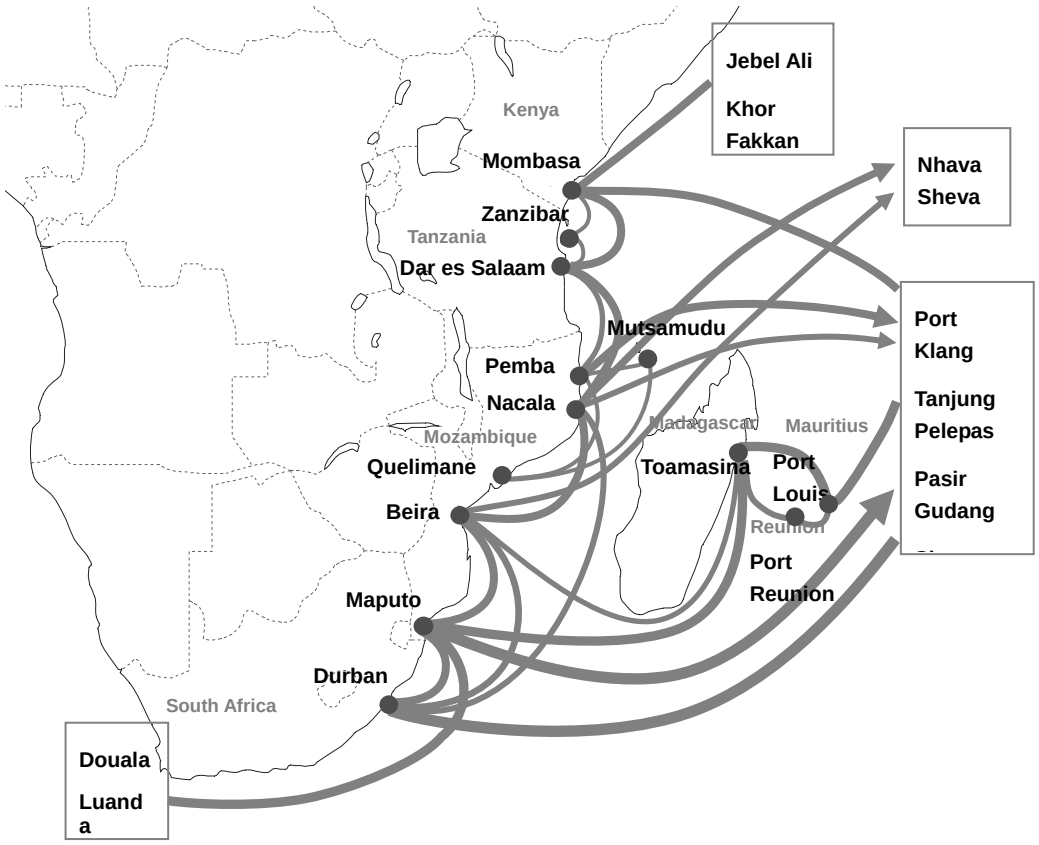
Table 2.4-10 Vessel deployment for Tanzanian ports

Shipping line [slot charterer]	Service name	Main line or feeder	Frequency	Number of vessels	Fleet capacity (TEU)	Average vessel size (TEU)	Number of voyages /year	Capacity /year (TEU)	Calling ports	Number of callings /year			
										Dar es Salaam	Zanzibar	Tanga	Mtwara
Maersk, Safmarine	Masika Exp.	M	weekly (fixed day)	6	15,200	2,533	52	132,095	Sharjah-Jebel Ali-Salalah-**Dar es Salaam**-Mombasa-Salalah-Sharjah	52			
Maersk, Safmarine	Zanzibar-Tanga Service	M	weekly	4	6,112	1,528	52	79,674	Jebel Ali-**Zanzibar**-Mutsamudu-**Tanga**-Mombasa-Karachi-Jebel Ali		52	52	
MSC	Af-IndSub-ME	M	weekly	6	14,535	2,423	52	126,316	Mombasa-**Dar es Salaam**-Nhava Sheva-Mundra-Karachi-JebelAli-Mombasa	52			
CMACGM, Delmas	Swahili Express	M	every 8 days	3	4,714	1,571	46	71,692	Nhava Sheva-Bandar Shahid-Jebel Ali-Khor Fakkan-Mombasa-**Zanzibar**-**Dar es Salam**-Nacala-(Longoni)-Nhava Sheva *( ): alternate calling	46	46		
Emirates Shipping	Gulf India Africa	M	2 sailings /month	3	5,100	1,700	24	40,800	Nhava Sheva-Karachi-Jebel Ali-Mombasa-**Zanzibar**-**Dar es Salam**-Nacala-Beira-Nhava Sheva	24	24		
Zim Integrate Shipping Srvcs	EAS	M	every 24 days	2	3,499	1,750	15	26,607	Durban-**Dar Es Salaam**-Mombasa-Djibouti-Suez-Port Said-Haifa-Suez-Djibouti-Mombasa-Durban	15			
UAFL	ME Exp.	M	every 12 days	3	4,588	1,529	30	46,517	Karachi-Jebel Ali-**Zanzibar**-Mutsamudu-Longoni-**Tanga**-Mombasa-Karachi		30	30	
Middle East/South Asia Total				27	53,748	1,991	272	523,702		189	152	83	
Maersk	Mashariki Exp.	M	weekly (fixed day)	3	5,108	1,703	52	88,782	Tanjung Pelepas-Mombasa-**Dar es Salaam**-Tanjung Pelepas	52			
MOL, Delmas	ASEA	M	bi-weekly	5	8,451	1,690	26	44,066	Loop1: PortKlang-Singapore-Colombo-Mahe-Mombasa-**Tanga**-**Dar es Salaam**-Colombo-PortKlang Loop2: PortKlang-Singapore-Colombo-Mahe-Mombasa-**Dar es Salaam**-Mahe-Colombo-Portklang	26		26	
Evergreen, Gold Star, Simatech, [Wan Hai]	EAF	M	every 10 days	3	5,680	1,893	37	69,107	Colombo-**Dar es Salaam**-Mombasa-Colombo	37			
Emirates Shipping	AFA	M	weekly	2	4,208	2,104	52	109,709	Xingang-Shanghai-Ningbo-Qingdao-HongKong-Singapore-PortKlang-Colombo-**Dar es Salam**-Mombasa-Colombo-Singapore-HongKong-Xingang	52			
PIL	EAS	M	every 8 days	9	15,018	1,669	46	76,133	Xingang-Dalian-Qingdao-Shanghai-Ningbo-Singapore-Mombasa-**Dar es Salam**-Pemba-Singapore-Davao-Manila-Shanghai-Xingang	46			
Ethiopian Shipping	Asia-Af	M	monthly	7	3,395	485	12	5,820	Kobe-Tianjin-Yokohama-Busan-Keelung-HongKong-Singapore-**Dar es Salaam**-Mombasa-Djibouti	12			
East Asia Total				29	41,860	1,443	224	393,616		224		26	
Ignazio Messina	Red Sea /East-south Africa	M	bi-weekly	4	5,200	1,300	26	33,893	Marseilles-Genoa-Naples-Aqaba-Jeddah-Dar es Salam-Mombasa-(Nacala)-Durban-Maputo-**Dar es Salam**-Mombasa-Jeddah-Marsellies *( ): irregular calling	26			
Europe Total				4	5,200	1,300	26	33,893		26			
Main Line Total				60	100,808	1,680	522	951,211		440	152	109	
MSC	Saf-Eaf Shuttle	F	weekly	4	3,196	799	52	41,662	Durban-**Dar es Salaam**-Mombasa-Durban	52			
Feeder Total				4	3,196	799	3,196	41,662		52			
Total 15 services by 18 shipping lines				64	104,004	1,625	3,718	992,873		492	152	109	

Source: Study Team

i) Mozambican ports

There are 18 services by 10 shipping lines to cover Maputo, Beira, Nacala, Pemba and Quelimane. Out of those, 11 are main line services and 7 are feeder services. Figure 2.4-13 depicts the existing container transport network covering Mozambican ports.



Source: Study Team

Figure 2.4-13 Trade lanes covering Mozambican ports

ii) South African ports / Walvis Bay

52 services by 35 shipping lines are available for South Africa/Walvis Bay area. Average vessel size is 2,753 TEU which is 1,200 TEUs larger than Mozambican ports', which indicates that the vessels deployed for this area are mostly sailing a longer distance.

iii) Indian Ocean Island ports

16 services by 10 shipping lines are available with average size of 1,728 TEUs.

iv) Tanzanian ports

15 services by 18 shipping lines are available with average vessel size of 1,625 TEUs. The service capacity for the Middle East/South Asia exceeds that for East Asia, which is distinctive trait compared with the other areas. As seen in the most of the trade lanes covering this area, Mombasa in Kenya might be included in this area.

v) Details of vessel deployment for Mozambican ports

Main line services

7 main lines out of 11 are for East Asia, 2 for Middle East/South Asia, 1 for Mediterranean and 1 for Europe.

As far as the main lines are concerned, the services for East Asia are dominant, due to Mozambican ports' geographical position on the east coast of the African continent, and traditionally close trade relationship with Asian countries.

In some trade lanes for East Asia, Mozambican ports are combined with IOI ports as they are located on the way from Asia. In the trade lanes for Middle East/South Asia, Kenyan and Tanzanian ports are combined.

Main line services for Europe, North/South America are mostly covered by transhipment through Durban.

(ii) Feeder services

All 6 feeder services call at Durban where major shipping lines have their transhipment hubs for the Southern African region.

The most frequent services are provided by Ocean Africa Container Line (OACL). OACL has a slot charter contract with Mozline who has the cabotage license in Mozambique. This is a common feeder service used by many main line carriers. United Africa Feeder Line has also common feeder services connecting with Indian Ocean Islands.

MSC has their own feeder vessels deployed in 2 different feeder loops; one to cover Nacala and the other to cover Beira. Those 2 ports are not covered with single loop in order to maintain a shorter turnround.

(iii) Services by port

- Nacala

5 main line services by CMA CGM, PIL, Emirates and Ignazio Messina call at Nacala, out of which 3 by CMA CGM and PIL are directly connecting Nacala with the Asian hub ports such as Singapore, Port Klang and Nhava Sheva for eastbound. However, currently no fixed-day service is available at Nacala due to unforeseen stay days there or in other preceding ports including Beira.

The particulars of liner vessels currently calling Nacala are shown in Table 2.4-11.

- Maputo

7 main line services by CMA CGM, Maersk, MOL, PIL, MACS and Ignazio Messina call at Maputo, out of which Mearsk and MOL have weekly fixed-day services with the berthing windows secured in MIPS. 4 main lines are directly connecting Maputo with the Asian hub ports such as Port Klang, Tanjung Pelepas and Pasir Gudang for eastbound trade.

- Beira

3 main line services by CMA CGM, PIL and Emirates call at Beira but none of them is weekly due to unforeseen berthing time there. Emirates is directly connecting Beira with Nhava Sheva.

- Pemba and Quelimane

Currently those 2 ports don't have large cargo source. Pemba is being covered by 1 main line and 1 feeder line; the main line served by PIL seems specialized for exported timbers.

Quelimane is covered by 2 feeder lines only. Quelimane drastically dropped its throughput in 2007 because Empresa Moçambicana de Navegação, S.A.R.L. (so called "Navique", the only national flag line before) ceased its coastal service which had been in operation from 1997 to 2007.

Table 2.4-11 Particulars of liner vessels calling Nacala

Shipping Line	Service Name	Vessel name	Vessel Type	Geared or not	Container Capacity (TEU)	LOA (m)	Draft (m)	Beam (m)	DWT	GT	Reefer Plug	Speed	Delivery date	Service Freqency	Calling Ports
CMA CGM	MOZEX	ESM Traveller	FC	Y	1,128	151.31	9.78	25.07	17,400	12,691	150	18.0	01-Nov-84	every 11 days	Port Klang-Pointes des Galets-Maputo-Beira-Nacala-Port Klang
		Karin Rambow	FC	Y	1,118	147.87	8.51	23.25	13,807	9,957	220	19.5	01-Sep-05		
		Orinoco River	FC	Y	1,118	147.84	8.51	23.45	13,760	9,940	220	20.0	01-Dec-07		
		Sea Venture	FC	Y	1,118	147.82	8.50	23.25	13,716	9,954	220	19.5	01-Sep-08		
	Swahili Express	Cassandra B	FC	Y	1,698	182.44	10.00	25.20	23,623	18,263	330	20.0	01-Sep-08	every 8 days	Nhava Sheva-Bandar Shahid-Jebel Ali-Khor Fakkan-Mombasa-Zanzibar-Dar es Salam-Nacala-(Longoni)-Nhava Sheva *( ): alternate calling
		CMA CGM Maasai	FC	Y	1,452	167.07	9.84	25.00	20,406	14,981	150	19.0	01-Oct-95		
		CMA CGM Kailas	FC	Y	1,858	195.50	11.00	27.80	24,279	21,971	300	23.0	01-Feb-06		
		Elisa Delmas	FC	Y	1,641	168.80	9.21	27.20	20,979	16,916	200	20.0	01-Apr-02		
		Nala Delmas	FC	Y	1,641	168.80	9.22	27.20	20,944	16,916	200	20.0	01-Oct-02		
		Warnow Trader	FC	Y	1,608	167.97	10.82	27.06	22,250	16,165	200	19.5	01-Dec-96		
MSC	Saf-Moz	MSC Leila	FC	Y	928	158.91	10.10	23.09	16,768	13,315	66	15.5	01-Jul-87	every 11 days	Durban-Maputo-Nacala-Durban
PIL	IOM	Kota Anggun	FC	Y	1,454	182.83	9.53	28.00	23,842	17,652	100	19.0	01-Jun-99	every 9 days	Singapore-Port Louis-Reunion-Toamasina-Beira-Nacala-Singapore
		Kota Hapas	FC	Y	1,080	159.53	9.22	25.00	18,889	13,491	150	18.5	01-Mar-02		
		Pacific Diamond	FC	Y	1,170	159.53	8.72	25.00	17,296	13,547	150	18.0	01-Jan-02		
		Kota Hakim	FC	Y	1,098	159.50	9.22	25.00	18,830	13,491	150	18.5	01-Sep-01		
Emirates Shipping	Gulf India Africa	Viona	FC	Y	1,853	178.57	10.86	28.20	22,248	17,360	385	21.0	01-Mar-06	2 sailing /month	Nhava Sheva-Karachi-Jebel Ali-Mombasa-Zanzibar-Dar es Salam-Nacala-Beira-Nhava Sheva
		Violetta	FC	Y	1,853	178.57	10.86	27.60	22,267	17,360	385	21.0	01-Feb-07		
		Wehr Oste	FC	Y	2,526	208.30	11.40	30.04	33,670	25,703	481	21.7	01-Nov-02		
OACL	East Coast	Barrier	FC	Y	1,162	162.92	8.10	22.30	14,099	10,743	100	17.5	01-Aug-97	3-4 sailing /month	Durban-Maputo-(Nacala)-(Beira)-Durban *( ): irregular calling
		Ridge	FC	Y	1,162	163.40	8.12	22.30	14,148	10,749	100	17.5	01-Jul-95		
MACS	African Coastal	White Rhino	SC	Y	474	113.00	8.39	19.03	9340	5977	0	14.0	01-Apr-86	every 10 days	Durban-Maputo-Beira-Quelimane-Nacala-Monbasa-Durban
		Black Rhino	SC	Y	364	139.20	3.77	16.70	5107	4976	0	11.5	01-Jul-95		

Source: Lloyds, MDS, web sites of the shipping lines

2.4.2 Assessment on the status of Mozambican ports in the container transport network

In this sub-section, the Study Team will analyze the current status of Mozambican ports from the view point of vessel deployment by shipping lines.

(1) Analysis on slot allocations

As observed in the previous sub-section, the larger vessels need to be deployed on longer-distance routes in order to maintain the unit cost for navigations at a fairly commercial level. However, in case the cargo source at a port is not sufficient to fill up the whole fleet capacity of a trade lane, some other ports need to be combined in the same trade lane.

Analysis on the slot allocation for a port in the total fleet capacity will give an idea on the relative position of the port in terms of the cargo source among other calling ports in the trade lanes.

1) Slot allocations for Mozambican ports

As shown in previous Table 2.4-5, average capacity per vessel deployed for Mozambican ports is 1,527 TEU. Total capacity of vessels in a year is 898,820 TEU which is considered to include the allocations for the other ports in South Africa, Western Africa, Kenya, Tanzania and Indian Ocean Islands which are located on the way of the trade lanes bound for Mozambique.

The average allocation for Mozambican ports alone is calculated as just 13.7% of total fleet capacity. The calculation is shown below:

	Throughput of the ports (TEU)		Total capacity of vessels deployed (TEU)		
Maputo	85,851		898,820		
Beira	92,236		×2 for discharge & loading		
Nacala	56,444				
Pemba	7,846				
Quelimane	4,426				
Total	246,803	÷	1,797,639	=	13.7%

When the same calculation is applied to each port of Maputo, Beira and Nacala, following results are given respectively:

Table 2.4-12 Average vessel allocations for Mozambican ports

	Throughput (TEU) A	Total Capacity (TEU) B	B×2 (TEU) C	Allocation (%) A÷C
Maputo	85,851	597,100	1,194,201	7.2%
Beira	91,029	249,283	498,566	18.3%
Nacala	52,088	188,371	376,742	13.8%

Source: Study Team

Maputo has a relatively low figure of 7.2% because it tends to be combined with the South African ports or Western African ports which have a larger cargo source than Maputo.

Beira has the highest figure of 18.3% because it is covered by more feeder vessels and fewer main lines than other ports.

2) Comparison with the other areas in Southern Africa

Table 2.4-13 below compares the allocations by port group in Southern Africa:

Table 2.4-13 Average vessel allocations for Southern Africa

Port Group	Throughput (TEU) A	Total Capacity (TEU) B	B×2 (TEU) C	Allocation (%) A÷C
Mozambican Ports	246,803	898,820	1,797,640	13.7%
South African Ports/Walvis Bay	3,979,597	5,140,830	10,281,660	38.7%
Indian Ocean Islands Ports	847,379	997,815	1,995,630	42.5%
Tanzanian Ports	364,000	992,873	1,985,746	18.3%

Source: the Study Team

The higher figures for South African/Walvis Bay ports and IOI ports are reflecting the contribution from the transshipment hubs such as Durban, Cape Town, Walvis Bay and Port Louis which are generating additional throughput to their own local cargo sources.

Tanzanian ports' figure of 18.3% might be improved if Mombasa were combined with Tanzanian ports.

The allocation of 13.7% for Mozambican ports is the lowest among all those areas, which means Mozambican ports are more "dependent" on the other ports' cargo sources from the viewpoint of vessel deployment.

The consideration above reveals that the ports in Mozambique don't have enough cargoes to fill up the whole capacity of the vessels deployed. This means that at present the ports in Mozambique cannot be served alone and need to be combined with some other ports in the adjacent areas such as in South Africa, IOI and Tanzania/Kenya. The above is more prevalent in the main line trades with long distance in which larger vessels are deployed.

In other words, it can be said that the Mozambican ports, with a strategic position in the container transport network, can induce vessel callings with a smaller cargo source, which must be an advantage to the port sector and exporters/importers in Mozambique.

(2) Recent trend of liner services in Mozambique

Reflecting the increasing cargo volume to/from Mozambican ports, the number of callings of main line services is in an upward trend in Mozambique. The new services recently announced by shipping lines are as follows:

- July, 2009 :

Maersk lines' new main line for Asia started to call at Maputo with weekly fixed-day service. The vessel leaving Maputo arrives at Tanjung Pelepas after 15 days.

- April, 2010 :

Emirates Shipping re-launched Gulf India Africa (GIA) service adding Nacala and Beira to the original ports of call.

- July, 2010 :

MOL's main line from Maputo to East Asia increased the frequency from every 10 days to weekly fixed-day. Transit time from Maputo to Port Klang is just 14 days, which is the fastest among other shipping lines.

It is a recent trend among the main line carriers to avoid the congestion at Durban where the handling capacity is reaching its limit and the state-owned operators' unions often go on strike. More

vessels are now coming to Maputo and the newly developed Ngqura as an alternative port in place of Durban. If Durban does not rectify this situation, the spill-over of cargoes might possibly gain momentum.

(3) Deteriorating competitiveness of Mozambican ports

Despite the shipping industry's positive trend above, Mozambican ports have some disadvantages besides those derived from infrastructures. Following weak points were revealed through the interviews by the Study Team with the various parties concerned.

1) Inbound transshipments hampered by customs regulations

As shown in previous Table 2.4-4, transshipment is not very common in Mozambican ports, with the exception of the 3,824 TEUs handled at Nacala in 2009.

It is partially because Durban is playing dominant role of a transshipment hub in the region. Currently, a substantial volume of import/export containers to/from Mozambican ports are transshipped at Durban.

The other critical reason is that, under current customs regulations in Mozambique (Ministerial Diploma No.10/2002), shipping lines are required huge amount of bond when they transship the inbound containers at Mozambican ports. The bond needs to be furnished to the customs at full amount of import duties on the cargoes to be transshipped. This seems to be discouraging the shipping lines who want to transship inbound containers at Mozambican ports.

2) Lack of domestic feeder line

As stated in the previous sub-section, Empresa Moçambicana de Navegação, S.A.R.L. ceased its coastal service in 2007. Since then, all coastal services have been undertaken by foreign shipping lines. It is observed that, due to the profit-oriented policy of those lines, the small ports such as Quelimane have a difficulty to secure the vessels for the exports of local products.

Development of a national shipping line to serve such small ports needs to be considered from the socio-economic viewpoint in order to encourage the trades by local industries in those areas. It will also have a beneficial effect on the major ports such as Maputo, Beira and Nacala to enhance their local-hub functions connecting with neighboring minor ports.

(4) Evaluation by UNCTAD

Trade Facilitation Working Group of UNCTAD started to release "Liner Shipping Connectivity Index (LSCI)" in 2004 to evaluate the availability of maritime networks for a country. LSCI is generated from 5 components: 1) number of vessels, 2) container-carrying capacity of those vessels, 3) maximum vessel size, 4) number of services, and 5) number of companies that deploy container ships on services to/from a country's ports. The LSCI score represents how a country is attractive or convenient to the shipping lines and the traders in view of the opportunity of shipping to/from a country. In 2009, Mozambique ranked 85th among 162 countries in the world. Table 2.4-14 shows the scores of the countries in Sub-Saharan Africa. Mozambique is below Mauritius, Namibia and Kenya, but nearly matches Tanzania. Sudan is rapidly catching up with Mozambique.

It is notable that Namibia, located on the opposite coast side of Southern Africa, has steadily been improving its LSCI score, which would be attributable to Walvis Bay's strategic policy and well-organized actions to induce transit cargoes to/from adjacent landlocked countries or transshipment cargoes from shipping lines.

The interviews by the Study Team with logistics companies in South Africa revealed that the positive inter-state actions are going on among the governments and private sectors in Namibia, Botswana and Zambia to de-regulate customs procedures at the border posts. Those countries seem to be solidarized under the initiatives named "Walvis Bay Corridor Group". The container terminal at Walvis Bay port introduced an incentive tariff for transit cargoes coming through those corridors. Mozambican ports need to pay close attention to the development of this port as a role-model.

Table 2.4-14 Liner Shipping Connectivity Index in 2009

Economy	2004	2005	2006	2007	2008	2009	World rank 2009	Change 2009/2008	Change 2009/2004
South Africa	23,13	25,83	26,21	27,52	28,49	32,07	29	3,58	8,94
Nigeria	12,83	12,79	13,02	13,69	18,30	19,89	50	1,59	7,06
Cote d'Ivoire	14,39	14,52	12,98	14,98	16,93	19,39	53	2,46	5,00
Ghana	12,48	12,64	13,80	14,99	18,13	19,33	54	1,20	6,85
Djibouti	6,76	7,59	7,36	10,45	10,43	17,98	58	7,55	11,22
Senegal	10,15	10,09	11,24	17,08	17,64	14,96	63	-2,68	4,81
Mauritius	13,13	12,26	11,53	17,17	17,43	14,76	64	-2,67	1,63
Togo	10,19	10,62	11,09	10,63	12,56	14,42	68	1,86	4,23
Namibia	6,28	6,61	8,52	8,37	11,12	13,61	69	2,49	7,33
Benin	10,13	10,23	10,99	11,16	12,02	13,52	70	1,50	3,39
Kenya	8,59	8,98	9,30	10,85	10,95	12,83	72	1,88	4,24
Cameroon	10,46	10,62	11,41	11,65	11,05	11,60	73	0,55	1,14
Congo	8,29	9,10	9,12	9,61	11,80	11,37	74	-0,43	3,08
Angola	9,67	10,46	9,46	9,90	10,22	11,31	75	1,09	1,64
Tanzania	8,10	8,59	8,71	10,58	10,46	9,54	83	-0,92	1,44
Mozambique	**6,64**	**6,71**	**6,66**	**7,14**	**8,81**	**9,38**	**85**	**0,57**	**2,74**
Sudan	6,95	6,19	5,67	5,66	5,38	9,28	86	3,90	2,33
Gabon	8,78	8,76	8,72	8,57	8,93	9,16	88	0,23	0,38
Madagascar	6,90	6,83	8,31	7,97	7,82	8,64	91	0,82	1,74
Guinea	6,13	6,89	8,71	8,47	6,41	8,32	97	1,91	2,19
Gambia	4,91	6,13	4,80	4,74	4,97	7,53	103	2,56	2,62
Sierra Leone	5,84	6,50	5,12	5,08	4,74	5,56	111	0,82	-0,28
Liberia	5,29	5,95	4,55	4,50	4,25	5,49	112	1,24	0,20
Cape Verde	1,90	2,28	2,76	2,45	3,63	5,13	115	1,50	3,23
Comoros	6,07	5,84	5,39	5,51	5,15	5,00	117	-0,15	-1,07
Seychelles	4,88	4,93	5,27	5,29	4,49	4,90	118	0,41	0,02
DRC	3,05	3,03	2,66	2,68	3,36	3,80	137	0,44	0,75
Guinea Bissau	2,12	5,19	5,03	5,22	5,34	3,54	143	-1,80	1,42
Eritrea	3,36	1,58	2,23		3,26	3,26	145	0,00	-0,10
Somalia	3,09	1,28	2,43	3,05	3,24	2,82	149	-0,42	-0,27
Sao Tome & Principe	0,91	1,28	1,57	1,64	2,54	2,38	153	-0,16	1,47

Source: UNCTAD "Transport Newsletter No.43"

(5) OD analysis of containers to/from Mozambican ports

Table 2.4-15 shows the breakdown of export/import container volume to/from Mozambican ports by trade region. The figures are roughly estimated by the Study Team based on the current region-wise vessel deployment shown in Table 2.4-5 and the "trade value" statistics for the year 2009 obtained from National Institute of Statistics (INE), while the "trade volume" statistics were not available at both INE and Customs.

Table 2.4-15 OD of containers to/from Mozambican ports

Destination of export / Origin of import	Export		Import	
	TEU	Share	TEU	Share
Eastern/Southeastern Asia	51,500	46%	56,000	46%
Europe	31,600	28%	29,000	24%
Southern Asia	13,000	12%	10,700	9%
Southern Africa	4,600	4%	6,400	5%
Western Asia	3,800	3%	7,300	6%
Eastern Africa	2,500	2%	3,700	3%
Southern/Central America	2,200	2%	2,200	2%
Northern America	1,800	2%	2,800	2%
Western/Northern Africa	600	1%	1,400	1%
Oceania	200	0%	1,000	1%
Total	111,800	100%	120,500	100%

Source: Study Team

2.4.3 Bulk cargo transport

In this sub-section, transport network of dry/break/liquid bulk cargoes in/around Mozambique is analyzed. Table 2.4-16 shows the volume of international bulk cargoes handled in ports in/around Mozambique in 2008. The South African statistics don't classify dry/break bulk and liquid bulk separately, and only the aggregated volume of bulk cargoes is available. In Richards Bay, the major part of bulk cargo is dry bulk, and in Durban, the volumes of dry/break cargo and liquid cargo are roughly the same.

Richards Bay Port is by far the largest bulk port in the region. The port handles a huge amount of exported coal. Regarding inbound flow, Durban Port handles the largest volume. More than 70% of imported bulk cargos are petroleum and its products. In Mozambique, Maputo Port is the largest bulk port, which handles transit bulk cargoes (coal, magnetite, ferrochrome, etc.) from South Africa, and imported alumina to Mozal which is the largest factory in the country and the second largest aluminum producer in Africa. Beira Port handles a large amount of fuel, especially transit to Zimbabwe utilizing the advantage that the port is connected with its capital city by a pipeline. Handling volume of bulk cargo in Nacala Port is still very small. The port handles imported fuel mainly for local consumption, and clinkers for the cement industry. Nacala Port doesn't make good use of the deep water bay of Nacala. The maximum water depth alongside quays of the dedicated bulk terminal is 7.5 to 10.0 meters, which is not enough for efficient bulk cargo transport, and therefore larger bulk carriers are sometimes accommodated in the container terminal hampering container operations.

Besides public ports listed in the table, a private jetty for Moma Heavy Sand Project on the Southern coast of Nampula handles around 500,000 tons of exported ilmenite, zircon and rutile in 2009.

Table 2.4-17 to Table 2.4-19 show origin and destination of international bulk cargoes handled in Mozambican ports. Since CFM doesn't have data on origin and destination of cargoes, and the Customs office doesn't disclose OD data for individual ports, the Study Team estimated the OD using the port statistics and the trade data (OD by commodity) provided by SADC. In the estimation, it was assumed that the share of a country for a commodity was the same in all Mozambican ports, and the share remained unchanged since 2006 in which the updated SADC database is available. The result of an interview survey by the Study Team was also used in the estimation.

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 Aluminum produced by Mozal in Maputo are the main contributors. The principal exported commodities to Eastern Asia are mineral products such as magnetite, ferro-chrome and chrome ore. They are exported from South Africa or Zimbabwe via Maputo.

The import partners are more diversified than those of export destinations. The import volume from Western Asia is the largest followed by Oceania. Imported commodity from West Asia is oil products, whereas that from Oceania is Australian alumina which is the raw material for Mozal aluminum smelter. Substantial amount of wheat, oil products and clinker are imported from Europe. All imported commodities from Southern Africa listed in the tables come from the Republic of South Africa. The major commodities imported from the country are oil products and sulphur. It is probable that some amount of oil products are imported by land transport. This might have caused an overestimation of the Southern Africa's share.

Nacala Port exports few bulk cargoes. The major import origins for Nacala are Western Asia from which oil products are imported and South Eastern Asia which exports clinker to Mozambique.

The dominant import origin for Beira Port is also Western Asia, since the port handles a substantial amount of oil products which are transported to Zimbabwe via a pipeline.

Table 2.4-16 International bulk cargo handled in ports in/around Mozambique in 2008

(1000 tons)

	Export			Import		
	Dry/Break	Liquid	TOTAL	Dry/Break	Liquid	TOTAL
Dar es Salaam	122	52	174	1,493	2,142	3,635
Mtwara	29	0	29	34	6	40
Pemba	0	0	0	0	0	0
Nacala	56	0	56	331	119	450
Quelimane	0	0	0	0	0	0
Beira	247	0	247	695	974	1,669
Maputo	3,650	89	3,739	1,966	638	2,604
Rechards Bay			78,008			6,123
Durban			8,598			30,504

Source: Study Team

Table 2.4-17 OD of major bulk cargoes handled in Mozambican ports in 2008 (1)

(1,000 tons)

Maputo			
COMMODITY	VOLUME	TRANSIT FROM	EXPORTED TO
ALUMINUM	540		Europe (540)
MAGNETITE	800	South Africa (800)	Eastern Asia (540) Europe (260)
CITRUS	130	South Africa (40) Swaziland (30)	Europe (80) Others (50)
SUGAR	420	South Africa (190) Swaziland (100)	Europe (310) Eastern Africa (50) Southern Asia (40) Americas (20)
COAL	740	South Africa (740)	Europe (550) Western Asia (80) Southern Asia (30) Northern Africa (30) Eastern Africa (20) Americas (20)
FERRO-CHROME	460	South Africa (300) Zimbabwe (160)	Eastern Asia (310) Europe (100) Americas (50)
CHROME ORE	350	South Africa (340) Zimbabwe (10)	Eastern Asia (230) Europe (70) Americas (50)
COMMODITY	VOLUME	TRANSIT TO	IMPORTED FROM
CLINKER	140		South Eastern Asia (80) Southern Asia (30) Europe (30)
WHEAT	100		Europe (60) Americas (40)
ALUMINA	1,000		Oceania (1,000)
PET COKE	210		Southern Asia (110) Americas (100)
SULPHUR	160		Southern Africa (160)
FUEL OIL	600		Western Asia (330) Southern Asia (70) Southern Africa (70) Americas (60) Europe (40) South Eastern Asia (30)

Source: Study Team

Table 2.4-18 OD of major bulk cargoes handled in Mozambican ports in 2008 (2)

(1,000 tons)

Beira			
COMMODITY	VOLUME	TRANSIT FROM	EXPORTED TO
GRANITE	120	Zimbabwe (120)	NA
COMMODITY	VOLUME	TRANSIT TO	IMPORTED FROM
FUEL OIL	940	Zimbabwe (580) Malawi (180)	Western Asia (520) Southern Asia (110) Southern Africa (110) Americas (90) Europe (60) South Eastern Asia (50)
WHEAT	210	Zimbabwe (40) Malawi (80)	Europe (130) Americas (80)
CLINKER	230	Malawi (40)	South Eastern Asia (130) Southern Asia (50) Europe (50)
FERTILIZER	190	Zimbabwe (30) Malawi (120) Zambia (30)	Western Asia (120) Southern Africa (40) Southern Africa (30)
Nacala			
COMMODITY	VOLUME	TRANSIT TO	IMPORTED FROM
FUEL OIL	120	Malawi (30)	Western Asia (70) Southern Asia (10) Southern Africa (10) Americas (10)
CLINKER	130		South Eastern Asia (70) Southern Asia (30) Europe (30)

Source: Study Team

Table 2.4-19 Origin and destination of bulk cargoes to/from Mozambican ports in 2008

EXPORT

DESTINATION	SHARE	MAJOR COMMODITIES (1,000 tons)
Europe	57%	COAL (550), ALUMINUM (540), SUGAR (310), MAGNETITE (260), FERRO-CHROME (100), CITRUS (80), CHROME ORE (70)
Eastern Asia	32%	MAGNETITE (540), FERRO-CHROME (310), CHROME ORE (230)
Americas	4%	FERRO-CHROME (50), CHROME ORE (50), COAL (20), SUGAR (20)
Western Asia	2%	COAL (80)
Eastern Africa	2%	SUGAR (50), COAL (20)
Southern Asia	2%	SUGAR (40), COAL (30)
Northern Africa	1%	COAL (30)

IMPORT

ORIGIN	SHARE	MAJOR COMMODITIES (1,000 tons)
Western Asia	26%	FUEL OIL (920), FERTILIZER (120)
Oceania	25%	ALUMINA (1,000)
Europe	11%	WHEAT (190), CLINKER (110), FUEL OIL (100), FERTILIZER (30)
Southern Africa	10%	FUEL OIL (190), SULPHUR (160), FERTILIZER (40)
Southern Asia	10%	FUEL OIL (190), CLINKER (110), PET COKE (110)
South Eastern Asia	9%	CLINKER (280), FUEL OIL (80)
Americas	9%	FUEL OIL (160), WHEAT (120), PET COKE (100)

Source: Study Team

In general, major bulks such as coal are transported by the hub and feeder system as shown in Figure 2.4-14, in which cargoes are shipped from a deep-sea port adjacent to a cargo source such as a

mine, an oil field and a breadbasket 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 destination. The locations of hub ports for bulk cargoes are different from those for container hubs which are located along international trunk routes even in a place remote from the production center or consumption center. Bulk hub ports are normally located near the production and consumption center of a country or a region.

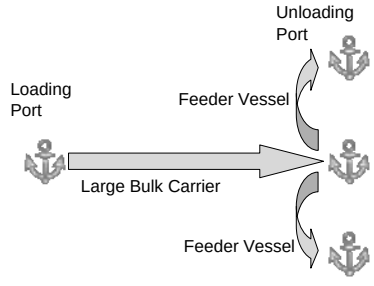
Table 2.4-20 shows typical sailing routes of bulk carriers and tankers calling at Nacala Port from October to December 2009. The sailing pattern at Nacala Port is quite different from the above mentioned pattern as shown in the table. Normally tankers calling at Nacala Port also call at several ports in the region including Maputo and Beira, and then go back to the Middle East or South East Asia. Routes of dry bulk carriers are similar to these. They call several ports in the region to discharge cargoes, and then go to Durban or Richards Bay probably to load cargoes in a different contract. Nacala is a deeper port than other Mozambican ports, but the port is not always the first port. Though a hub and feeder system exists in Mozambique for the shipment of fuel to Quelimane and Pemba, the transport volume is very small.

There are two reasons why a hub and feeder system is not adopted for bulk transport in Mozambique. One reason is the absence of appropriate hub ports. Maputo and Beira are shallow ports, and are not suitable for bulk-hubs. In the deep-water bay of Nacala, there is no deep-water bulk terminal at present. Richards Bay and Durban are major bulk ports in the region, but they are not major hub ports as shown in Figure 2.4-15. Durban is a very busy port, and water depths alongside quays are not enough for being a bulk hub. Richards Bay has deep-water quays, but the port is focused on providing an efficient transport route for the huge amount of bulk cargo generated in its hinterland. Dar es Salaam is a shallow and busy port for serving its hinterland. Another reason is the limited volume of bulk cargo demands in the country.

Table 2.4-20 Typical sailing route of bulk carriers and tankers calling at Nacala Port

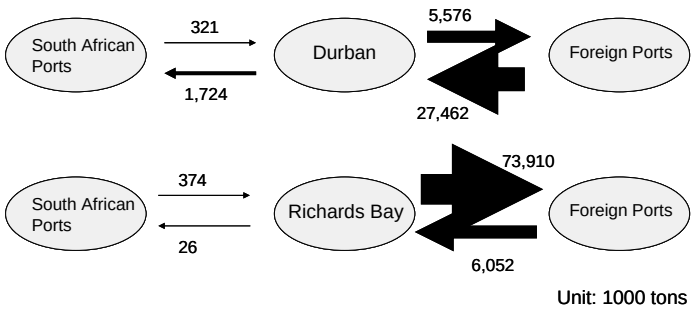
Vessel Name	DWT	Draft (m)	Type	Commodity Loaded or Discharged at Nacala	Route						
VOLA 1	20,620	8.2	Bulk Carrier	D Fertilizer L Sugar	Egypt	**Nacala**	Beira	**Nacala**	Durban	Portugal	
ARGOSY	41,035	11.5	Clude/Oil Product Tanker	D Oil Product	UAE	Durban	Maputo	Beira	**Nacala**	UAE	
BOW PRIDE	45,655	12.9	Chemical/Product Tanker	D Oil Product	Malaysia	**Nacala**	Durban	Indonesia			
CHENSTRANS ELBE	13,006	8.7	Chemical/Product Tanker	D Oil Product	Indonesia	**Nacala**	Kuwait				
OMIROS	42,183	11.5	Bulk Carrier	D Wheat	Gibraltar	**Nacala**	D. Salaam	Mombasa	Richards B		
EMPEROR	38,870	10.9	Bulk Carrier	D Wheat	U.K.	Beira	**Nacala**	Maputo	Durban	Gibraltar	
MAERSK MAY	47,401	12.6	Product Tanker	D Oil Product	Singapore	Maputo	Durban	**Nacala**	Beira	Durban	UAE
RAFFLES PARK	41,315	11.6	Chemical/Product Tanker	D Oil Product	UAE	**Nacala**	Maputo	**Nacala**	Mauritius	UAE	
CONCORDI	38,960	10.8	Chemical/Product Tanker	D Oil Product	Malaysia	Durban	**Nacala**	Durban	Mombasa	Yemen	
CHAMPION P.	38,465	11.6	Chemical/Product Tanker	D Oil Product	Indonesia	D. Salaam	**Nacala**	Beira	Maputo	Indonesia	
SUNNY GORY	56,057	12.6	Bulk Carrier	D Wheat	Turkey	Gibraltar	Durban	**Nacala**	Mombasa	Richards B	India
AEGEAS	39,378	11.7	Chemical/Product Tanker	D Oil Product	UAE	**Nacala**	Maputo	Beira	Maputo	UAE	
BOW VIKING	33,644	10.1	Chemical Tanker	D Oil Product	Malaysia	**Nacala**	Beira	Maputo	Richards B	India	
GAGAR	40,354	11.1	Chemical/Product Tanker	D Oil Product	Malaysia	Singapore	Mombasa	**Nacala**	Durban	Indonesia	

Source: Study Team



Source: Study Team

Figure 2.4-14 Hub and feeder system for bulk cargo transport



Source: Study Team

Figure 2.4-15 Bulk cargo flow via South African ports

2.5. Present conditions of Nacala Port and major ports in/around Mozambique

2.5.1 Nacala Port

(1) Overview

The Port is located in the deep water bay of Nacala in Nampula Province, the most populated Province in Mozambique. Nacala is about 1500 km north-east of Maputo, 850 km north-east of Beira and 860 km south of Dar es Salaam.

The Port is a natural deep-sea port. Currently the Port is the second deepest port in south-eastern Africa, and much deeper quays will be able to be constructed without major dredging work.

The Port serves for cargo demands in Northern Mozambique. At present, the volume of transit cargo from/to Malawi is small due to the terrible conditions of Nacala Corridor; however, the on-going and planned improvement projects of the Corridor are expected to increase the transit cargo volume dramatically. Development of Northern Provinces in Mozambique is one of the prioritized strategies of GOM, and a variety of industrial development projects are on-going or planned there, which include agricultural development in Nampula, forestry development in Niassa, and SEZ development in Nacala. The Port is expected to support these projects, and these projects are expected to increase the handling volume of the Port greatly. The planned coal mining project in Tete Province is expected to bring a large amount of cargoes to the Port.

(2) Port facilities and equipment

The Port has a container terminal (South Wharf) and a conventional cargo terminal (North Wharf) as shown in Figure 2.5-1. The northern part of the conventional terminal is dedicated to liquid bulk handling. A four kilometer pipeline connects the terminal and storage tanks.

The North Wharf has a length of 620 m, while the South Wharf has a length of 372 m. The water depth of the former varies from -7.5 m to -10 m. The latter has a water depth of -14 m over the full length.

The eastern half of the North Wharf has a water depth of -10 m and is used for the mooring of tankers and bulk carriers (for fertilizer and plaster) and general cargo vessels. The western half of the North Wharf is underused. The damaged pavement of the apron remains unrepaired.

The South Wharf accommodates two container vessels at a time. Large draft dry bulkers carrying wheat and clinker are also moored at the South Wharf hampering container operation.

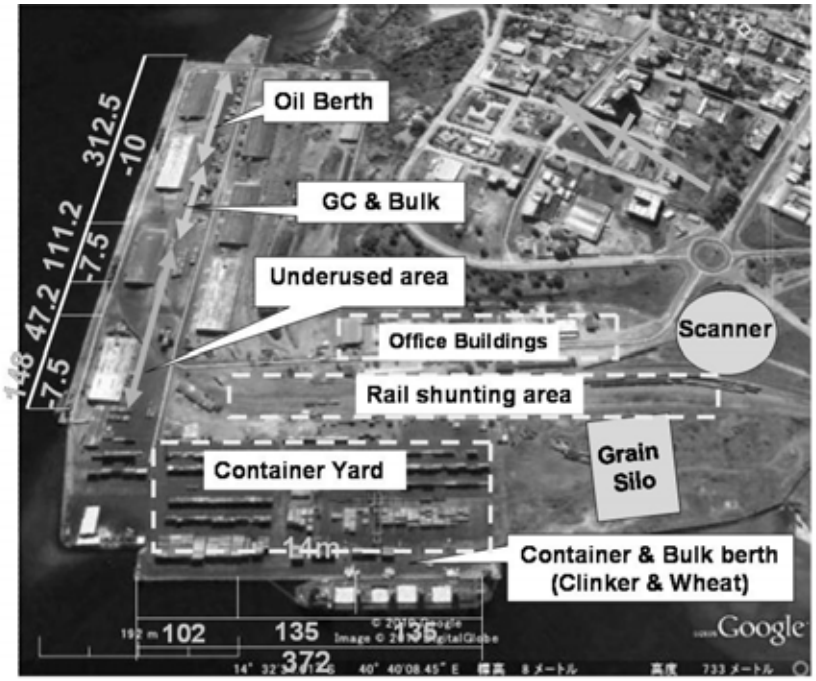
The piers in the South Wharf and a part of piers in the North Wharf are heavily damaged. This hampers cargo operation and makes the handling productivity very low. The deterioration will be assessed in Chapter 4.

Rail shunting area and the main port road run parallel to the South Wharf, and divide the port into two zones, the north and the south wharves. Since there is no marshalling yard or depot for the railway out side the port, all railway operation is conducted inside the port terminal.

Scanning facilities are located outside of the port gate.

The specifications of the container terminal are summarized in Table 2.5-1 and the layout of the terminal is shown in Figure 2.5-2. The maximum storing capacity when three high (full) and four high (Empty) and using all overspill and pre-stacking areas is 6.722 TEUs. There are 24 connection points for reefer containers.

The Port has an inland empty container stock yard called Dry-Park outside the port area (Figure 2.5-3). Two heavy machines converted from power shovels are utilized to stock empty containers in the Dry-Park. The capacity of the Dry-Park is 1,678TEUs. Besides the Dry-Park, the Port has stack areas for empty containers outside the container terminal but inside the port area, of which the total capacity is 1,740 TEUs.



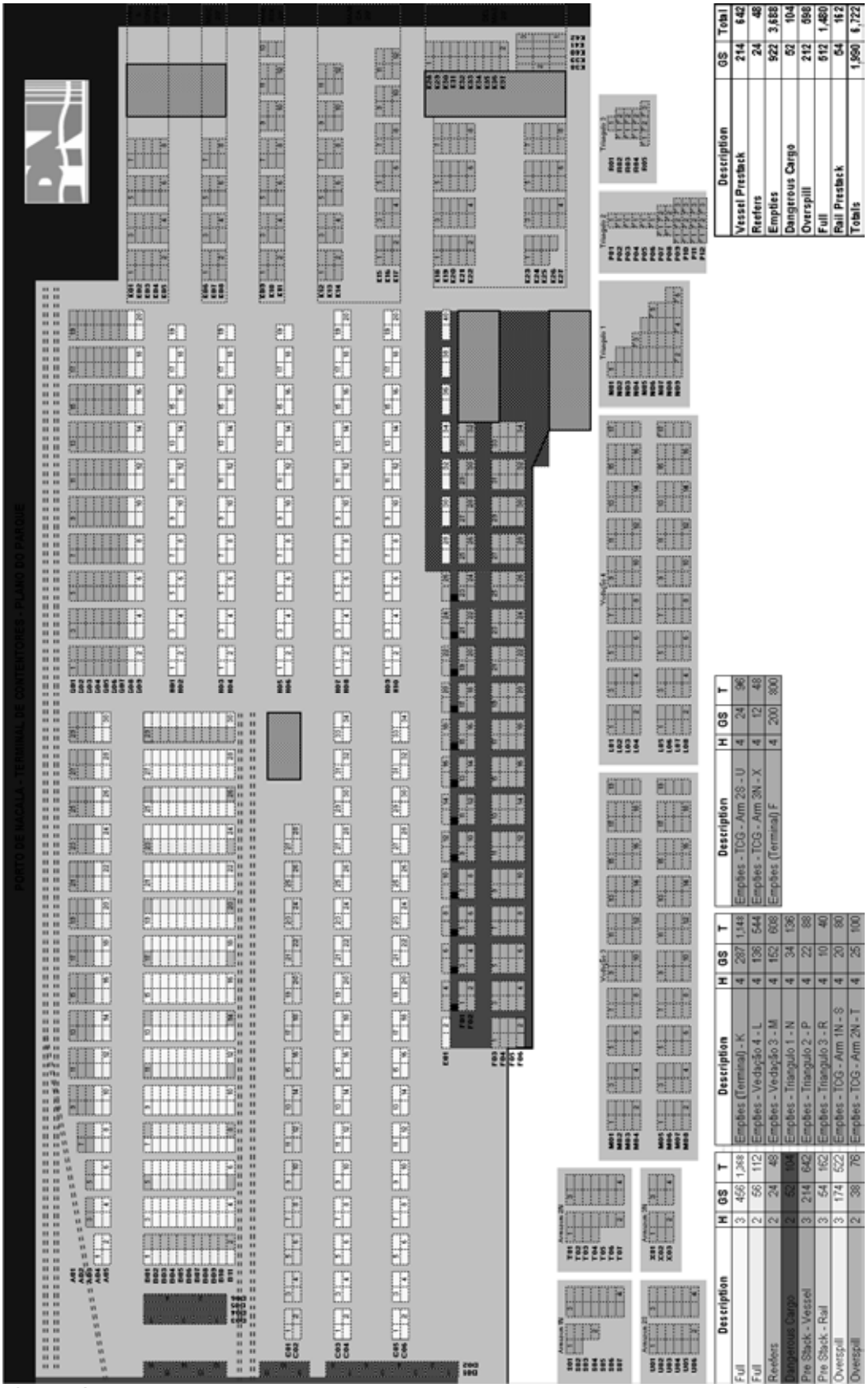
Source: Study Team

Figure 2.5-1 Berth allocation of the existing Nacala Port

Table 2.5-1 Specifications of the container terminal

Quay length:	:	372 m (2 quays)
Maximum draft	:	14 m
Handling capacity	:	75.000 TEUs/year
Storage capacity	:	3.750 containers
Electric points	:	21 for refer containers
Lifting Equipment	:	3 (2x45 tons and 1x9 tons)
Reachstackers:	:	3x45 tons
Trailers	:	2
Tractors	:	1
Electrical cranes	:	1 with 22 tons capacity
Gantry crane	:	1 rail/truck transfer gantry crane with 25 ton handling capacity

Source: CDN (Reorganized by the Study Team)



Description	GS	Total
Vessel Prestack	214	642
Reefers	24	48
Empties	922	3,688
Dangerous Cargo	52	104
Overspill	212	636
Full	512	1,480
Rail Prestack	54	162
Totals	1,990	6,722

Description	H	GS	T
Full	3	456	1,368
Full	2	56	112
Reefers	2	24	48
Dangerous Cargo	2	52	104
Pre Stack - Vessel	3	214	642
Pre Stack - Rail	3	54	162
Overspill	3	174	522
Overspill	2	38	76

Description	H	GS	T
Empties (Terminal) - K	4	287	1,148
Empties - Vedação 4 - L	4	136	544
Empties - Vedação 3 - M	4	152	608
Empties - Triangulo 1 - N	4	34	136
Empties - Triangulo 2 - P	4	22	88
Empties - Triangulo 3 - R	4	10	40
Empties - TCG - Arm 1N - S	4	20	80
Empties - TCG - Arm 2N - T	4	25	100

Description	H	GS	T
Empties - TCG - Arm 2S - U	4	24	96
Empties - TCG - Arm 3N - X	4	12	48
Empties (Terminal) F	4	200	800

Source: CDN

Figure 2.5-2 Layout of Nacala container terminal

Source: Study Team

Figure 2.5-3 Dry-park of the Port

The specifications and the layout of the conventional terminal are shown in Table 2.5-2 and Figure 2.5-4. Quay side warehouse 1 and 4 are dedicated to fertilizer, warehouse 2 and 3 are dedicated to sugar. Those warehouses are lent to specific users. The Port has 6 quay cranes on the conventional terminal, but 2 of them are out of order.

Table 2.5-2 Specifications of the conventional terminal

Quay length:	:	620 m (4 quays)
Maximum draft	:	10 m
Handling capacity	:	2.400.000 tons/year
Warehouses	:	8 with storing capacity of 50.000 tons
Electrical cranes	:	4 (2x5 tons, 1x10 tons and 1x20 tons)
Forklifts	:	3 (1x3 tons and 2x2.5 tons)
Bagging Machines	:	3
Trimming Machines	:	1
Grabs	:	7
Hoppers	:	6
Front-end-loaders	:	2

Source: CDN

Source: Study Team, Google

Figure 2.5-4 Layout of conventional terminal

Table 2.5-3 Dimensions of warehouses and open yards in the Port

	Area	Frontage	Depth	Floor	Commodity
Warehouse 1	3,040 m^2	80m	38m	1	Fertilizer
Warehouse 2	2,880 m^2	80m/60m	38m/30m	1	Sugar
Warehouse 3	3,800 m^2	100m	38m	1	Sugar
Warehouse 4	3,800 m^2	100m	38m	1	Fertilizer
Warehouse A	3,800 m^2	100m	38m	1	Wheat
Warehouse B	3,800 m^2	100m	38m	1	Fertilizer
Warehouse C	3,800 m^2	100m	38m	1	Fertilizer
Open yard 1	2,800 m^2	140m	20m	-	Scrap metal
Open yard 2	3,600 m^2	80m	45m	-	Fertilizer

Source: Scaled up by the Study Team

(3) Cargo throughput and vessel traffic

Figure 2.5-5 shows the historical change of cargo handled in Nacala Port. The average growth rate of the total handling volume in the last ten years is 7.6%, whereas the average growth rate of container cargoes in the same period is 8.8%. The container growth rate in the last five years recorded 12.3%. Domestic cargoes have been decreasing.

As shown in Figure 2.5-6, more than 95% of cargoes are international cargoes including transit and transshipment cargoes. The volume of inbound cargoes is larger than that of outbound cargoes both in Mozambican cargo and transit cargo.

Figure 2.5-7 shows the breakdown of cargoes handled in the Port in 2009 by cargo types. The volume of bulk and break bulk cargo is slightly larger than that of containerized cargoes. Almost all of the bulk and break bulk cargoes are inbound cargoes, whereas inbound and outbound container cargoes are balanced. However, this doesn't mean that numbers of laden containers are balanced and few empty containers are generated. As shown in Table 2.5-4, larger numbers of 20-foot laden containers are exported than imported containers, and on the other hand, larger numbers of 40-foot laden containers are imported than exported containers. Thus the traffic of each length of containers is not balanced, and a considerable amount of empty containers are generated. As for transit containers, the numbers of inbound and outbound are balanced. As shown in Figure 2.5-8, around one third of the total containers are empty containers. The ratio of empty containers is relatively high.

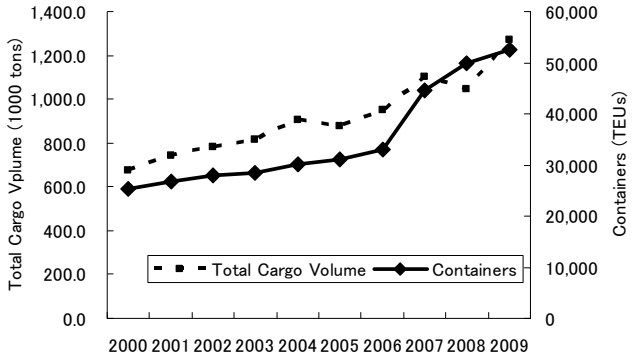
As shown in Figure 2.5-9, around three quarters of total containers are international cargoes to/from Mozambique, and the percentage of the transit cargo is around 10%. The ratio of transit containers is rather small compared with Maputo or Beira due to the condition of roads and railways connecting with LLCs.

It is remarkable that the Port handles transshipment cargoes, even though the quantity is very small. Nacala is the sole Mozambican port which handles transshipment containers. There are likely three reasons why the Port has been handling transshipment containers. The first reason is its geographical location. Since Nacala is located in an aperture between Eastern Africa and Southern Africa, the Port can attract both Southern African loop service and Eastern African loop service. The transshipment cargoes currently handled at Nacala Port are cargoes transported from Beira or Maputo by the Southern African loop (cabotage transport by foreign flag vessels) and transshipped at Nacala to the Eastern African loop bound for South Asia. The second reason is the water depth. Since there is no tidal restriction in Nacala unlike other ports in the region, the port doesn't hinder the sailing schedule of container vessels. The third reason is the remaining capacity of the Port.

Figure 2.5-10 shows the historical change of container cargoes handled in Nacala Port. The graph demonstrates indicators where the volumes handled in 2004 are 1.0. Transshipment is rapidly increasing. Although the tendency cannot be extrapolated simply because it can fluctuate by the change of policy of a shipping company, it can at least be said that Nacala shows promise as a local transshipment port.

The figure indicates also that the growth of transit cargoes is rather modest and the domestic

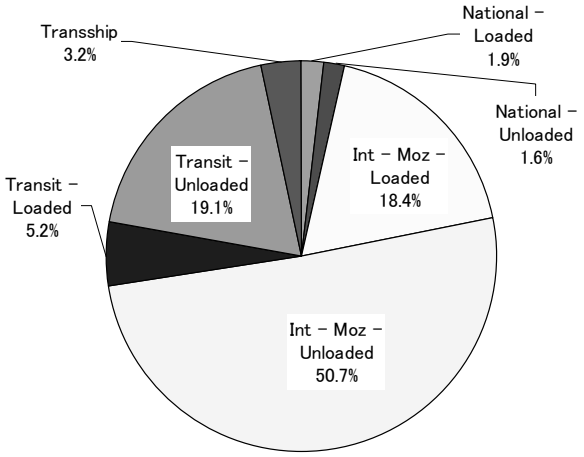
containers are decreasing.



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Cargo Volume (1000 tons)	673	743	780	818	907	875	950	1,100	1,046	1,270
Domestic					95	73	79	75	59	44
International - Moz					628	616	741	784	699	878
International - Transit					175	185	108	218	253	303
International - Transship					9	2	23	23	35	45
Containers (TEUs)	25,307	26,709	28,063	28,527	30,225	31,118	33,128	44,687	49,770	52,620
Domestic					5,625	4,955	5,344	4,793	3,787	4,356
International - Total					24,600	25,849	26,788	37,558	43,104	48,264
- Mozambique					18,869	21,691	22,879	31,515	36,896	38,262
- Transit					5,153	4,158	3,909	6,043	6,208	6,178
- Transship					578	314	996	2,336	2,879	3,824

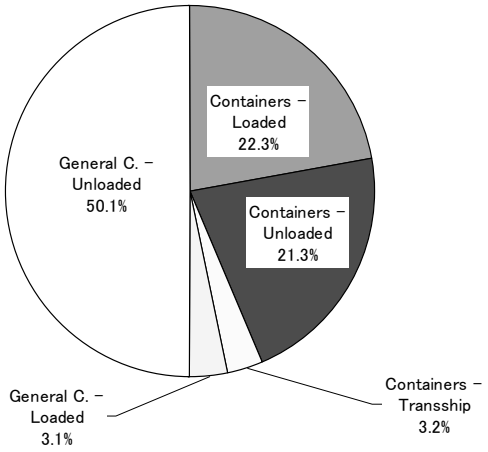
Source: CFM (reorganized by the Study Team)

Figure 2.5-5 Historical change of cargoes handled in Nacala Port



Source: CFM (reorganized by the Study Team)

Figure 2.5-6 Breakdown of cargoes handled in Nacala Port in 2009 by trade direction



Source: CFM (reorganized by the Study Team)

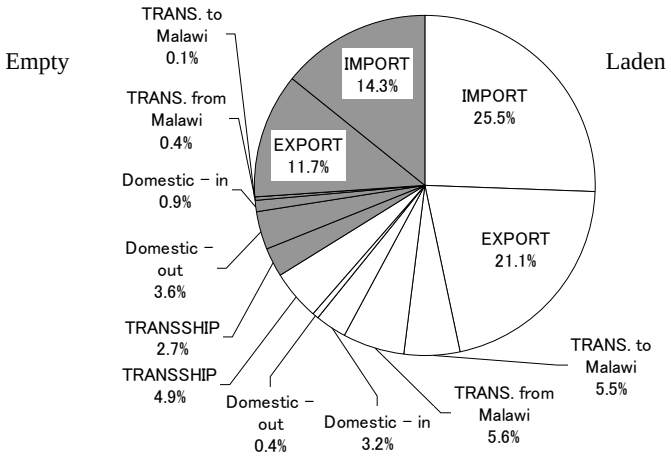
Figure 2.5-7 Breakdown of cargoes handled in Nacala Port in 2009 by cargo types

Table 2.5-4 Numbers of containers handled in 2009

(TEUs)

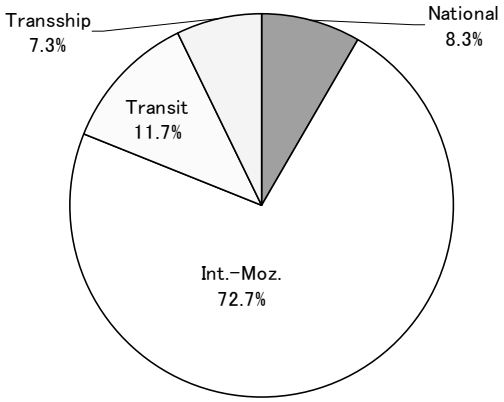
	INBOUND		OUTBOUND			
	Laden	Empty	Laden	Empty	Laden	Empty
	IMPORT		EXPORT		TRANSSHIP	
20'	5,976	7,131	9,588	2,249	2,136	188
40'	3,804	232	811	1,998	233	629
	TRANSIT - Discharged		TRANSIT - Loaded			
20'	2,627	0	2,659	215		
40'	138	28	172	0		
	DOMESTIC - Discharged		DOMESTIC - Loaded			
20'	1,713	370	65	1,140		
40'	7	63	68	396		

Source: CDN (reorganized by the Study Team)



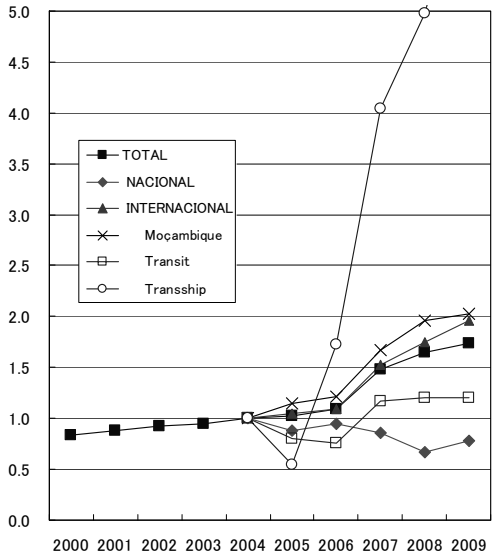
Source: CFM (reorganized by the Study Team)

Figure 2.5-8 Breakdown of laden and empty containers in 2009



Source: CFM (reorganized by the Study Team)

Figure 2.5-9 Breakdown of container cargoes handled in Nacala Port in 2009 by traffic type



Source: CDN (reorganized by the Study Team)

Figure 2.5-10 Historical change of container cargoes handled in Nacala Port

Table 2.5-5 Unit weight of containerized cargoes

(tons/TEU)

IMPORT	11.2
EXPORT	16.5
TRANS. to Malawi	14.8
TRANS. from Malaw	14.1
DOMESTIC - in	9.1
DOMESTIC - out	1.7
TRANSSHIP	12.7
AVERAGE	13.4

Source: Study Team

Table 2.5-5 shows the unit weight of containerized cargoes handled in the Port. Since the statistics of CDN include the weight of boxes for both laden and empty containers, the average weight

of one TEU empty was assumed to be 2.3 tons and the box weight was deducted in the calculation of the unit weight. The unit weight of 13.4 tons per TEU was obtained. Exported containers tend to be heavier than imported containers. The calculated unit weight for out-bound containers is quite strange. This would be due to statistical error because the handled volume is very small.

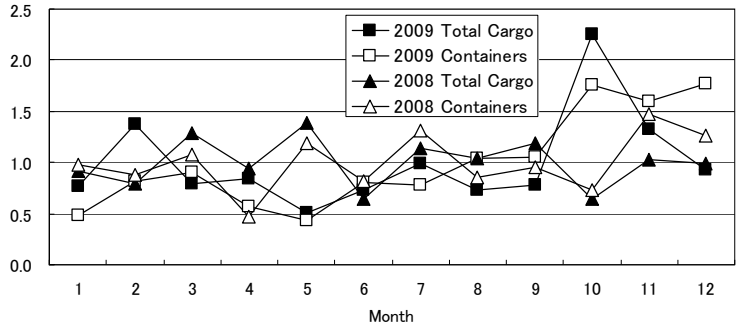
Table 2.5-6 is the breakdown of commodities handled in the Port. Almost all inbound domestic traffic is occupied by containers, whereas the major commodity of outbound domestic traffic is fuel. Almost all of exported cargoes from Mozambique are containerized. Around one third of imported cargoes are containers. Other major imported commodities are clinker, fuel, cereal and cement. Outbound transit cargoes consist of containers and bugged sugar. Inbound transit cargoes are more diversified, which consist of containers, fertilizer, fuel, cereal, and miscellaneous conventional cargoes.

Table 2.5-6 Breakdown of commodities handled in Nacala Port

(1000 tons)

	NACIONAL		INTERNACIONAL-MOZ		TRANSIT		TRANSSHIP	
	2008	2009	2008	2009	2008	2009	2008	2009
TOTAL	58.6	44.2	699.4	877.6	256.4	307.5	31.5	40.9
LOADED								
SUB TOTAL	28.5	23.5	222.8	234.0	72.9	65.5		
CONTAINERS	8.8	8.3	194.8	225.4	44.6	49.8		
FUEL	19.34	15.2						
AGRICULTURAL PROD.			8.8	3.6	28.2	15.7		
Sugar					28.2	15.7		
OTHERS	0.3	0.0	19.4	5.0				
DISCHARGED								
SUB TOTAL	30.1	20.7	476.7	643.6	183.5	242.0		
CONTAINERS	29.3	18.7	165.5	201.5	45.1	49.8		
FUEL	0.0	1.7	93.5	117.8	25.2	35.3		
AGRICULTURAL PROD.			80.5	128.6	3.0	57.1		
Cereal			54.0	89.7	0.0	49.9		
Others			26.5	38.9	3.0	7.2		
MINERAL PROD.			133.6	134.3				
Clinker			133.6	134.3				
CEMENT			0.0	53.8				
FERTILIZER					30.0	43.4		
OTHERS	0.8	0.3	3.6	7.6	80.2	56.4		

Source: CFM (reorganized by the Study Team)



Note: The data is based on the statistics of CDN, therefore liquid bulk handled by CFM is excluded.
Source: Study Team

Figure 2.5-11 Monthly fluctuation of cargo handling volume in Nacala Port

Figure 2.5-11 shows the monthly fluctuation of handling volume in the Port. There is no clear seasonal tendency both in total cargo flow and container flow. The monthly peak ratio (the average of 2008 and 2008) is 1.8 for total cargoes, and 1.6 for containers, respectively.

Table 2.5-7 shows the comparison of port statistics and railway statistics for transit cargo to/from Malawi in 2009. This indicates that the share of railway for transit transport is very large. The railway transport account for around 70 % of total transit traffic, and almost all outbound transit cargoes are transported by railway. The railway share in inbound traffic is smaller. This is probably due to limited availability of inbound trains, for which transport demands are two times larger than those for down trains.

On the other hand, the modal share of railway for domestic transport of exported or imported cargoes to/from Mozambique is very small. Even when all of domestic cargo transported by Nacala Railway is assumed to be port cargo, modal share of the railway is around 7 %.

Table 2.5-8 shows the number of vessel calls at the Port in 2008 and 2009. The Port received 299 vessels including 108 container vessels in 2009. This means that the average cargo handling volume per vessel call is around 4,000 tons or 480 TEUs (inbound plus outbound).

As shown in Table 2.5-9, 50,000 DWT-class vessels call at the Port almost every month and occasionally even larger vessels enter the Port. Though all of these large vessels are conventional vessels such as grain bulkers, they berth at container quays due to the shortage of water depth of general cargo quays. This “mixed operation” makes port traffic very complicated and hampers container operation.

Table 2.5-7 Hinterland transport of transit cargoes in 2009

(1000 tons)

TRANSIT CARGO OF THE PORT		RAIL TRANSIT CARGO			SHARE OF RAIL
DISCHARGED		UP			
Subtotal	237.9	Subtotal	145.4		61.1%
Cereal	49.9	*Wheat*	28.6		57.4%
Fuel	35.3	*Fuel*	21.6		61.2%
Fertilizer	43.4	*Fertilizer*	33.8		77.9%
Containers	90.7	*Containers*	51.2		56.4%
Other agricultural	7.2	*Clinker*	5.5	}	54.3%
Others	11.4	*Others*	4.6		
LOADED		DOWN			
Subtotal	65.5	Subtotal	68.1		104.0%
Sugar	15.7	*Sugar*	9.0		
Containers	49.8	*Containers (sugar)*	37.2		
		Contentores (pea)	14.5		
		Containers (others)	2.9		
		Others	4.6		
TOTAL TRANSIT CARGO	303.4	TOTAL TRANSIT CARGO	213.5		70.4%

Source: Study Team

Table 2.5-8 Numbers of vessel calls at Nacala Port

	2008	2009
TOTAL	263	299
CDN	206	237
CABOTAGE	44	23
General cargo	1	0
Container	19	0
Others	1	0
Tanker	23	23
LONG DISTANCE	162	214
General cargo	40	37
Grain	3	10
Others	6	11
Container	78	108
Tanker	35	48
CFM	57	62

Source: CFM, CDN (reorganized by the Study Team)

Table 2.5-9 Dimensions of maximum vessels calling at Nacala Port

	2008	2009											
		JAN.	FEV.	MAR.	APR.	MAY.	JUN.	JUL.	AGO.	SEP.	OCT.	NOV.	DEC.
LOA (m)	228.0	185.1	189.9	196.5	199.8	185.7	189.4	186.5	193.0	190.0	195.6	189.9	190.0
Draft (m)	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	30,006	30,963	29,828	24,679	29,733	30,751	30,081	29,998	29,130	30,751	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

Note: The data is based on statistics of CDN, therefore tankers berthing CFM terminal are not included.
Source: CDN (reorganized by the Study Team)

(4) Operation and management

1) Framework of operation and management

Railroad Development Corporation ("RDC") and its consortium had been working to create a regional integrated port and railway transportation system for Mozambique, Malawi and Zambia since 1997. The consortium negotiated with CFM in January 1999 to concession the Port and the railway. The consortium included: Edlow Resources Limited ("ERL": Bermuda) and RDC as foreign investors, along with Mozambican private investors and CFM.

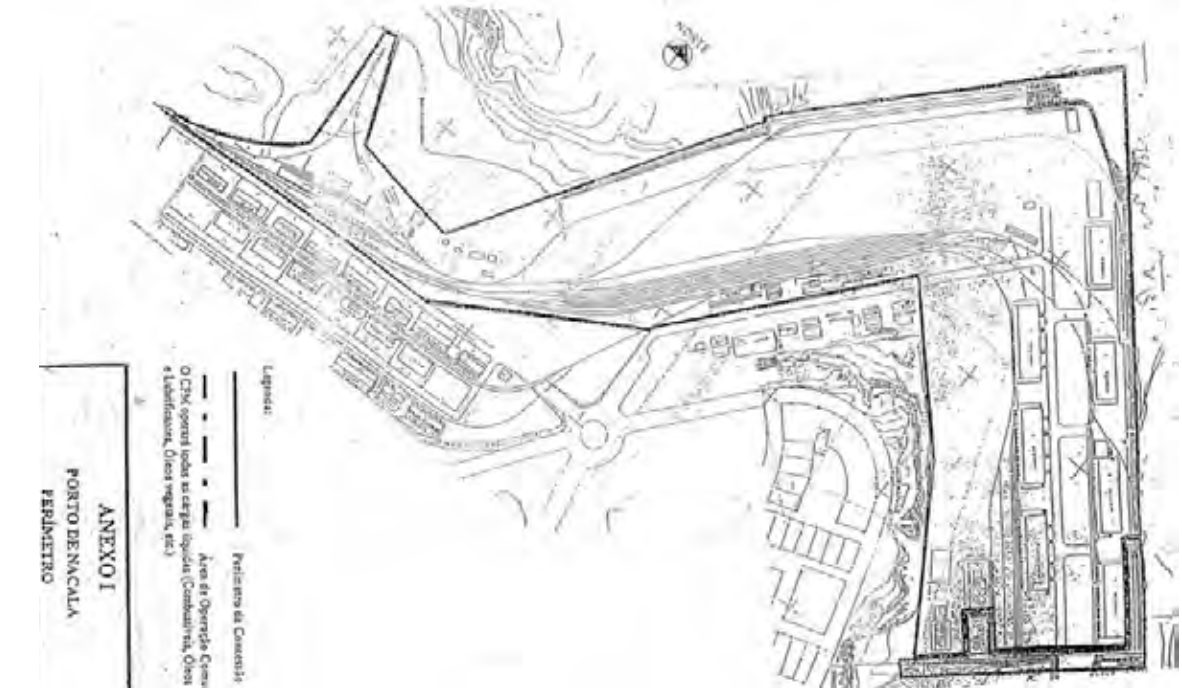
The concession agreement was entered into the 29th day of September 2000 between GOM including CFM and the CDN. In 2005 facilities of the Port were taken over by CDN. CDN has responsibilities, rights and duties to manage/operate/rehabilitate the Port for a 15-year concession from the day of take over and an option for a further 15 years.

On 12 September 2008, RDC and ERL sold their interests in CDN to Mozambican investor, Insitec Group. In 2010 Insitec sold the major part of its share of CDN to Vale Mozambique, which requires rehabilitation of the railway and construction of a new port terminal for the coal mining project in Tete Province.

The concessioned area includes both the container terminal and conventional terminal; however, the oil terminal is excluded from the concessioned area as shown in Figure 2.5-12. The oil terminal is managed and operated directly by CFM, like other major ports in the country.

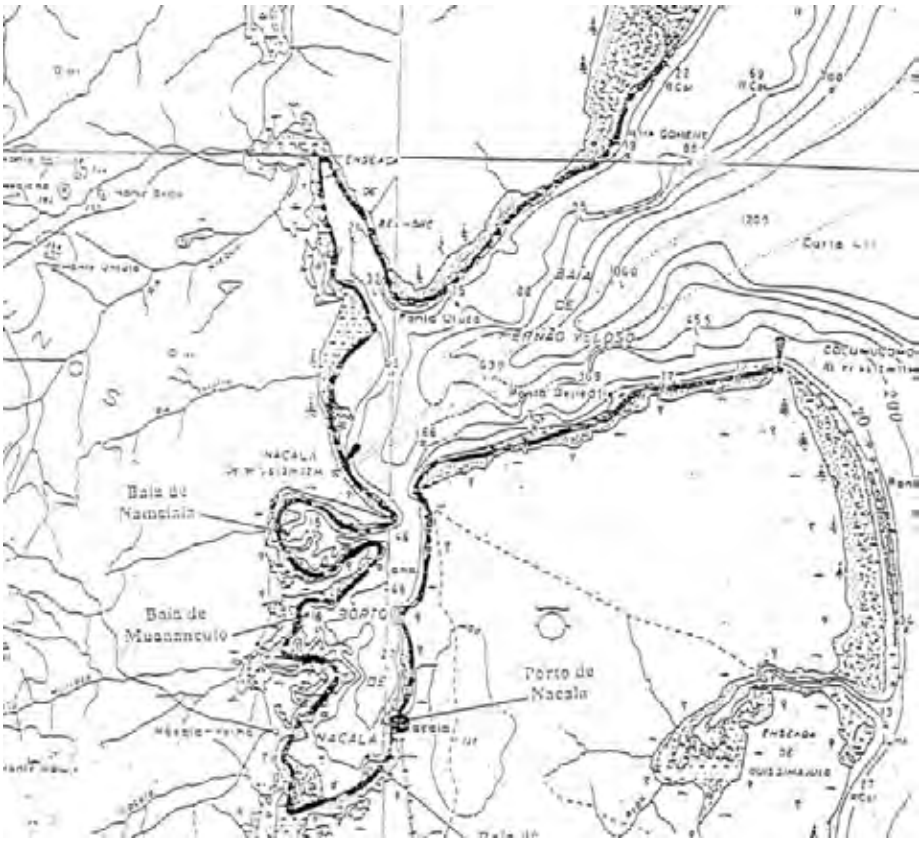
Operation works in the container terminal and conventional terminal are contracted out to a stevedoring company. The role of CDN in terminal operation is planning and instruction. Maritime services such as pilotage and tug assistance are provided by CDN. CDN is authorized to carry out the maritime services as the exclusive operator in the area under jurisdiction of the Port. (see Figure 2.5-13) The area includes not only Nacala Bay but also Fernão Veloso Bay.

The power of port authority exercised by CFM in the area of port jurisdiction was ceased as of the date when CDN's operation began.



Source: CDN

Figure 2.5-12 Concessioned area of the Port

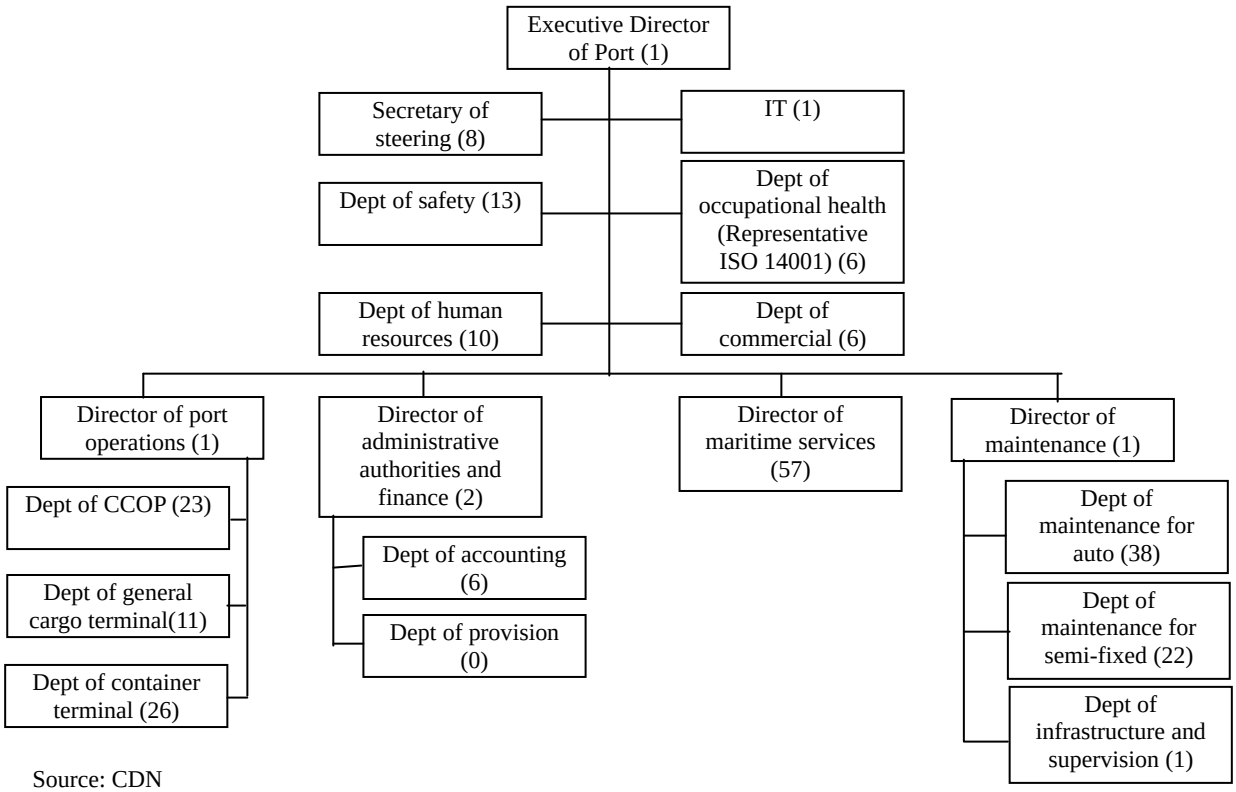


Source: CDN

Figure 2.5-13 The area under jurisdiction of the Port

2) Organization of CDN

Figure 2.5-14 shows the organization chart of CDN-port. The numbers in brackets are numbers of staff in each division. The total number of employees in CDN-port is 233 of which the operation department has 61 people engaged in documentary examination and works related to the container terminal and conventional terminal. Since operation works are contracted out to a stevedoring company, the number of staff members in charge of terminal operation is rather small.



Source: CDN

Figure 2.5-14 Organization chart of CDN-port

3) Port tariffs and dues

CDN has rights and obligations to establish a policy on port tariffs and dues. The setting, adjustment, charging and collection of such port tariffs and dues etc. are stipulated in the Nacala Port Concession Contract as follows:

- CDN shall be free to set and revise the tariffs.
- The tariffs shall be sufficient to cover the long-term costs.
- The tariffs may include reductions intended to increase traffic.
- CDN may adjust tariffs as part of a promotional offer
- CDN shall be allowed to charge and collect tariffs in Dollars on foreign registered ships and transit traffic.
- CDN shall provide clients with at least fourteen (14) days notice of any changes to tariffs levels.

Thus, in terms of tariff policy, commercial operation of the Port is guaranteed by the concession.

Tariff Book prepared by CDN is comprised of five chapters, and the tariff levels for principal services are as follows; (source: CDN)

Chapter A: Harbour Dues

This chapter relates to maritime services and stay of vessels.

Entrance fee		600.00 USD/vessel
Quay dues	Quay dues	0.04 USD/day x DWT
	Anchor dues	0.02 USD/day x DWT
Quay dues for fishing vessels		275.00 USD/day
Pilotage dues	Per service	220.00 USD/service
	For vessels' shifting	150.00 USD/service
Mooring and unmooring	Per service	75.00 USD/services
	For vessels' shifting	40.00 USD/services

Chapter B: General Cargo Terminal

This chapter relates to goods handling services at non-specialized quays.

Stevedoring	Loading / Unloading
Unitized cargo	7.80 / 7.80 USD/ton
Timber, steel and copper	8.00 / 8.00 USD/ton
Timber, logs	12.50 / 12.50 USD/ton
Loose bags	8.00 / 8.00 USD/ton
Grains in bulk	4.00 / 4.00 USD/ton
Light vehicles up to 3.5 tons	12.00 / 12.00 USD/each vehicle
Vehicles of 3.5 up to 5 tons	24.00 / 24.00 USD/each vehicle
Vehicles of over 5 tons	48.00 / 48.00 USD/each vehicle

Goods Handling	Indirect Loading / Unloading	Direct Loading / Unloading
Unitized Cargo	4.00 / 4.00 USD/ton	3.50 / 2.50 USD/ton
Timber, Sawn	4.00 / 4.00 USD/ton	2.50 / 3.00 USD/ton
Steel	4.00 / 4.50 USD/ton	2.50 / 3.50 USD/ton
Copper	7.50 / 4.50 USD/ton	6.00 / 3.50 USD/ton
Loose Bags	6.60 / 6.60 USD/ton	4.50 / 5.00 USD/ton
Grains in bulk	6.00 / 6.00 USD/ton	3.00 / 3.15 USD/ton
Light vehicles up to 3.5 tons	48.00 / 48.00 USD/each vehicle	24.00 / 24.00 USD/each vehicle
Vehicles of 3.5 up to 5 tons	96.00 / 96.00 USD/each vehicle	48.00 / 48.00 USD/each vehicle
Vehicles of over 5 tons	192.00 / 192.00 USD/each vehicle	96.00 / 96.00 USD/each vehicle

Storage in warehouse		
Loading	Coal and packed minerals	0.20 USD/ton x week
	The first week	0.30 USD/ton or m^3 x week
	Following week	0.25 USD/ton or m^3 x weeks
Unloading	The first seven days	0.40 USD/ton or m^3 x days
	Following days	0.60 USD/ton or m^3 x days
Transshipment	Grains and bagged products – first 7 days	0.10 USD/ton x days
	Grains and bagged products – following days	0.15 USD/ton x days
	Goods – first 7 days	0.30 USD/ton or m^3 x days
	Goods – following days	0.35 USD/ton or m^3 x days

Lease of storage area		
Warehouse	Next to quays	3.5 m^2 x months
	Others	2.5 m^2 x months
Land	Paved	0.6 m^2 x months
	Unpaved	0.4 m^2 x months

Storage in open yard		
Loading	Coal, minerals, clay and kaolin (bulk)	0.15 USD/ton x week
	Coal and packed minerals	0.15 USD/ton x week
	Metals, ingots, sheets, bars, and other types, in bundles	0.10 USD/ton x days
	Steel rods	0.10 USD/ton x days
	Goods - first week	0.15 USD/ton or m^3 x week
	Goods - following week	0.25 USD/ton or m^3 x week
Unloading	The first seven days	0.30 USD/ton or m^3 x days
	Following days	0.40 USD/ton or m^3 x days
	Light vehicles up to 3.5 tons	6.00 USD/each x days
	Vehicles of 3.5 up to 5 tons	9.00 USD/each x days
	Vehicles of over 5 tons	15.00 USD/each x days
Transshipment	Goods – first 7 days	0.25 USD/ton or m^3 x days
	Goods – following days	0.20 USD/ton or m^3 x days
	Light vehicles up to 3.5 tons	10.00 USD/each x days
	Vehicles of 3.5 up to 5 tons	15.00 USD/each x days
	Vehicles of over 5 tons	25.00 USD/each x days

Chapter C: Container Terminal

This chapter relates to goods handling services at the container terminal.

Stevedoring		
Loading	Containers	65 USD/TEU
	Reefer containers	75 USD/TEU
	Empty containers	60 USD/TEU
	Abnormal containers	75 USD/TEU
Unloading	Containers	65 USD/TEU
	Reefer containers	75 USD/TEU
	Empty containers	60 USD/TEU
	Abnormal containers	75 USD/TEU
Transshipment	Direct transshipment	120 USD/TEU
	Indirect transshipment (per operation)	85 USD/TEU
	Re-stowage without passing through the quay platform	80 USD/TEU
	Re-stowage passing through the quay platform	120 USD/TEU

Container cargo handling		
Loading	Containers A (Minerals)	135 USD/TEU
	Containers B (Agricultural Products)	175 USD/TEU
	Reefer containers	275 USD/TEU
	Containers C (Goods)	205 USD/TEU
Unloading	Reefer containers	275 USD/TEU
	Containers	205 USD/TEU

Storage of containers	
Empties	6 USD/TEU x days
With refrigerated cargo	45 USD/TEU x days
With goods – first 7 days	6 USD/TEU x days
With goods – following days	7 USD/TEU x days

Chapter D: Liquid Bulk Facilities (This is charged by CFM)

This chapter relates to goods handling services at bulk liquids facilities.

Chapter X: Add on Profits

This chapter covers add-on services not covered by the previous chapters.

Although the concession allows the introduction of volume-discount, CDN has not introduced it.

Pilotage dues are calculated based on six hours, 2 x 1.5 hours for coming in to the Port and 2 x 1.5 hours for going out of the Port. The Port has two tugboats and one boat.

The free storage period is three days for import container cargoes and empty containers, twelve days for local transit cargoes, and fifteen days for transit container cargoes to/from Malawi because CDN-railway forces the transit cargoes to stay in the Port for a long time due to shortage of locomotives. On the other hand, the free storage period for export cargoes is not fixed and is determined by CDN depending on the situation. For export, charges after free days are levied on shipping lines.

4) Operation of container cargoes

While the container wharf is mainly used for mooring container ships, large bulk ships such as those bringing wheat also dock at the container wharf. Figure 2.5-15 shows the occupancy of container berths by container ships and bulk ships from January through April of 2010.

It is observed that some container ships, especially those carrying a large volume of containers, stay at the wharf for a week.

	Container Carriers		Bulk
1/1			
1/2	MSC LEILA		
1/3			
1/4			
1/5	KARIN RAMB		
1/6			
1/7			
1/8	NEW DYNAM	UMGENI (848)	
1/9			
1/10			
1/11			
1/12			
1/13			ORIGINATORIO Clinker (17,012 t)
1/14			
1/15			
1/16			
1/17	NALA DELMAS	MSC LEILA (616)	
1/18			
1/19			
1/20			
1/21	MEKHANIC		
1/22			
1/23	HOHEBANK		
1/24			
1/25	UMGENI (825)	ELISA DELMA (1,209)	
1/26			
1/27			
1/28			
1/29			
1/30			
1/31			
2/1			
2/2	LE DING		
2/3			
2/4		MSC LEILA (668)	
2/5			
2/6			
2/7			
2/8	RIDGE		
2/9			
2/10			
2/11			
2/12			
2/13			
2/14	MAASAI (777)		OCEAN FRIEND (Trigo/Wheat) (12,375 t)
2/15			
2/16			
2/17			
2/18			
2/19			
2/20		KARIN RAMB	
2/21	WARNOW TRADER (822)		
2/22			
2/23			ATHOS (Trigo/Wheat) (12,369)
2/24			
2/25			
2/26			
2/27	MSC LEILA (704)		C. HARMONY (Trigo/Wheat) (25,215 t)
2/28			
3/1			
3/2			

	Container Carriers		Bulk
3/3			
3/4			
3/5			
3/6			
3/7			
3/8			
3/9	NALA DELMAS (575)		
3/10			
3/11			
3/12			
3/13		BARRIER	
3/14			
3/15	ELISA DELMAS		
3/16			
3/17			
3/18	ORINOCO RIV	MSC LEILA	
3/19			
3/20			
3/21			
3/22	BLACK RHINO		
3/23			
3/24			
3/25			
3/26			
3/27			
3/28			
3/29	CASSANDRA		
3/30			
3/31			
4/1			JOANNA A (Clinker) (18,005 t)
4/2			
4/3			
4/4	BARRIER		
4/5		MSC LEILA	
4/6			
4/7	KARIN RAMB		
4/8		MAASAI	
4/9			
4/10			CONSOLIDATOR (Clinker) (37,500 t)
4/11			
4/12			
4/13			
4/14	WHITE RHINO		
4/15			
4/16			
4/17	WHITE RHINO	ESM TRAVELLE	
4/18			
4/19	BLACK RHINO		
4/20			
4/21			
4/22			
4/23			
4/24			
4/25	NALA DELMAS		TINA LITRICO (Trigo/Wheat) (9,000 t)
4/26			
4/27			
4/28	LEILA (562)		
4/29			
4/30			
5/1			
5/2			

Source: CDN, edited by Study Team

Figure 2.5-15 Berth occupancy of the container wharf (January –April, 2010)

CDN introduced a yard planning system in 2009, though the operating ratio still remains at only 60% due to electrical or communication problems. The Port doesn't have an integrated terminal operation system which covers planning of yard, monitoring of all movement of containers,

controlling gate operation, and issuing documents.

There is one yard planner and one vessel planner in the Port. The documents for vessel plan are accepted 24 hours prior to loading operations; however, there are cargoes which do not complete customs clearance until just before loading, and thus planners have to adjust accordingly.

Containers are unloaded and loaded by ship cranes. While unloaded containers from a container carrier are once placed on the apron of the quay and then loaded on a chassis by a reach stacker and hauled to the container yard, those containers, which are to be loaded on board, are stacked behind the apron prior to the arrival of the ship, and moved by a reach stacker to the ship side for loading on board.

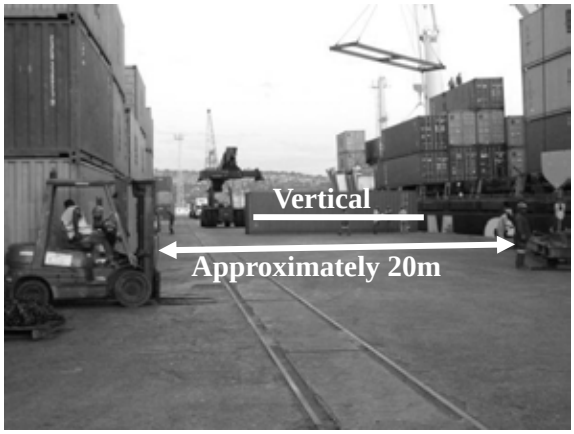
In case of unloading operations, containers are basically placed parallel to the quay and a reach stacker moves at right angles to the quay to put containers on yard chassis. This unloading operation can minimize the movement of reach stacker and is thus not only efficient but also reduces the load on the pavement. On the other hand, in the case of loading operations, containers are placed at right angles to the quay by a reach stacker and are loaded by ship's gear. When this loading operation is conducted, many containers can wait along the quay. So this way of loading operation makes it easy to handle containers by ship's gear effectively.

However, according to the result of the site survey conducted by the Study Team, the operation methods described above were not always followed. In particular, the direction of containers on the quay was different, that is, when unloading operation was conducted, the containers for unloading are placed at right angles to the quay which resulted in wasteful movements of the reach stacker. In addition, because the pre-stack containers were too close to the quay, the width of the apron was less than the ideal width as some of the necessary areas for marshaling were occupied as stock yard. Thus, inefficient operations were observed through the site survey. The result of the site survey is shown in Table 2.5-10.

Table 2.5-10 Result of site survey on container loading and unloading operation

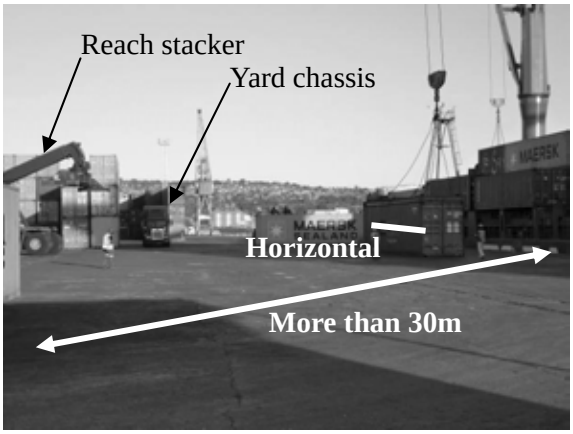
Date / Time	Name of Ship / Spec	Observations
2 / Jul / 2010 16:20-18:50	MSC Leila Length 158.91m 928TEU Ship's gear: 3	Unloading Placement of container: Vertical to the quay Simultaneously used ship's gear: 1 (sometimes using max 2 gears at one time to place containers on the quay side) Yard Chassis: 3 Reachstacker: 1(quay side), 1(stock yard) (sometimes a toplifter came to the quay from the yard to assist the handling) Available apron depth: approximately 20m (see Figure 2.5-16)
6 / Jul / 2010 15:50-16:40	Ridge (OCEAN AFRICA) Length 163.40m 1,162TEU Ship's gear: 3	Unloading Placement of container: Vertical to the quay, max 6 units (Horizontal once during the observation) Simultaneously used ship's gear: 1 (sometimes using max 2 gears at one time to place containers on the quay side) Yard Chassis: 4 Reachstacker: 1(quay side), 1(stock yard) Available apron depth: more than 30m (see Figure 2.5-17)
8 / Jul / 2010 8:30-8:50	Ridge Same as above	Loading Placement of container: Vertical to the quay Reach stacker: 1(each vessel) Apron: approximately 30m
	CMA CGM Kailas Length 195.50m 1,858TEU Ship's gear: 2	
9 / Jul / 2010	CMA CGM Kailas Same as above	Loading
		Long queue is observed near the entrance of container terminal to take out empty containers.

Source: Study Team



Source: Study Team

Figure 2.5-16 Typical situation of unloading containers at the quay side



Source: Study Team

Figure 2.5-17 Ideal situation of unloading containers at the quay side

The gang composition of each shift is shown in Table 2.5-11.

Table 2.5-11 Gang composition for container loading/unloading by a ship's gear

Operator of Ship's gears	1	person
Signal man (on shore/on board)	1	person
On board labor (lasher/unlasher)	4	persons
On shore labor	4	persons
Miscellaneous labor	4	persons
Total	14	persons per a ship's gear

Source: CDN (Reorganized by the Study Team)

The container handling productivities observed for those container ships which called on the Port over the period from January through April in 2010 in which the total units handled at the Port exceeded 300 units are listed in Table 2.5-12. In the table some parameters that may influence the productivity, i.e. existence of another ship at the container wharf and ratios of empty containers and 40' containers, are also indicated. The container handling productivity observed in 2009 is shown in Figure 2.5-18. It widely varies from a few units/hour/ship to 20 units/hour/ship. On average the container handling productivity is about 8 units/hour/ship.

In general, for those occasions when a container ship stays at the wharf alone, the handling productivity is higher than those occasions when another ship stays simultaneously. Higher productivities are also observed for some occasions with another container ship. On such occasions, the productivity of the container handling of the other ship is generally lower than the average.

Container cargoes are the principal cargoes of the Port and the revenue of the Port highly relies on the container handling charge. For the container shipping lines, it is most important to deploy their fleet in accordance with the fixed schedule. For the consignees, it is also vital to export or import on schedule. The container handling operation at the Port sometimes requires container ships to stay at the port for a week when they bring a large number of containers.

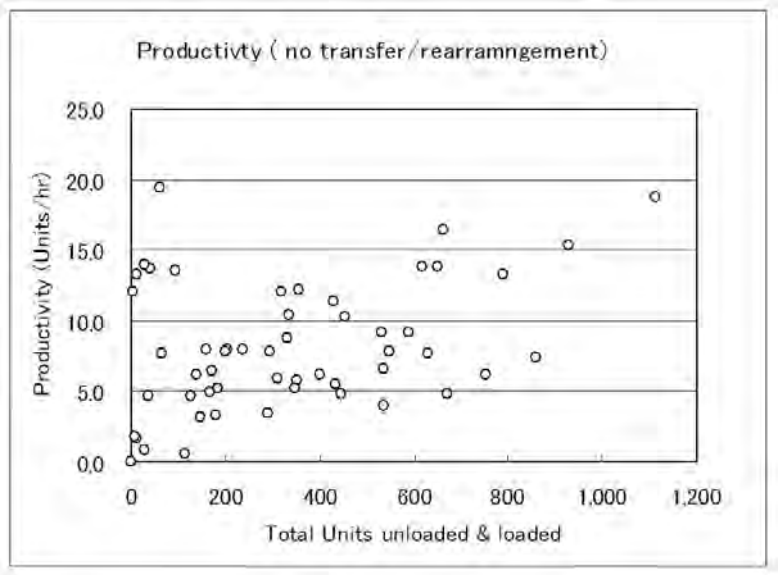
It is quite inconvenient for both shipping lines and consignees that their schedules cannot be maintained. Unless the Port improves the productivity to the levels seen in other container terminal in the world, it will not be able to attract either shipping lines or consignees.

In addition, no development project will be financially feasible because the revenue earned through the operation of the newly completed facilities will not be enough to pay for the investment since handling productivity is too low.

Table 2.5-12 Container handling productivities observed in January to April 2010

Ship Name	Berth Occupaqncy	Units handled	Operation Hours	Productivity Uni/hr/Ship	Container Ratio	
					Empty	40'
KARIN RAMB	Two container ships	376	18.72	20.09	0.3%	46.3%
MSC LEILA	Alone	668	41.63	16.05	39.4%	29.9%
RIDGE	Alone	616	40.15	15.34	60.4%	31.0%
MSC LEILA	Alone	474	35.48	13.36	27.8%	20.0%
BARRIER	Alone	360	27.04	13.31	2.2%	39.2%
MSC LEILA	Bulk ship	704	56.47	12.47	47.6%	24.3%
BARRIER	Two container ships	312	25.16	12.40	9.9%	46.8%
MEKHANIC	Two container ships	319	26.49	12.04	31.1%	54.9%
ESM TRAVELLE	Two container ships	341	30.1	11.33	11.4%	13.2%
MSC LEILA	Two container ships	422	40.11	10.52	0.9%	26.1%
UMGENI	Two container ships	848	82.36	10.30	52.8%	42.0%
UMGENI	Two container ships	825	87.06	9.48	15.6%	25.2%
NALA DELMAS	Alone	575	68.96	8.34	37.7%	15.7%
MSC LEILA	Two container ships	562	73.5	7.65	10.0%	29.7%
ELISA DELMA	Two container ships	1209	161.93	7.47	46.6%	19.9%
WARNOW TRADER	Bulk ship	822	110.19	7.46	45.1%	24.3%
MSC LEILA	Two container ships	447	60.08	7.44	12.3%	17.7%
HOHEBANK	Aline	305	41.33	7.38	0.0%	31.5%
ORINOCO RIV	Two container ships	456	62.03	7.35	18.9%	36.8%
NALA DELMAS	Two container ships	483	67.21	7.19	0.0%	3.6%
CASSANDRA	Alone	281	42.24	6.65	0.0%	36.3%
KARIN RAMB	Two container ships	237	36.35	6.52	16.9%	52.3%
KARIN RAMB	Alone	332	51.66	6.43	0.0%	12.0%
MSC LEILA	Two container ships	616	101.1	6.09	32.1%	13.7%
NEW DYNAM	Two container ships	488	86.15	5.66	25.6%	32.6%

Source: CDN, Edited by Study Team



Source: CDN, Edited by Study Team

Figure 2.5-18 Container handling productivity (Units/hour/ship)

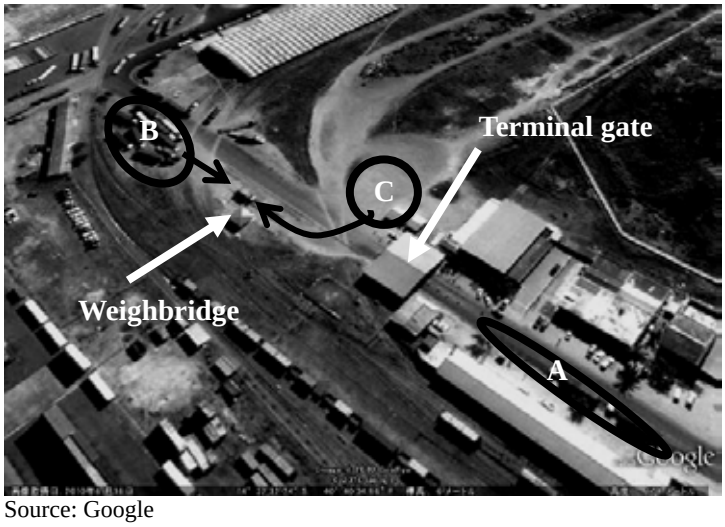
According to CDN, the average dwell time of container cargoes is as follows;

Import	:	10 days on average
Export	:	5 days on average
Transit (by railways)	:	25-30 days on average

The reason why the dwell time for transit container cargoes by railway tends to be as long as 25-30 days is a lack of locomotives. On the other hand, virtually all of import and export cargoes to/from domestic hinterland are transported by trucks.

CDN calculates and levies port dues based on the document issued by the customs. To verify the document, all trucks except empty container trucks coming from Dry-Park are scaled by the weighbridge just behind the second gate. Kudumba has conducted scaling since May 1, 2010 according to the contract with CDN. Costs for weighbridge are included in the port tariff.

Trucks waiting for customs clearance stay in front of the gate [A]. Trucks waiting for the weighbridge stay inside the gate [B, C]. (See Figure 2.5-19)



Source: Google

Figure 2.5-19 Waiting location of trucks around the gate

5) Dry/break bulk cargo handling

While the Port has no export dry bulk cargo, in 2009 it handled a large amount of imported dry bulk cargoes such as clinker (187,000 tons), wheat (116,999 tons), fertilizer (42,000 tons) and plaster (5,800 tons). While clinker and wheat are brought by large bulkers which dock at the container wharf, other dry bulk cargoes are unloaded at the general cargo wharf.

Clinkers and grains are generally unloaded by grabs of ship cranes and directly loaded on either dump trucks or rail wagons. Figure 2.5-20 and Figure 2.5-21 show the unloading of wheat and clinker, respectively. Wheat for Malawi is stored in silos in the Port, and then delivered by railway.

Grains are sometimes once stored in transit shed on general cargo wharf before they are delivered to the warehouses outside of the Port.

Source: Study Team

Figure 2.5-20 Unloading wheat at the South Wharf (container wharf)

Source: Study Team

Figure 2.5-21 Unloading of clinker at container wharf

Fertilizer and plaster are generally once stocked in the transit shed or open storage. They are packed in the Port and then moved out of the Port or shipped again from the Port. Figure 2.5-22 and Figure 2.5-23 show the unloading and packing of fertilizer.

Almost all fertilizer is discharged in bulk but partially bagged. CDN is recommending that bags not be used. All fertilizer discharged in the Port is transit cargo to Malawi. It is carried out of the Port mainly by train in bulk, so it is necessary to store in the warehouse for a while.

A part of fertilizer is stored in the open yard with cover to protect it from rain. That fertilizer is bagged in the Port. The bonded area in the current situation is limited only inside of the Port. So bagging inside the Port is convenient for customs clearance. According to CDN, storage of fertilizer will not be necessary in the near future.

Source: Study Team

Figure 2.5-22 Unloading and packing of fertilizer at wharf

Source: Study Team

Figure 2.5-23 Packing of fertilizer in the yard

The commodities handled as break bulk cargoes have been becoming fewer over the past five years. (In fact, the loaded general cargoes in 2009 were only the bagged cargoes such as sugar and wheat bran or scrap from Malawi and no export general cargoes from Mozambique). The major commodities of the unloaded cargoes were cement (54,000 tons) and rice (17,000tons). Figure 2.5-24 shows how the bagged sugar are brought to the Port and stored at a transit shed before being exported.

Scrap is loaded after collecting a sufficient volume for one vessel. There was one call in 2009 to load 3,300 tons. But there were no calls in 2008. Scrap is collected using an open yard of about 2,800m^2.

Source: Study Team

Figure 2.5-24 Bagged cargoes brought from Malawi for export

The cargo handling productivities of dry/break bulk cargoes observed in 2009 are shown in Table 2.5-13. It is seen that the productivities for the major bulk cargoes, i.e., clinker and wheat, are quite high. The difference of the productivities among clinker, wheat, and fertilizer results from the number of cranes employed for unloading. Three (3) or four (4) cranes at a time are employed for unloading clinker, while only two cranes at a time are employed for unloading wheat, fertilizer and plaster. Sometimes fertilizer is packed by packing machine placed under hoppers on the apron during the unloading operation.

Table 2.5-13 Volume and handling productivities of dry bulk and general cargoes (2009)

Commodity 2009	Volume ton	Operation hours	Productivity t / hr	Type
Plaster(Gesso)	5,822	142	41.0	Bulk
Wheat(Trigo)	116,072	1,589	73.0	Bulk
Clinker	186,563	1,182	157.8	Bulk
Fertilizer(Adubo)	42,481	941	45.1	Bulk/Bag
Mixed	2,348	234	10.0	Bag
Bran (Ferelo)	2,949	147	20.1	Bag
Sugar (Açucar)	15,739	199	79.1	Bag
Rice (Arroz)	17,611	444	39.7	Bag
Cement (Cimento)	53,842	1,266	42.5	Bag
CXAS, TKS	181	41	4.4	Other
Mchine (Maquinas)	238	10	23.8	Other
Locomotive	304	3	101.3	Other
Fish (Peixa)	1,069	114	9.4	Other
Scrap (Sucata)	3,378	149	22.7	Other
Total	448,597			

Source: CDN, Edited by Study Team

6) Liquid bulk handling

Liquid bulk unloaded at the Port includes petroleum and edible oil. For petroleum unloading, pipe lines are installed from the northern end of the general cargo wharf to the storage tank area to the south of the Port. CFM is the operator of liquid bulk handling. Edible oil is stored in the tanks on the north perimeter of the general cargo wharf. Figure 2.5-25 shows the petroleum unloading operation.

Source: Study Team

Figure 2.5-25 Liquid bulk unloading operation

7) Port security

To comply with the ISPS code, CDN has prepared a port facility security plan and has appointed a port facility security officer (PFSO). The Port is surrounded by an electric wire fence (See Figure 2.5-26). CCTV system is installed at the gate for monitoring.

Source: Study Team

Figure 2.5-26 Security fence

Scanning inspection for all inbound and outbound trucks (including containers, dry bulk cargoes, break bulk cargoes, liquid bulk cargoes, and empty tanks) has been conducted in the Port since 1 May 2010. Customs has a 20-year contract with Kudumba for scanning inspection. The facilities for

inspection are to be transferred to the Government of Mozambique after the concession period. Kudumba conducts scanning and customs takes care of documentation. Customs also conducts a physical inspection of questionable cargoes. Fines of 10 times the total value of cargo are imposed on cargoes found to be in violation. Though the inspection cost is different for each type of cargo, it is extraordinarily expensive. For example, it costs 100 dollars per container. The cost is a very big burden for port users, and it can spoil the competitiveness of the Port.

(5) Financial status

1) Concession Agreement of the Port

The concession agreement was entered into the 29th day of September 2000 between GOM including CFM and the CDN. CDN has responsibilities, rights and duties to manage/operate/rehabilitate both of the railway and the Port for a 15-year concession. The period is able to be extended for another 15 years upon CDN's request.

CDN has been granted a lease of the land and infrastructure required for the operation, management and rehabilitation of two terminals (container and general cargo) in the Port by GOM and CFM for the concession period.

CDN started commercial operation with effect from 10 January 2005, which is called the taking over date. Services of CDN in the Port include pilotage, towage, bunkering, stevedoring, cargo handling and storage, warehousing, road and rail linkages, transfer and transport of passengers and other ancillary and associated services, excluding the handling of liquid bulk commodities, such as petroleum products, gas and petro-chemicals.

In accordance with the agreement, CDN is subject to pay concession fees to the GOM and CFM. The concession fees consist of three portions; initial fee, fixed fee and variable rent. The initial fee is a once-off fee paid on the taking over date. The fixed fee is a quarter basis fee which is in return for the use of the utilities and facilities provided by the GOM and CFM, and for the exclusive right given to CDN to act as the operator of the Port. The variable rent (revenue fee) is a half year basis fee which is profit share for the GOM and CFM.

2) Financial statements of CDN (port and railway sector)

CDN has been preparing consolidated financial statements (the port and the railway) since its operation began. Balance sheets, operation statements and cash flow statements of CDN (the port and the railway) from 2005 to 2009 are as shown in the following tables. It should be noted that 1) in 2005, Bank of Mozambique denominated in its currency from Metical: 1,000 old Meticais to 1 new Metical, and 2) data of 2009 are half-yearly financial statements ended on 30 June 2009.

Table 2.5-14 Balance sheet of CDN

Unit: MT '000

	2005*1)	2006	2007	2008	2009*2)
Current assets	131,418,597	136,886	278,853	412,703	441,842
Fix assets	165,461,750	169,093	135,603	158,178	166,232
Total Assets	**296,880,347**	**305,979**	**414,456**	**570,881**	**608,074**
Current Liabilities	116,767,767	535,095	725,507	653,644	832,122
Non Current Liabilities	258,619,327	36,492	43,236	407,473	374,949
Equity	-78,506,747	-265,608	-354,287	-490,236	-598,997
Total Equity & Liabilities	**296,880,347**	**305,979**	**414,456**	**570,881**	**608,074**

Source: Financial Department of CDN

Table 2.5-15 Operation statements of CDN

Unit: MT '000

	2005[*1)]	2006	2007	2008	2009[*2)]
Revenue	346,303,200	456,024	605,207	611,106	335,557
Expense	470,951,367	655,462	693,885	747,055	444,319
Gross Profit/Loss	-124,648,167	-199,438	-8,678	-135,949	-108,762
Income tax	0	0	0	0	0
Net Profit/Loss	**-124,648,167**	**-199,438**	**-8,678**	**-135,949**	**-108,762**

Source: Financial Department of CDN

Table 2.5-16 Cash flow statement of CDN

Unit: MT '000

	2005[*1)]	2006	2007	2008	2009[*2)]
Cash from operations	16,895,522	-141,094	51,582	-44,700	-57,182
Cash from investing activities	-119,002,259	-40,379	-18,409	-42,381	-19,523
Cash from financing activities	84,832,768	133,319	-24,855	83,033	57,967
Cash and cash equivalents at the beginning of the year	*102,254,584*	*84,981*	*36,827*	*45,145*	*41,097*
Cash and cash equivalents at the end of the year	**84,980,615**	**36,827**	**45,145**	**41,097**	**22,359**

Source: Financial Department of CDN

CDN has continued to show negative net worth from 2005 and the heavy loss of equity continues to be MT 100 million per year. The financial status of CDN is indicative of how dependent it is on the assistance of shareholder funding, but the shareholders expect CDN to recover in the near future. To improve its financial situation, CDN should firstly tackle the problem of the inadequate revenue it generates from operation.

According to the financial department of CDN, The U.S. Overseas Private Investment Corporation ("OPIC") provided CDN with US$ 13.5 million of financing for a project that includes rehabilitation of the railway and refurbishment of the Port. But OPIC and Banco Comercial de Investimentos (BCI bank) signed a purchase and sale agreement where BCI bank agreed to purchase the loan at a price of US$ 15.5 million (including principal, interest and commitment fees) and in exchange, OPIC agreed to transfer all its rights and obligations on the loan to BCI bank in 2008. CDN and BCI bank also signed an additional loan agreement in 2009 so the total amount of BCI bank loan at present is almost 17 million USD. CDN stated that they expended about 70% of the OPIC loan for operational cost of railway sector as a working capital between 2005 and 2007, not for investment of the railway and/or the Port.

3) Financial conditions of CDN-port

Annual Report 2009 of CDN-port

An annual report of CDN-port in 2009 describes that operating revenue of 2009 in the Port is around MT 500 million against about MT 420 million in 2008, which is 19% growth as shown in following table. Operating revenue is increasing according to the increase of cargo throughput. Revenue of container terminal accounts for 66.6% of total operating revenue.

The total revenue of CDN-port is approximately MT 520 million against about MT 435 million in 2008, a growth rate of about 20%. It is subdivided by currency type in: MT 281 million and US$ 8,821 thousand to apply the annual medium exchange rate of MT 27.12 in 2009. Meanwhile, the total expenses of CDN-port in 2009 is MT 406 million (MT 12 million and US$ 7.6 million), which is 78.1 % of the total revenue in 2009. The annual report stated that this expense value has increased about 34% against 2008.

Table 2.5-17 Operating revenue of CDN-port (digest)

Unit: MT

BILL	ITEM	ANNUAL 2008	ANNUAL 2009	2009/2008 (%)
725	Vessels	26,732,195.19	49,861,757.65	86.5%
723	Unloading	72,752,911.64	79,470,244.08	9.2%
727	Loading	11,888,790.93	18,636,399.84	56.8%
7291	Container Terminal	260,476,552.28	332,539,015.93	27.7%
7292	Accessories	36,109,912.84	9,228,988.95	-74.4%
75	Supplemental	11,247,831.47	9,463,012.89	-15.9%
TOTAL		**419,208,194.35**	**499,199,419.34**	**19.1%**

Source: Annual Report 2009 of CDN-port

Financial statements and the indicators of CDN-port

The Study Team estimated balance sheets and income statements from 2007 to 2009 based on trial balances of CDN-port for reference. These data indicate CDN-port is profitable.

Table 2.5-18 Balance sheet of CDN-port (estimation)

Unit: MT '000

	2007	2008	2009
Current assets	166,457	179,156	161,029
Fixed assets	66,677	61,139	82,203
Total Assets	**233,134**	**240,295**	**243,232**
Liabilities	185,015	129,528	128,143
Total Equity	48,119	110,767	115,089
Total Equity & Liabilities	**233,134**	**240,295**	**243,232**

Source: Trial balance of CDN-port and prepared by the Study Team

Table 2.5-19 Income statements of CDN-port (estimation)

	2007	2008	2009
Revenue	389,798	452,522	544,859
Operating revenue	*378,987*	*403,646*	*489,214*
Other revenue	*10,811*	*48,876*	*55,645*
Expenditure including tax	365,209	389,874	477,889
Operating expenditure	*302,196*	*331,211*	*410,899*
(depreciation)	*(31,852)*	*(12,189)*	*(13,076)*
Other expenditure	*63,013*	*58,663*	*66,990*
Net Profit/Loss for the year	**24,589**	**62,648**	**66,970**

Source: Trial balance of CDN-port and prepared by the Study Team

Basic financial indicators are calculated in the following table. Return on Net Fixed Assets is net operating income over total fixed assets and used as an indicator to understand the profitability of operation. It is necessary to keep the rate higher than the average interest rate of various funds for investments, which have different interest rates. Judging from the ratio, Return on Net Fixed Assets is about 109% which is very high.

Return on Equity (ROE) is net income after tax over stakeholder equity and is also an indicator to know the profitability. It is necessary to keep the rate higher than the cost of equity. Here the performance of CDN-port shows about 55%. It is also high.

Operating Ratio is operating expense over operating revenue and is an indicator to know the operation efficiency. It must be less than 70-75% for the port operation. Here the performance of CDN-port shows about 82%, which is unsatisfactory.

The reason for the good results on both Return on Net Fixed Assets and ROE is considered that

both total fixed assets and equity are low. That means an inefficient operation has been performed under creaky facilities. In addition, deficits of the railway may make it difficult to carry out new investment in the Port. Thus, the financial sustainability of the Port is very precarious.

Table 2.5-20 Financial ratios of CDN-port

	2007	2008	2009
Return on Net Fixed Asset	115%	118%	95%
ROE	51%	57%	58%
Operating Ratio	80%	82%	84%

Source: Financial Department of CDN and calculated by the Study Team

Average personnel cost of the Port including salaries, bonus, social cost and pension are around MT. 261,200 per year per person in 2009 as shown in following table. The average cost between 2008 and 2009 has grown at a rate of around 10.8%, which is almost equal to the average inflation rate for the past three years (10.6%) of Mozambique.

Table 2.5-21 Average wage of CDN-port

Unit: MT

	2007	2008	2009
Total personnel cost	35,270,729	49,248,670	62,427,615
No. of Stuff members	169 persons	209 persons	239 persons
Average personnel cost	208,702	235,639	261,203

Source: Financial Department of CDN and calculated by the Study Team

4) Expenditure commitment of CDN for the Port

Operating lease commitment:

Financial statements for the six months ended 30 June 2009 of CDN indicate that CDN is subject to pay concession fees to the GOM (15%) and CFM (85%) under the concession agreement. The concession fees are categorized as initial fee, fix fee and variable rent. Those amounts are shown below;

a. The amount of initial fee: US$ 500,000.
b. The amount of fixed fee:
- US$ 500,000 per annum from year two to year five (year one is grace period),
- US$ 1,500,000 per annum from year six to year ten,
- US$ 2,000,000 per annum from year eleven to year fifteen.

c. The amount of variable rent:
- 5% of gross annual returns of year one and year two,
- 10% of gross annual returns during years three to five,
- 12.5% of gross annual returns during years six to ten,
- 15% of gross annual returns during years eleven to fifteen.

Regarding bonds of rehabilitation, maintenance and operational performance and hand back, no bond has been issued to date.

Finance lease commitment:

CDN entered into a five year agreement for one tugboat “LURIO” in May 2009. CDN has an option to acquire it when the lease agreement expires in 2014. A Mozambican company has leased port equipment and machinery to CDN.

5) Accountability and compliance

CDN prepared financial statements for the first six (6) months of 2009 in accordance with Generally Accepted Accounting Principle (GAAP) in Mozambique. CDN has not yet adopted the International Financial Reporting Standards (IFRS). In Mozambique, large companies are required to prepare financial statements in accordance with the IFRS in and after 2011. CDN is listed as a large company. A world's leading auditing firm examines the financial statements and the corporate governance practice for the first six (6) months of 2009 in accordance with International Standards on Auditing. In the audit report, the firm stated that they did not express any opinion on the financial statements because they were not able to obtain sufficient and appropriate audit evidence to provide a basis for an audit opinion on the financial statements.

6) Revenue of CFM-Nacala Port

In accordance with 2009 annual statistical information of CFM, revenue of CFM-Nacala Port decreased by approximately 15 % compared with the previous year. This information does not include the amount of concession fees paid by CDN-port.

Table 2.5-22 Revenue of CFM-Nacala Port

(Unit: MT '000)

	2008	2009
Load	358.3	20.0
Export	358.3	0.0
Storage	0.0	20.0
Unload	11,610.2	19,025.6
Transit	10,064,6	1,893.3
Import	107.0	0.0
Cabotage	1,211.0	0.0
Storage	227.6	17,132.3
Specialized Facilities	54,044.8	29,114.6
Container	0.0	402.3
Liquid Bulk	54,044.8	28,712.3
Total	**68,959.3**	**59,063.2**

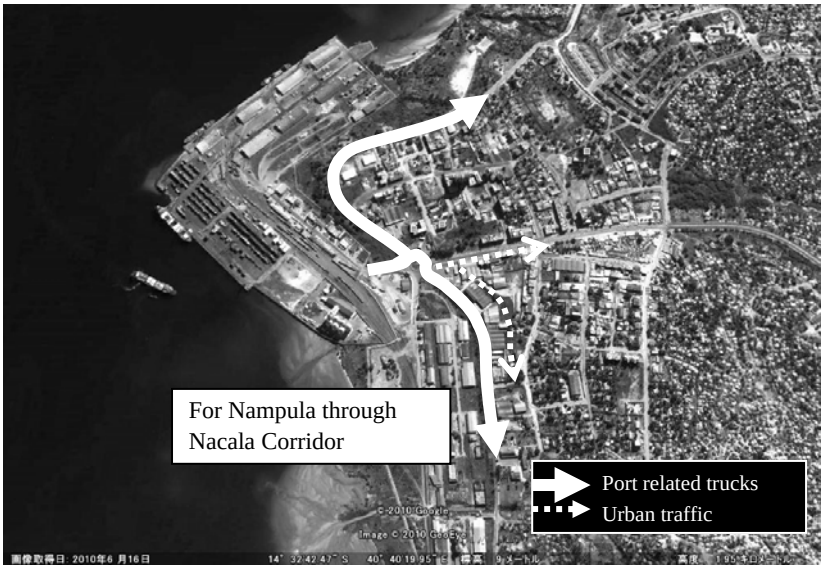
Source: 2009 Annual Statistics Information of CFM

(6) Hinterland access

1) Trucks

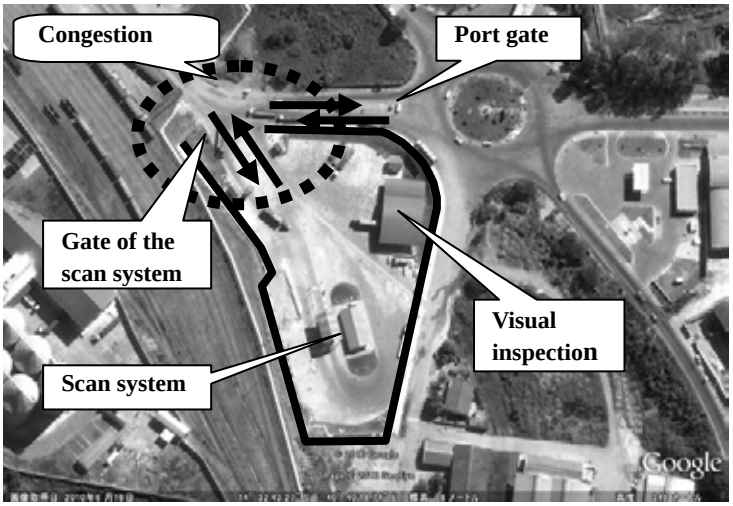
Port-related traffic and urban traffic are separated to some extent. The port-related trucks are regulated to use only a two-lane road along the coast. (see Figure 2.5-27) Trucks to/from the Port cannot enter the downtown area. The port road joins Nacala Corridor at 4 km to the south of the Port. The port road is also used by urban traffic.

The Port has only one gate, and all traffic to/from the Port concentrates at the gate. Although the cargo handling volume in the Port still remains rather small, traffic congestion is always observed around the port gate. One of the causes of the congestion is inefficient gate operation. The other cause is the meaningless 100% scanning of port cargoes. The gate of the scanning system is located just behind the first gate as shown in Figure 2.5-28. There is only one gate to enter and exit.



Source: Study Team, Google

Figure 2.5-27 Traffic regulation for port-related trucks



Source: Study Team, Google

Figure 2.5-28 Traffic flow around scan system facility

2) Train

The Port is directly connected with its hinterland in northern Mozambique, Malawi, and Zambia (only eastern border town of Chipata) by Nacala Corridor Railway.

The facilities and equipment of rail transfer station in the Port are in very poor condition. A gantry crane for rail transfer is not operational.

The railway doesn't have a rail yard and depot outside the Port. Accordingly the port terminal is used for shunting, marshalling and waiting of trains. This is an impediment to efficient land use of the Port. The very old-fashioned rail alignment in the Port such as rails on aprons hampers port operation.

The schedule for train is not fixed; it depends on the situation of transit cargoes. The schedule is determined on the day before needed.

(7) Land use

According to the concession between GOM and CDN, the area of the Port includes Fernao Veloso Bay (not only Nacala Bay). Littoral zone of this is not developed mostly, except some part of the eastern shore of Nacala Bay where the port facilities are located. Some small villages are scattered along the coast of the port area. The land use of the littoral zone in Nacala will be described in detail in 2.7.

CFM owns the coastal area, within 10 km to the south of the Port and 5 km to the north. No one is allowed to build a house within 100 meters from shoreline (at high tide).

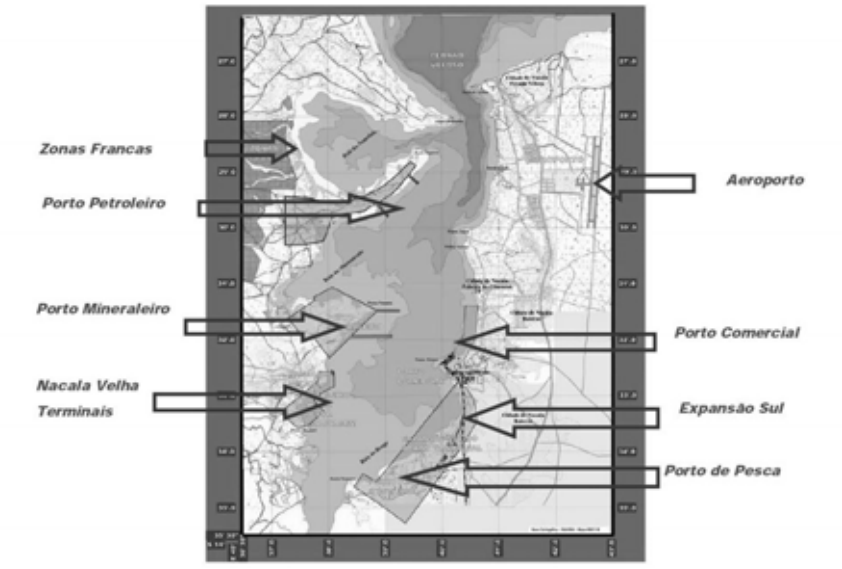
(8) Development plans

According to the concession agreement, Nacala Port area (the area under jurisdiction of the Port) occupies the whole area of Nacala Bay and Fernão Veloso Bay (as shown in Figure 2.5-29). A master plan for the long-term development of the whole Nacala Port area has never been formulated.

A master plan for the development of the Nacala Bay was prepared in 1974, just after the completion of the existing port facilities, by CFM and “Hidrotécnica Portuguesa”, a Portuguese consulting firm. The master plan includes an integrated zoning plan of the Nacala Bay for various functions of the port: Commercial Port, Petroleum Terminal, Mineral Terminal, and other port facilities such as facilities for domestic shipping and fishing port as well as Industrial Free Zones (see Figure. 2.5-29).

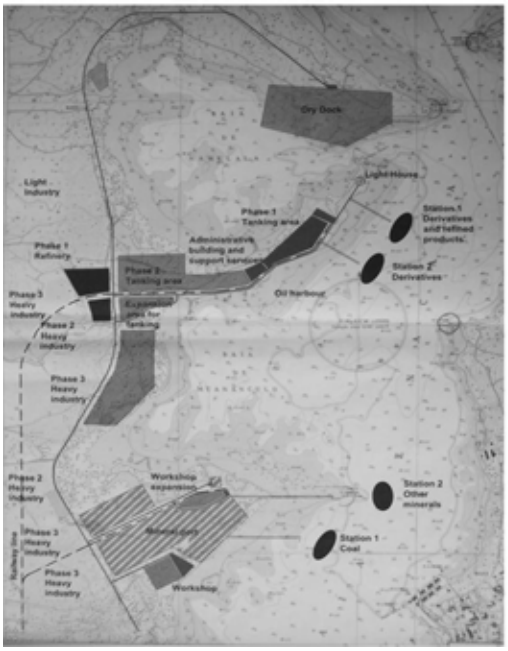
In 1985, as a consequence of the serious erosion problems which resulted in a disaster of enormous proportions, the National Institute of Physical Planning, in a joint effort with “GERAP”, a Portuguese consultancy company, finalized the elaboration of Nacala City Master Plan, with the main aim of issuing guidelines to prevent the reoccurrence of new disasters due to the erosion and to promote physical development of the city based on a balanced distribution of activities. The Nacala City Master Plan is based on the above mentioned master plan for Nacala Bay development.

CFM has reviewed the previous Nacala Master Plan, and updated Nacala Master Plan to provide the facility layout of petroleum terminal, mineral terminal, domestic shipping terminal, fish port, and tourism and free zone developments. The updated Nacala Master Plan prepared by CFM is still a conceptual master plan and no quantitative background data or development time schedule are presented.



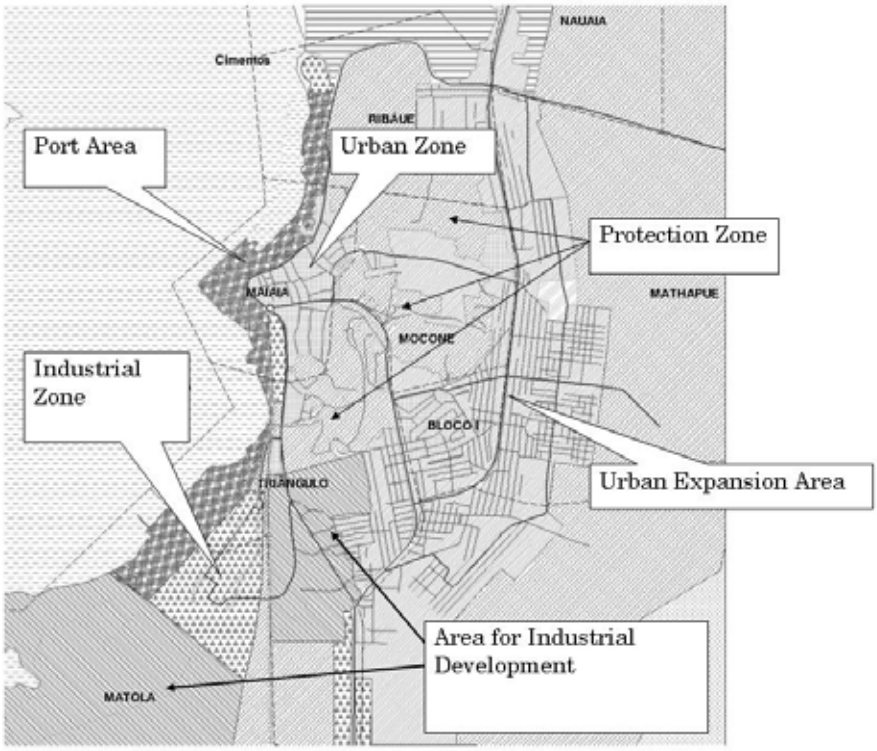
Source: CFM Presentation material “ Moçambique Nacala 2002 Monografia of CFM

Figure 2.5-29 Master Plan for Nacala Bay Development



Source: CDN

Figure 2.5-30 Development plan of liquid and dry bulk terminal



Source: Nacala City Master Plan, Nacala City

Figure 2.5-31 Port area defined in Nacala City Master Plan

The concession contract requires CDN to prepare its development plan of the Port over the concession period, i.e. up to 2019 on the basis of the 1974 Nacala Master Plan. However, CDN has not formulated a development plan, and doesn't intend to formulate it. This is a serious violation of the concession contract.

SEZ development around the Port is on-going, however there is no spatial plan of the development considering harmonization of the Port and SEZ. This makes the SEZ less attractive.

A coal terminal development in Nacala Bay by Vale Mozambique is in the process of EIA. The terminal is planned at the site indicated in the master plan, but Vale explained that this is a sheer coincidence and that the company has never referred to the master plan.

Ministry of Energy plans to relocate the fuel terminal to the location in the vicinity of the existing oil tanks to the south of the Port. The Ministry also plans installation of a LPG unloading facility in the Port. However, the absence of the updated master plan of the Port makes it very difficult to establish a well-coordinated relocation plan which considers long-term development of the Port. The relocation of the oil terminal requires due consideration for maritime safety and environmental protection.

2.5.2 Major ports in/around Mozambique

In this sub-section, the Study Team will analyze present conditions of major ports in/around Mozambique, which can be potential competitors to Nacala Port in the transit cargo market or partners with which the Port forms a maritime network. The locations of Nacala Port and the eleven ports analyzed are shown in Figure 2.5-32. Besides these ports, there exist some major ports in this region, including Saldanha Port (South Africa), which handle 47 millions tons of bulk and breakbulk cargo. However they are unlikely to be competitors to Nacala in the transit market nor to be partners in the maritime network. Therefore these ports are excluded from the analysis. A private jetty for Moma Heavy Sand Project on the Southern coast of Nampula, which handles around 500,000 tons of exported ilmenite, zircon and rutile in 2009, is also excluded from the analysis for the same reason.

Source: Study Team

Figure 2.5-32 Major ports in/around Mozambique

The ports analyzed in this section are outlined in Table 2.5-23. Figure 2.5-33 shows the comparison of quay lengths and cargo throughput among these ports. These show that Durban Port is by far the largest port in terms of infrastructure and container traffic. Regarding total cargo volume, Richards Bay Port, which handles a considerable amount of exported coal, is the largest port. Cape Town and Port Elizabeth also attract many containers. Compared with these South African ports, Mozambican ports are still very small in terms of both infrastructure and cargo throughput. Generally the cargo handling volume per berth in Mozambican ports is smaller than that in South African or Tanzanian ports.

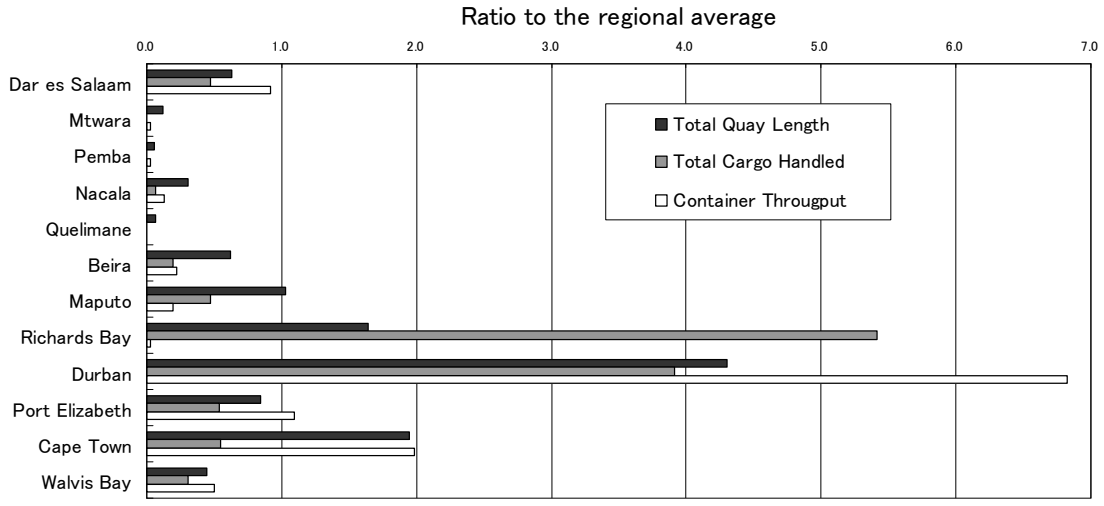
Among Mozambican ports, Maputo port is the largest port in terms of infrastructure and total

cargo volume. Before the civil war, the port was the main port serving for the landlocked region of South Africa including Johannesburg, and its cargo handling volume was more than two times larger than at present. Container throughput of Maputo and Beira is almost the same, and the container throughput of Nacala is around half of that of the two ports. The advantage of Nacala is its water depth. The depth alongside quays in Nacala is the largest among Mozambican ports, and is the second largest in the region after Richards Bay Port. Currently only the shallower part of Nacala Bay is utilized for the port, and much deeper quays can be constructed in the bay without dredging.

Table 2.5-23 Outlines of major ports in/around Mozambique

Country	Port	Total Quay Length (m)	Maximum Depth Alongside Quays (m)	Total Cargo Handled (1000 tons)	Container Througput (TEUs)
Tanzania	Dar es Salaam	2,014	10.5	7,421	354,587
	Mtwara	385	9.8	90	9,247
Mozambique	Pemba	185	7.5	101	9,295
	Nacala	982	14.0	1,046	49,770
	Quelimane	210	3.5	66	4,172
	Beira	1,994	11.8	3,037	85,716
	Maputo	3,310	12.6	7,375	74,729
South Africa	Richards Bay	5,248	19.0	84,591	9,350
	Durban	13,765	12.8	61,171	2,642,165
	Port Elizabeth	2,697	12.2	8,365	423,885
	Cape Town	6,231	13.1	8,568	767,501
Namibia	Walvis Bay	1,413	12.8	4,795	194,102

Note: Total cargo volume in South Africa is estimated by the Study Team since Transnet doesn't disclose the weight of containerized cargoes. In the estimation, the weight of one TEU of container is assumed to be 10 tons. Cargo volumes are as of 2008 (for Mtwara as of 2007).
Source: Study Team



Source: Study Team

Figure 2.5-33 Comparison of quay lengths and cargo throughput among Southern African ports

(1) Maputo Port

1) Outline

Maputo Port, located in the capital city of Mozambique is the country's main port. At the same time, the port is the gateway port of Maputo Corridor (road and rail) which connects the port with Johannesburg, 550 km west of Maputo. The port is also connected with Zimbabwe and Swaziland by road and railway.

The port is well-sheltered from the open sea. The access channel was dredged up to -11 meters in 2010. The maximum tidal range in the port is 3.9 meters.

Maputo Port has two terminals: Maputo terminal and Matola terminal (see Figure 2.5-34). Both of them have been conceded to the Maputo Port Development Company (MPDC) for a period of 15 years, with a 10 year extension option. MPDC is formed by CFM (49%) and a consortium of private companies (51%) including DP World and Grindrod (South Africa). The concession commenced on 14 April 2003, and in 2010, GOM and MPDC agreed to extend the concession from 2018 to 2033 with an option of a further ten year extension, aiming at facilitating CAPEX. Under the Agreement MPDC has been granted the rights to finance, rehabilitate, operate, manage, maintain, develop and optimize the port concession area. The company is vested with the powers of port authority and will be responsible for marine operations, towage, stevedoring, terminal and warehousing operations as well as port planning and development.

Source: Google (reorganized by the Study Team)

Figure 2.5-34 Terminals in Maputo Port

2) Facilities

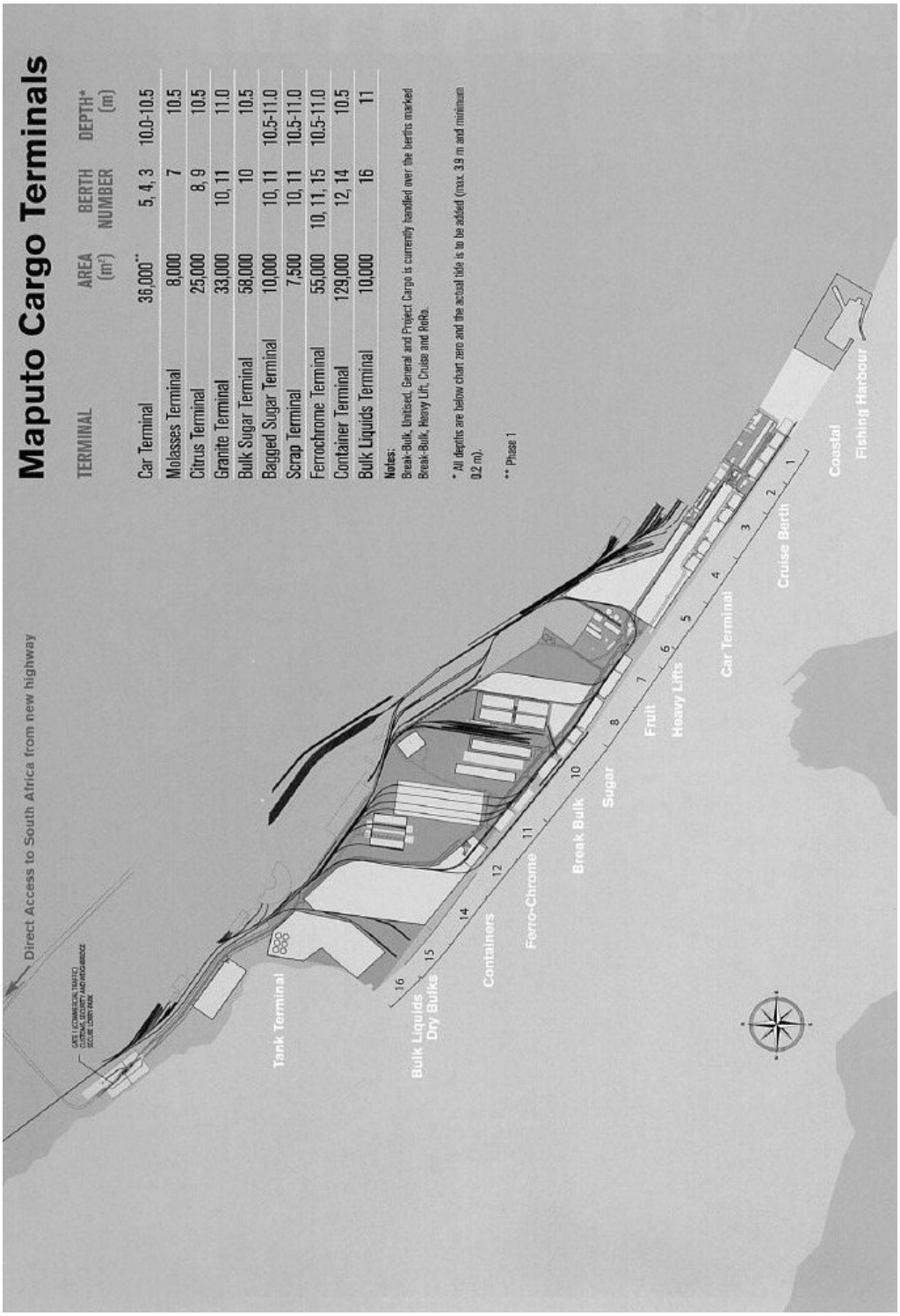
Maputo terminal

Maputo terminal has 14 berths (a total of 2,898 meters) and handles mainly containers and break bulk cargoes. Matola terminal is a deep water bulk terminal for handling coal, petroleum, aluminum and grain. Specifications and layout of berths in the terminal are shown in Figure 2.5-35 and Table 2.5-24.

The container terminal has been operated by MIPS (60% DP world and 40% CFM) since 1996. The length of the container berth is 300 m and the depth is 11.5 m. The terminal is equipped with two quay gantry cranes (35 tons each) and two mobile cranes (100 tons each). Total number of ground slots is 1,500. The annual handling capacity of the terminal is 150,000 TEUs.

Each general cargo berth is dedicated to a specific commodity such as sugar, citrus and molasses. They are operated by different companies.

Car terminal has a dedicated 300 m berth with 10.5 m depth. The capacity is 54,000 units per annum.



Source: MPDC

Figure 2.5-35 Layout of Maputo terminal

Matola terminal

Matola terminal is a bulk cargo terminal, which has four berths for handling coal, petroleum, aluminum and grain respectively. Specifications and layout of berths in the terminal are shown in Figure 2.5-36 and Table 2.5-24.

The coal terminal is operated by the Grindrod Group, a holding company based in South Africa.

The terminal handles anthracite, coal, and magnetite exported from South Africa, though the terminal is capable of handling all dry bulk commodities. By the completion of its expansion project, it can handle a total of 6 million tons of which 4.5 million tons will be committed to coal exports and 1.5 million tons to magnetite exports. Before the expansion, the capacity was 4 million tons. The terminal has its own exclusive berth, shiploader, stockpile area, rail tipplers, stacker reclaimer and conveyor handling system. Grindrod also operates bulk terminals in Richards Bay, Durban and Walvis Bay.

The aluminum terminal handles both products and raw materials of Mozal aluminum smelter which is operated by the joint venture consisting of BHP Billiton (47.1 %), Mitsubishi Corporation (25 %), Industrial Development Corporation of South Africa Limited (24%), and GOM (3.9 %), namely aluminum ingots, alumina, petroleum coke and pitch, at the both sides of the jetty. The terminal is operated by Mozal.

The grain terminal is operated by Stema SARL, which handles cereal and soya bean meal and has a storage capacity of 30,000 tons. The petroleum terminal is operated directly by CFM.

Source: Google, the Study Team

Figure 2.5-36 Layout of Matola terminal

Table 2.5-24 Berths in Maputo Port

Berth No.	Length (m)	Design Depth (m)	Use
MAPUTO			
1	163	4.2-7.2	Small ships
2	150	4.2-7.2	Small ships
3	225	4.2-7.2	Car Terminal
4	225	5.4-8.0	Car Terminal
5	227	10.0-10.5	Car Terminal
6	98	6.9-8.0	Small ships
7	200	10.5	Molasses
8	200	10.5	Citrus Terminal
10	400	10.5	Bulk sugar, Bagged suger
11	200	11	Ferro Crome, Scrap, Break bulk, Bulk
12	200	11	Containers
14	250	11	Containers
15	185	11	Bulk, Break bulk
16	172	11	Break bulk, Bulk, Liquid bulk
sub total	2,895		
MATOLA			
	dolphin	9.5	Grain
	210	12.6	Aluminum
	dolphin	10.5	Petroleum
	205	10.5	Coal
sub total	415		
TOTAL	3,310		

Source: MPDC (reorganized by the Study Team)

3) Cargo throughput and vessel traffic

In the past, Maputo Port was the main gateway to the northern region of South Africa. In 1971 the port had handled 17 million tons of cargoes, however, the cargo volume dropped sharply during the civil war. Port traffic has been recovering since 1992, but the current cargo volume (8 million tons in 2009) is still much smaller than during its peak period. The average growth rate of cargo throughput in the past ten years is 11.9 % for total cargoes and 10.8 % for containers.

As shown in Table 2.5-25 and Figure 2.5-37 around 40% of cargoes are transit cargo to/from South Africa.

Table 2.5-26 and Table 2.5-27 show the breakdown of cargoes handled in the port. Major cargoes handled in the port are containerized cargoes, exported aluminum, exported sugar, imported alumina, imported fuel, and transit coal and magnetite from South Africa. The cargoes to/from Mozal aluminum smelter account for around 40% of cargoes to/from Mozambican hinterland, or 20% of the total cargo volume. Mozal explained that the volume of production and export would not increase due to availability of electricity which is generated in Cahora Bassa Hydro Power Station, and transmitted via South African grid. All products of Mozal are exported to the European market via Rotterdam Port, where import duty on aluminum made in Africa is exempted. EU plans to abolish the import duty on aluminum from all countries and the African privilege will be lost in the future. Then the trade partner of Mozal will be diversified. Alumina, the principal raw material, alumina, is imported from Western Australia.

Table 2.5-27 is based on the only available data on transit cargoes in Maputo Port provided by CFM. But the data seems to contain some inaccuracies. For example, a greater volume of sugar must arrive from Swaziland, and the volume of inbound transit cargo is too small. The Mozambican Customs couldn’t provide data to the Study Team.

The percentage of transit containers is not disclosed in the port statistics of Maputo Port. Before 2006 the ratio of transit containers was less than 15 %, but according to a recent announcement from MPDC the volume of transit containers is increasing rapidly with an annual growth rate of 22%, and the ratio of transit containers is around 30 % of total container throughput. .

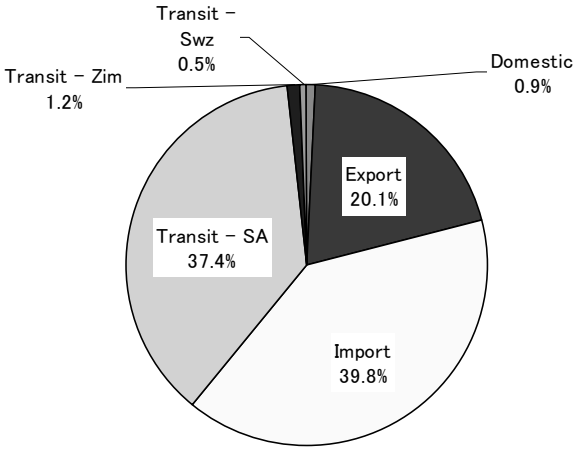
The numbers of vessels calling at the port was 761 vessels in 2008 and 613 in 2009. In 2009, 13 container lines called at the port, whereas only 5 lines called in 2007.

Table 2.5-25 Cargo handled in Maputo Port

(1000 tons)

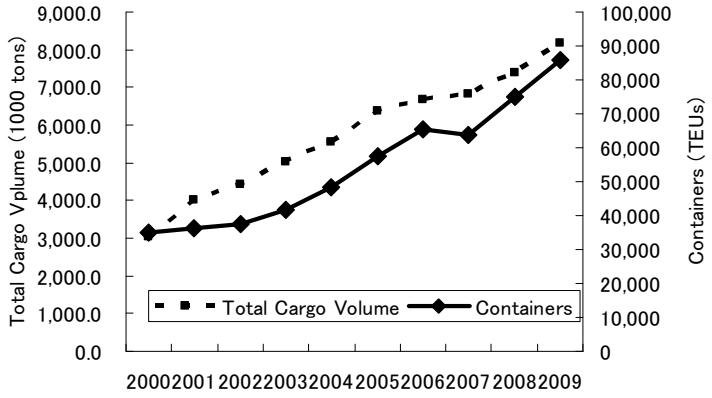
	2008	2009
Total	7,374.6	8,167.0
Domestic	80.8	73.6
International	7,293.8	8,093.5
To/from Mozambique	4,397.7	4,890.2
Export	1,451.2	1,640.5
Import	2,946.4	3,249.7
Transit	2,896.2	3,203.3
South Africa	2,501.7	3,057.7
Zimbabwe	267.4	101.9
Swaziland	127.1	43.7

Source: CFM (Reorganized by the Study Team)



Source: CFM (Reorganized by the Study Team)

Figure 2.5-37 Formation of cargo handled in Maputo Port in 2009



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Cargo Volume (1000 tons)	3,036	4,002	4,424	5,036	5,540	6,367	6,672	6,826	7,375	8,167
Domestic	68	82	50	72	56	60	50	65	81	74
International - Moz	1,305	1,996	2,569	2,902	3,256	3,604	3,966	4,054	4,398	4,890
International - Transit	1,663	1,924	1,804	2,063	2,229	2,703	2,657	2,708	2,896	3,203
Containers (TEUs)	34,871	36,177	37,361	41,642	48,478	57,676	65,555	63,764	74,792	85,851
Domestic	3,142	3,752	2,351	2,156	4,129	3,588	3,039	3,910	2,236	
International - Total	31,729	32,425	35,010	39,486	44,349	54,086	62,516	59,854	72,556	85,851
- Mozambique	NA	27,460	30,199	33,485	38,121	45,140	52,506	NA	NA	NA
- Transit	NA	4,965	4,811	5,641	6,228	8,948	9,914	NA	NA	NA

Source: CFM, MCLI (Reorganized by the Study Team)

Figure 2.5-38 Historical change of cargo volume handled in Maputo Port

Table 2.5-26 Details of cargo handled in Maputo Port (excluding transit)

(1000 tons)

	Domestic		International excluding transit	
	2008	2009	2008	2009
TOTAL	80.8	73.6	4,397.7	4,890.2
LOADED	57.5	68.4	1,451.2	1,640.5
- CONTAINERS	13.4	0.1	508.9	477.7
- CITRUS			59.7	0.0
- PLASTER	0.0	16.5		
- SUGAR			141.9	451.6
- FUEL	43.6	49.9	19.3	1.9
- GAS CONDENSATE			69.4	69.7
- SCRAP			29.0	9.6
- ALUMINUM			537.9	544.1
- CORN			72.1	70.2
- OTHERS	0.5	1.9	13.0	15.5
DISCHARGED	23.3	5.2	2,946.4	3,249.7
- CONTAINERS	17.0	0.0	442.0	530.3
- FISH	4.2	4.1	0.0	1.6
- FUEL	0.9	1.0	595.0	581.6
- CORN			48.6	15.0
- RICE			82.3	195.8
- CLINKER			139.9	121.4
- WHEAT			106.9	233.8
- CEMENT			84.7	164.7
- VEGETABLE OIL			43.1	30.9
- VEHICLES			15.6	23.8
- ALUMINA (MOZAL)			1,044.8	1,031.5
- PET COKE (MOZAL)			205.2	208.6
- PITCH (MOZAL)			37.2	43.7
- STEEL PIPE			8.5	16.4
- SULPHUR			68.1	0.0
- OTHERS	1.2	0.0	24.7	50.7

Source: CFM (Reorganized by the Study Team)

Table 2.5-27 Transit cargo handled in Maputo Port

(1000 tons)

	SOUTH AFRICA		SWAZILAND		ZIMBABWE	
	2008	2009	2008	2009	2008	2009
TOTAL	2,501.7	3,057.7	127.1	43.7	267.4	101.9
LOADED	2,501.7	3,057.7	127.1	43.7	167.4	101.9
- COAL	740.4	1,428.7				
- CITRUS	36.0	49.6	31.4	0.0		
- MOLASSES	0.0	32.6				
- STEEL ROLL	20.5	21.1				
- MAGNETITE	802.9	822.6				
- GRANIT	30.3	5.9				
- FERRO-CHROME	301.8	246.7			156.4	51.7
- FERRO ALLOYS	39.5	28.6			2.7	0.0
- CHROME ORE	337.4	403.2			8.3	38.1
- SUGAR	185.9	16.2	95.6	43.7	0.0	12.1
- OTHERS	7.2	2.4				
DISCHARGED	0.0	0.0	0.0	0.0	100.0	0.0
- SULPHUR					95.0	0.0
- OTHERS					5.0	0.0
				TOTAL	2,896.2	3,203.3

Source: CFM (Reorganized by the Study Team)

4) Development plan

The long-term objective is to re-establish the ports of Maputo and Matola as key economic growth centers in Mozambique and as competitive transit ports for the vibrant import/export markets

of South Africa, and the neighboring countries of Swaziland, Zimbabwe, Botswana and Zambia.

In 2009 larger vessels with draft of 10 m or more carried 78 % of port cargoes, although they accounted for only 24 % of total vessels calling at the port. And the requirement for draft is expected to grow. Therefore deepening of the port is the priority of MPDC's port development. MPDC plans to dredge the access channel up to 12.1 m by 2015 and dredge the basin up to 12.8 m. In addition, three new 15 m berths will be built.

The master plan of the port is based on the forecast which estimates that cargo volume will grow up to 34.2 million tons in 2020 and 48.6 million tons in 2030.

5) Ponta Techobanine Project

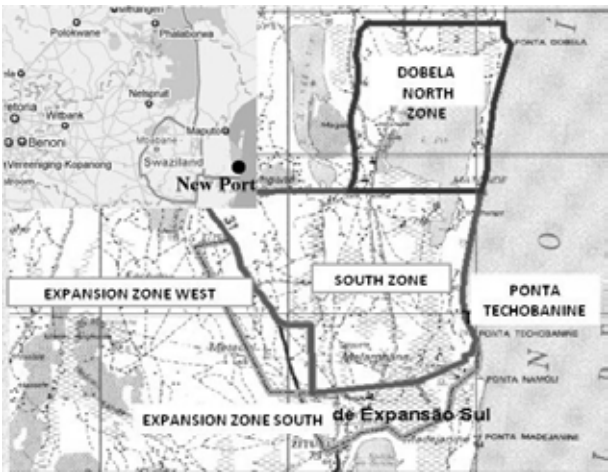
In Ponta Techobanine, 70 kilometers south-east of Maputo and 40 kilometers to the national border with South Africa, new port development is planned. The purpose of the project is to build a port to complement industrial, commercial and tourism development. The project will occupy a total area of 22,382.4 hectares and includes the development of SEZ. The required investment is US$ 500 million (which excludes the costly reinforcement of railway connecting with hinterland countries).

The port is planned to import fuel to Mozambique, Botswana, South Africa and Zimbabwe and to export coal, iron ore and other minerals from Botswana, South Africa, Swaziland and Zimbabwe. The handling volume is estimated to be 10 million tons in the initial stage and will eventually reach 200 million tons.

According to information from CFM, detailed design and funding arrangements are planned in 2011 and the new port is expected to start operation in 2015.

In the 1960s, studies identified that Ponta Dobela, to the north of Ponta Techobanine, would make a suitable deep-water port. But in 1976, Richards Bay was developed as a deep-water port and Ponta Dobela Project has not been implemented. Ponta Dobela is located in an environmentally sensitive area.

The Study Team observed that the planned area is a green field without any road and rail access. The port development requires cutting through a sand hill and dredging of the access channel in a sandy beach which isn't sheltered. A considerable amount of littoral sand drift will be an important technical issue to be coped with.



Source: CFM, (Reorganized by the Study Team)

Figure 2.5-39 Location of the new port in Techobanine

Source: CFM, (Reorganized by the Study Team)

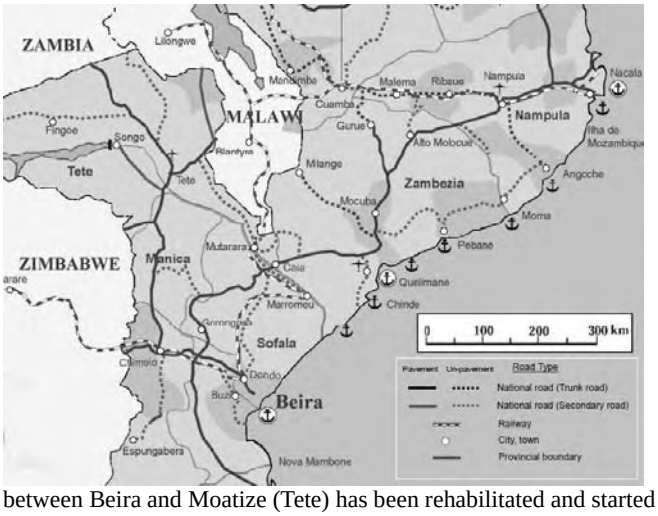
Figure 2.5-40 Conceptual plan of the new port in Techobanine

(2) Beira Port

1) Outline

Beira Port is the second largest port in Mozambique and is located in the second largest city of the country. The port is situated at the mouth of the Pungue River at Longitude 34º 50' E and Latitude 19º 51' S, 750 km north of Maputo and 860 km southwest of Nacala. Beira Port is the gateway of Beira Corridor and Sena Corridor leading to the mineral-rich Tete Province, landlocked Malawi, Zimbabwe and Zambia.

The port is directly linked to the hinterland (Zimbabwe and Zambia) by road and rail networks, and currently by road only to Malawi. The railway is operated by CCFB, a joint venture formed by CFM (49%) and Indian rail operators (51%). However, the improvement of efficiency has been very small since the participation of private operators. A 600 km pipeline, of which capacity is 1.2 million tons per year, links the port with Harare, the capital city of Zimbabwe, via Mutale.



Note: The railway between Beira and Moatize (Tete) has been rehabilitated and started operation in XX.
Source: JICA (Reorganized by the Study Team)

Figure 2.5-41 Location and hinterland access of Beira Port

In October 1998 a joint venture, Cornelder de Moçambique (CdM) was formed by Cornelder Holding, based in Rotterdam (67%) and CFM (33%) for the management of the port (Container and General Cargo Terminals). The period of the concession is 25 years with an optional 15 year extension. Liquid bulk terminal and coal terminal remain operated by CFM.

Sedimentation is the toughest challenge for the estuary port of Beira. In addition to the tidal restriction of navigation in the access channel, the shallowness of the basin hampers cargo handling. Cargo operators have to very carefully monitor the draft of vessels while loading cargoes and they often have to change the loading plan. Required annual maintenance dredging volume is 2.5 million m3. CFM is responsible for maintenance dredging of the channel and the basin, and delegates the dredging work to EMODRAGA, a public corporation. Two dredgers procured in Japan's ODA project have been the main dredgers in the port. In addition to these dredgers, CFM plans to acquire a dredging vessel with a capacity of 2,500 m3. This investment is budgeted at 35 million Euros, financed by DANIDA. The new dredger has enough capacity that CFM plans to use it for maintenance dredging in Maputo Port and Quelimane Port too.

2) Facilities

The layout of port facilities in Beira Port is shown in Figure 2.5-42. The port has a total of 11 berths stretching over a total length of 1994 meters, excluding berth number 1 which is not used due to deterioration and is reserved as a fishing harbor by the Ministry of Fishery. The water depths indicated in the figure are the approximate depths as of the time of the Study Team's visit.

Quays 2 to 5 are dedicated for container handling. The container terminal is equipped with two quay gantry cranes and two harbor mobile cranes. The capacity of the container yard is 3,650 TEUs including 144 reefers. The port seeks to handle cargoes from Copper Belt and plans to upgrade the security of the terminal.

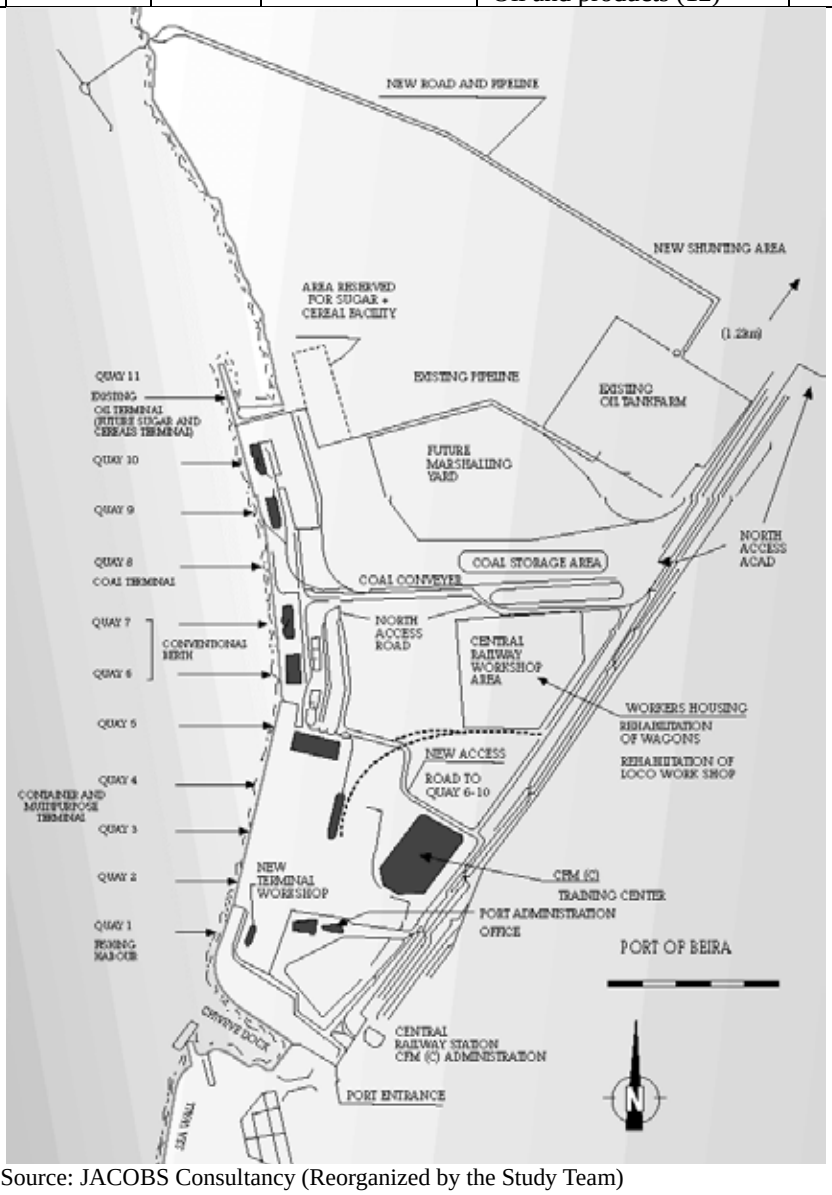
Quay 6 and Quay 7 are break bulk terminals; however the quays are often used for the handling of marine products, since fishing harbor (quay 1) is not operational. This handling sometimes hampers general cargo handling.

Berth number 8 is a coal berth connected to a coal stock yard by a belt conveyer. Since the handling volume of coal has been very small, the berth is mainly used for handling of molasses. To respond to the rapid increase of coal handling to be shipped from Moatize Coal Mine in Tete Province, the capacity of the terminal will be increased from 1.2 million tons to 5 million tons as described in detail later in this subsection.

Quay number 10 is used for handling cereals. Behind the quay, six grain silos were installed in 2010, of which capacity is 30,000 tons. The terminal is equipped with a pneumatic unloader. CFM plans to double the capacity.

Quay number 11 is the old oil berth, which is currently used only for bunkering. CFM has a plan to redevelop this area as a cargo terminal.

Terminal	Number	Length (m)	Alongside depth (m)	Commodities handled	Existing annual capacity
Containers	2-5	646	9.0-11.0	Containers, granite and copper	100,000 TEUs
General cargo	6, 7, 9, 10	670	6.5-7.0 6.5-8.5	Refrigerated citrus, vegetables, etc Dry general cargo	2,300,000 tons
Coal	8	188	7.2	Coal	1,200,000 tons
Oil and products	11 and 12	480	11.8	Bunker (11) Oil and products (12)	2,500,000 tons



Source: JACOBS Consultancy (Reorganized by the Study Team)

Figure 2.5-42 Layout of facilities in Beira Port

3) Cargo throughput and vessel traffic

As shown in Table 2.5-28 and Figure 2.5-43, a total of 3,029,000 tons of cargoes, 63% of which are transit cargoes and 36 % are international cargoes to/from Mozambique, is handled here. The share of domestic cargoes is less than 1 %. Around 80% of the total cargo volume is inbound on account of the large amount of inbound transit cargoes. The total handling volume accounts for 46 % of port capacity (6.5 million tons). Container throughput in 2009 is 92,236 TEUs which is equivalent to 92 %

of terminal capacity.

The historical change of cargo volume is shown in Figure 2.5-44. The average annual growth rate of cargo volume from 2000 to 2009 is 4.1 % for total cargoes and 12.7 % for containers, respectively. The growth rate of the total cargo volume is rather moderate due to the low growth of transit cargoes (2.4%). On the other hand, the international cargo from/to Mozambique recorded average growth of 10%. Transit cargoes are still the main cargoes of the port, although they decreased from 75% of total cargoes handled in 2000 to 63 % in 2009.

Table 2.5-29 shows the breakdown of domestic and international (excluding transit) cargoes handled in the port. Containers are the dominant domestic cargoes though the quantity is very small. Tobacco, sugar, tea, cotton, timber, scrap and vermiculite are the major containerized cargoes. Around 90 percent of exported cargoes and 35 percent of imported cargoes are containerized. Fuel and clinker are the major imported bulk cargoes.

Table 2.5-30 and Figure 2.5-45 show the breakdown of transit cargoes handled in Beira Port. Total volume of cargoes to/from Zimbabwe and Malawi is almost equal; their share is 44 % and 45 % respectively. The remaining are cargoes to/from Zambia. The volume of transit cargoes to/from other countries is negligible. The top 5 commodities in 2009 are fuel to Zimbabwe, fuel to Malawi, containers to Malawi, containers from Malawi and fertilizer to Malawi. Around 30 percent of the total transit cargoes are containerized cargoes.

Table 2.5-31 shows modal share of hinterland transport for transit cargoes to/from Zimbabwe. For some commodities, the modal share of railway exceeds 100 % due to statistical error or cargoes dwelling in the port over New Year's Eve. As shown in the table, around 25 % of transit cargoes to/from Zimbabwe are transported by railway. For outbound cargoes, the modal split of railway is around 80 % whereas it is around 10 % for inbound cargoes due to low modal share for imported fuel cargo which is transported by pipeline. Transit cargoes to/from Malawi and Zambia are not transported by railway due to lack of infrastructure.

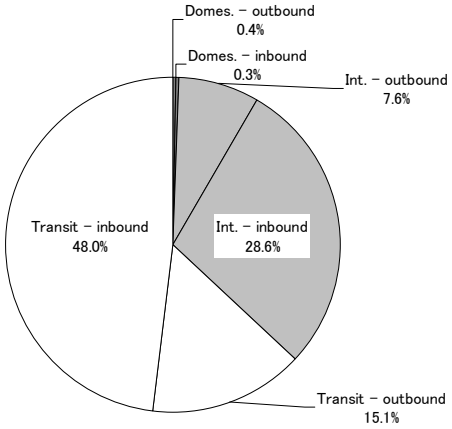
As shown in Table 2.5-32, the total numbers of cargo vessels calling at the port in 2009 was 386, of which 36 % was container vessels. The number of container vessels increased 25 % compared with the previous year.

Table 2.5-28 Cargo volume in Beira Port

(1000 tons)

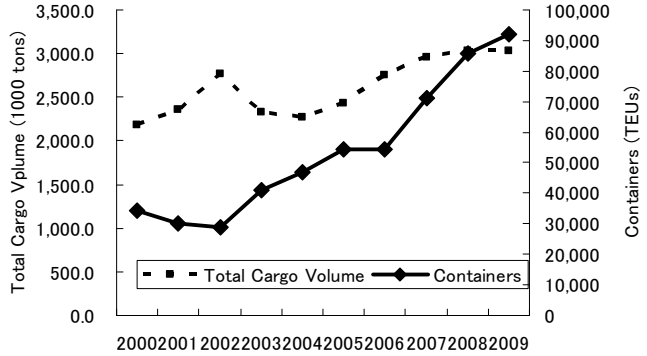
	Domestic		International excluding transit		Transit		Total	
	2008	2009	2008	2009	2008	2009	2008	2009
TOTAL	72.4	21.0	1,069.5	1,097.2	1,895.0	1,911.5	3,036.9	3,029.7
LOADED	34.2	11.6	254.9	230.0	372.9	456.0	662.0	697.6
- CONTAINERS	17.9	8.0	197.3	204.4	183.5	268.3	398.8	480.7
- OTHERS	16.2	3.5	57.6	25.6	189.4	187.7	263.2	216.9
DISCHARGED	38.2	9.4	814.5	867.3	1,522.1	1,455.5	2,374.9	2,332.2
- CONTAINERS	17.5	6.9	301.6	299.7	365.8	310.7	684.9	617.3
- OTHERS	20.8	2.5	512.9	567.6	1,156.3	1,144.8	1,690.0	1,714.8

Source: CFM (Reorganized by the Study Team)



Source: CFM (Reorganized by the Study Team)

Figure 2.5-43 Breakdown of cargo volume handled in Beira Port in 2009



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Cargo Volume (1000 tons)	2,185.5	2,356.1	2,761.9	2,322.6	2,273.6	2,428.2	2,746.3	2,961.1	3,036.9	3,029.7
Domestic	40.9	47.5	74.2	44.1	60.5	NA	NA	77.5	72.4	21.0
International - Moz	506.4	640.6	689.3	714.3	680.5	NA	NA	1,018.4	1,069.5	1,097.2
International - Transit	1,638.2	1,668.1	1,998.4	1,564.4	1,532.6	NA	NA	1,865.2	1,895.0	1,911.5
Containers (TEUs)	34,498	30,009	28,959	40,896	46,757	54,285	54,250	71,167	85,716	92,236
Domestic					5,125				3,140	1,207
International - Moz					15,639				44,231	50,493
International - Transit					26,011				38,345	40,536

Source: CFM (Reorganized by the Study Team)

Figure 2.5-44 Historical change of cargo volume handled in Beira Port

Table 2.5-29 Details of cargo handled in Beira Port (excluding transit)

(1000 tons)

	Domestic		International excluding transit	
	2008	2009	2008	2009
TOTAL	72.4	21.0	1,069.5	1,097.2
LOADED	34.2	11.6	254.9	230.0
- CONTAINERS	17.9	8.0	197.3	204.4
- FUEL	2.1	2.6		
- FERTILIZER	1.1			
- COAL	0.6			
- MOLASSES	12.5			21.0
- SUGER			20.0	
- CITRUS			0.3	
- TIMBER			19.2	
- SCRAP			17.4	4.1
- OTHERS		0.9	0.7	0.5
DISCHARGED	38.2	9.4	814.5	867.3
- CONTAINERS	17.5	6.9	301.6	299.7
- FUEL	17.5		178.2	182.3
- FISH	2.6	2.5	5.3	6.8
- RICE			24.2	51.6
- WHEAT			82.9	78.8
- CORN				50.5
- CLINKER			183.2	126.6
- VEGETABLE OIL				4.6
- FERTILIZER			8.4	22.7
- ACID			0.5	
- OTHERS	0.6		30.2	43.9

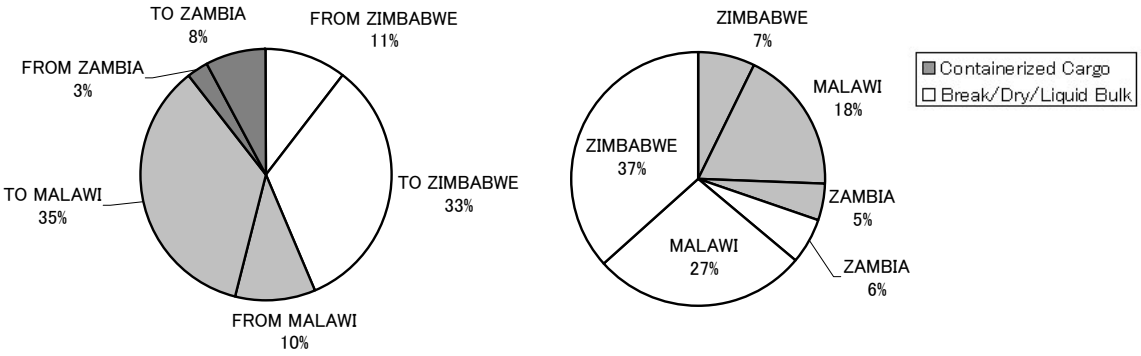
Source: CFM (Reorganized by the Study Team)

Table 2.5-30 Details of transit cargo handled in Beira Port

(1000 tons)

	ZIMBABWE		MALAWI		ZAMBIA		OTHERS	
	2008	2009	2008	2009	2008	2009	2008	2009
TOTAL	875.0	833.4	828.6	872.1	189.7	202.7	1.8	3.3
LOADED	170.5	203.8	132.2	196.1	68.4	52.9		
- CONTAINERS	48.1	70.8	120.9	170.9	12.8	23.4		
- GRANITE	122.5	127.4						
- WHEAT		5.6						
- SUGER			11.3	21.5	55.6	29.5		
- OTHERS				3.6				
DISCHARGED	704.4	629.6	696.4	676.0	121.3	149.8		
- CONTAINERS	41.9	64.9	229.2	179.7	94.7	66.1		
- FERTILIZER	31.5	34.9	118.9	134.8	26.0	78.6		
- FUEL	578.0	488.5	178.8	227.8				
- WHEAT	42.8	10.0	83.9	104.2				
- RICE		8.8						
- CORN		2.7	2.7	20.6				
- PALM OIL	2.0				0.0	3.4		
- VEGETABLE OIL		3.5	37.0	3.4				
- CLINKER			44.8					
- OTHERS	8.2	16.3	1.2	5.6	0.6	1.7		
						TOTAL	1,895.0	1,911.5

Source: CFM (Reorganized by the Study Team)



Source: CFM (Reorganized by the Study Team)

Figure 2.5-45 Breakdown of transit cargo handled in Beira Port by origin/destination (left) and by cargo type (right)

Table 2.5-31 Hinterland transport of transit cargo to/from Zimbabwe

(1000 tons)

	Total transit cargo to/from Zimbabwe		Transit rail cargo to/from Zimbabwe		Share of rail cargo	
	2008	2009	2008	2009	2008	2009
TOTAL	875.0	833.4	229.1	214.5	26.2%	25.7%
LOADED	170.5	203.8	141.6	156.6	83.0%	76.8%
- CONTAINERS	48.1	70.8	18.8	24.2	39.1%	34.2%
- GRANITE	122.5	127.4	95.9	128.8	78.3%	101.1%
- WHEAT		5.6				0.0%
- SUGER						
- OTHERS			26.9	3.4		
DISCHARGED	704.4	629.6	87.5	57.9	12.4%	9.2%
- CONTAINERS	41.9	64.9	28.2	20.2	67.3%	31.1%
- FERTILIZER	31.5	34.9	28.4	13.8	90.1%	39.6%
- FUEL	578.0	488.5	0.5	0.6	0.1%	0.1%
- WHEAT	42.8	10.0	15.7	15.6	36.6%	156.5%
- RICE		8.8		2.6		29.5%
- CORN		2.7	12.8	3.6		131.6%
- PALM OIL	2.0				0.0%	
- VEGETABLE OIL		3.5				0.0%
- CLINKER						
- OTHERS	8.2	16.3	2.0	1.5	24.4%	9.2%

Source: CFM (Reorganized by the Study Team)

Table 2.5-32 Number of vessel calls at Beira Port

	2008	2009
General Cargo Vessels	118	139
Container Vessels	114	144
Tankers	98	103
Fishing Vessels	NA	109
Others	66	43
TOTAL	396	538
(excluding fishing and others)	330	386

Source: CFM (Reorganized by the Study Team)

4) Development plans

In 2011, Vale Mozambique will start operation of Moatize Coal Mine in Tete Province and coal will be exported via Beira Port. Sena Rail Line, of which rehabilitation work is going to be completed soon, will be used for coal transport from Moatize to Beira. Annual handling volume is estimated to be 12 million tons. Riversdale, an Australian mining company, which has acquired exploration tenements in Moatize, also plans coal export via Sena Line and Beira Port. The amount of the coal export is reportedly 2 million tons per year. The company also has exploration tenements in Benga in the same Province.

Vale has contracted with a transship service provider to transport coal from the port to offshore in Mozambican water where the coal is transshipped to a Cape size or Panamax bulker. The vessel deployed for the transship service is a "self-unload vessel" which is a Handymax bulker (55,000DWT) equipped with an unloader. Its capacity is 45,000 tons because the 10,000 tons of unloading equipment reduce the loading capacity.

Emergency dredging of the access channels and basin is being be implemented to secure a depth of 8 meters, which is the minimum requirement for navigation of the self-unloading vessel considering the relatively large tidal range (6 to 7 meters). The shallowest part of the access channel had been only 3 to 5 meters. Some parts of the sand resulting from the dredging are used for reclamation of a swampy area to be developed as a coal terminal. This investment, budgeted at US$ 43 million, is co-financed by the EIB (European Investment Bank), ORET (Dutch International Development Agency) and CFM.

The handling capacity of berth number 8 will be increased from 1.2 million tons to 5 million tons by installing new equipment. The project is funded by Vale and Riversdale and the equipment is transferred to CFM. CdM will operate the terminal, which is currently operated by CFM, after improvement works are completed.

A new coal terminal is also planned at around 1 kilometer north of the new oil jetty (Berth 12). The terminal has a quay of 14 meters deep and a yard with rail lines, of which the area is 50 ha. The site is owned by CFM but resettlement of squatters in the CFM's land and residents around the site will be necessary. The new terminal will be operated by a consortium of CFM and a private partner, which has not been selected yet. The capacity of the new coal terminal is estimated at around 20 million tons per year. CFM plans to shift coal handling from quay number 8 to the new terminal and quay number 8 will be used for handling other commodities since the location of quay number 8, next to the grain terminal, is not suitable for coal handling.

Vale plans the second phase development of Moatize Coal Mine; however the coal mined in the second phase development area will be exported via Nacala Port using new rail link due to the restriction of port capacity in Beira.

Riversdale is considering transport of its products to Chinde Port via Zambezi River, however there still remain environmental and technical problems.

Besides the above-mentioned coal project, CFM plans to construct a sugar terminal and a fertilizer terminal in the area between the existing general cargo terminal and the oil jetty (Quay 12). The implementation schedule is not decided yet.

Beira Port has a master plan formulated in 1984, but it has not been updated since then. CFM is adjusting the master plan to cope with future demands.

(3) Quelimane Port

1) Outline

Quelimane Port is the smallest port in terms of cargo volume among the five major ports in Mozambique. The port is situated within the city of the same name in the Province of Zambezia, on the left bank of the Bons Sinais River, about 17 nautical miles from the Indian Ocean. The water depth of the access channel from the open sea to the port is less than 2 meters CD, but with the help of a

relatively large tidal range, the maximum depth reaches 6 to 7 meters at high tide.

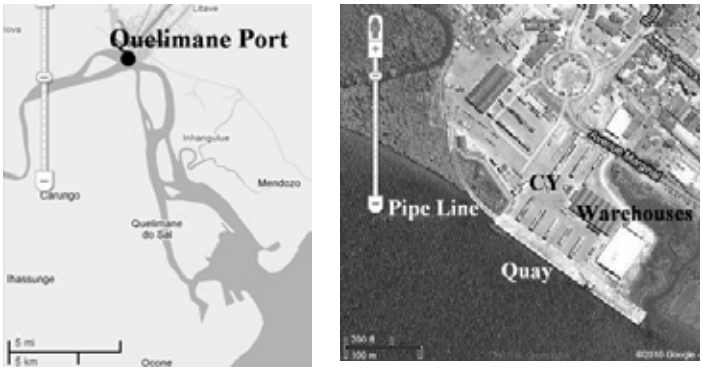
Quelimane is the nearest port to Malawi; the distance to the border is around 350 km. However, the condition of road through the mountainous region to the border town of Milange is poor. Since the 200 km railway between Quelimane and Mocuba is not operational, currently the port doesn't have railway access.

The port is owned by CFM and has been operated by Cornelder Quelimane Ltd, a company consisting of 51% Cornelder de Mozambique (which is also a consortium of Cornelder in Netherlands and CFM) and 49% CFM, since March 2005. Participation of a private operator was the precondition for funding of the rehabilitation work. Liquid bulk cargo continues to be handled by CFM directly like other privately operated ports in Mozambique. The port is operated 24 hours in three shifts.

2) Facilities

The port has only one berth, 230 meters long and approximately 3.5 meters deep, where all types of cargoes including liquid bulk are handled. The port has two warehouses with storage capacity of 3,806 m2. The handling capacity of the container yard is 800 TEUs including 18 reefer points. The port is equipped with a harbor mobile crane, reach stackers and forklifts suitable for container handling. The total annual handling capacity of the port is about 650,000 tons

The berth was constructed in two phases. In 1953, a 120 meter long quay was constructed while during the second phase, in 1968, the quay was extended to the current length. Rehabilitation work was implemented from 2005 to 2007. The work included rehabilitation of the sub-structure of the quay; strengthening of the slab of the quay, paving of the quay and rehabilitation of a warehouse. New cargo handling equipment was also provided. The rehabilitation work was funded by Germany.



Source: Google (Reorganized by the Study Team)

Figure 2.5-46 Location and layout of Quelimane Port

Source: Study Team

Figure 2.5-47 Rehabilitated quay of Quelimane Port

3) Cargo throughput and vessel traffic

As shown in Table 2.5-33, total number of ship calls in 2009 was 135. Most of them are small coasters, of which average parcel size is 143 tons.

The total cargo volume handled in the port in 2009 was 76,700 tons, which is about 10 percent of the port capacity. The historical change of cargo volume is shown in Figure 2.5-48. The cargo volume handled in the port had been increasing until 2005, but since then the cargo volume has been decreasing sharply mainly due to diversion of sugar traffic to Nacala and Beira, which had accounted for 50 % of total traffic of the port. Sugar in containers had been transported from Marromeu to Quelimane via Zambezi River and transshipped to cabotage vessels to Maputo. But Navique, the only Mozambican cabotage company, was disbanded in 2007, and no sugar has been handled in Quelimane Port since then. The ban on log exports in 2006 also had a negative impact on port traffic. Cornelder explained that rehabilitation work from 2005 to 2007 had not hampered port traffic so much.

Table 2.5-34 shows the breakdown of cargoes by commodities. The statistics include containerized cargo. Major commodities handled in the port are timber (export) and fuel (domestic inbound). Although the port is close to the Malawian border, transit containers had not been handled in the port. In 2009, the port started handling transit containers from/to Malawi. Major transit commodities are exported cotton, tea, timber, and imported chemical products and machinery. The transit cargoes are expected to be a trigger for the recovery and growth of the port.

4) Development plan

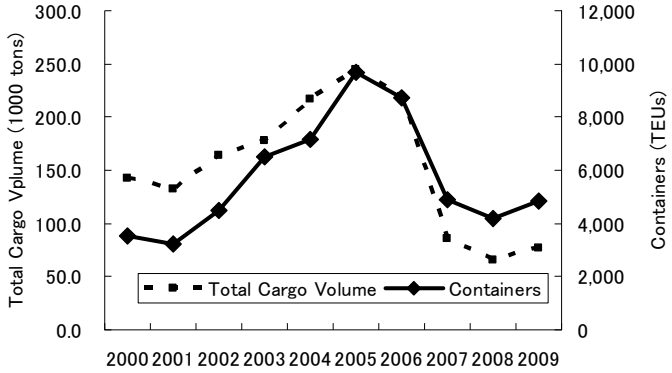
The port has just finished rehabilitation work; therefore no further development is planned. The new large dredger to be deployed in Beira Port has remaining capacity to take care of maintenance dredging of other ports and EMODORAGA plans to use it for maintenance of the channel and basin of Quelimane Port. Cornelder doesn't intend to implement dredging beyond the maintenance work.

Cornelder explained to the Study Team that the strategic targets of the port are to reopen cabotage and increase transit cargo to/from Malawi.

Table 2.5-33 Numbers of vessel call at Quelimane Port

	2008	2009
Domestic	74	106
International	21	29
TOTAL	95	135

Source: CFM (Reorganized by the Study Team)



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Cargo Volume (1000 tons)	141.9	132.9	164.2	177.4	217.4	244.1	219.2	85.7	65.7	76.7
Domestic	48.2	63.8	80.1	95.5	130.5	156.2	NA	27.0	16.7	15.2
International	93.7	69.1	84.1	81.9	86.9	87.9	NA	58.7	49.0	61.5
Containers (TEUs)	3,518.0	3,239.0	4,488.0	6,488.0	7,176.0	9,681.0	8,730.0	4,870.0	4,172.0	4,828.0
Domestic									908.0	748.0
International (Mozambique)									3,264.0	3,747.0
International (Transit)										333.0

Source: Cornelder and CFM (Reorganized by the Study Team)

Figure 2.5-48 Historical change of cargo volume handled in Quelimane Port

Table 2.5-34 Breakdown of cargo handled in Quelimane Port

(1000 tons)

	2008	2009
DOMESTIC	16.7	18.3
LOADED	0.6	4.4
- TIMBER	0.0	2.6
- METAL PRODUCTS	0.0	0.7
- OTHERS	0.6	1.0
DISCHARGED	16.0	13.9
- FUEL	12.3	11.0
- METAL PRODUCTS	2.0	1.6
- TRANSPORT MACHINERY	0.0	0.1
- OTHERS	1.7	1.3
INTERNACIONAL	49.0	51.9
LOADED	39.1	34.3
- SHRIMP AND LOBSTER	1.5	1.1
- COPRA	0.9	2.4
- METAL PRODUCTS	0.3	1.5
- TIMBER	32.4	25.9
- OTHERS	4.0	3.4
DISCHARGED	9.9	17.6
- IRON OR STEEL	2.1	3.2
- CEMENT	0.0	2.4
- TRANSPORT MACHINERY	0.3	0.3
- OTHERS	7.5	11.7

Note: Transit cargoes are not included. Total cargo volume doesn't correspond to the data listed in Figure 2.5-48 due to statistical error.
Source: CFM (Reorganized by the Study Team)

(4) Pemba Port

1) Outline

Pemba Port, Mozambique's most northern container port, is 200 km north of Nacala. Although the nautical distance between Nacala and Pemba is short, the road distance between the two ports is more than 400 km due to lack of direct road access. The port is located in a well-sheltered and deep bay of Pemba as shown in Figure 2.5-49. Though it was very windy when the Study Team visited the port, the basin remained calm. Water depth of the access channel and anchorage basin is more than 20 meters. Pemba Port is operated directly by CFM. CFM has 72 workers in the port and an additional 600 contract workers are employed as the need arises.

Source: Google (Reorganized by the Study Team)

Figure 2.5-49 Location of Pemba Port

Source: Google (Reorganized by the Study Team)

Figure 2.5-50 Layout of facilities in Pemba Port

Source: Study Team

Figure 2.5-51 Deteriorated concrete bridge of Pemba Port

Source: Study Team

Figure 2.5-52 Container handling at Pemba Port

2) Facilities

The layout of port facilities is shown in Figure 2.5-50. The port has only one jetty of which length is 185 meters and the width is 70 meters. Water depth alongside the jetty is 7.5 meters. The jetty is connected to the land with a 75-meter-bridge. The jetty was constructed in 1957 when the port was developed and its deteriorated parts were rehabilitated in 1996. The surface of the apron seemed to be in good condition; however the Study Team observed exposure of reinforcing rods on the bottom of concrete slab of the connecting bridge (see Figure 2.5-51). The area of container yard is approximately 1.5 ha. The CY is equipped with seven outlets for reefers. The condition of pavement of CY seemed relatively good.

A part of the jetty is used as a supply base for offshore petroleum development by a US company.

The only available cargo handling equipment are two reach stackers of which lifting capacities are 28 tons and 25 tons, which are not enough for container handling. A yard gantry crane and a mobile crane with lifting capacity of 81 tons are out of commission. It was observed that a reach stacker moved around the CY possibly due to inadequate yard planning. There is no quay crane. Containers are loaded on yard chassis directly by a vessel crane (see Figure 2.5-52). According to the information from CFM, the productivity of vessel/quay-operation is 12 movements per hour; however that seems to be the targeted productivity rather than the actual productivity.

The port complies with the ISPS Code and the security management at the gate seemed adequate. Basic safety measures such as wearing helmet were also implemented.

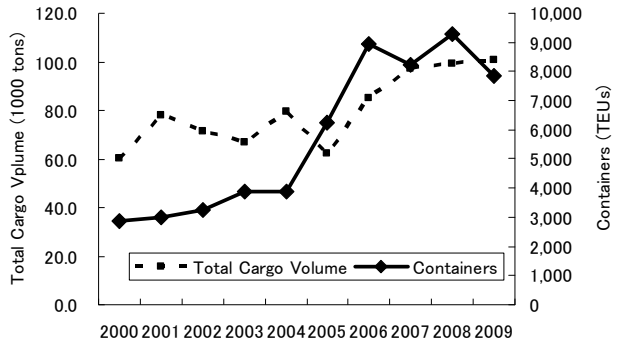
3) Cargo throughput and vessel traffic

In 2009, a total of 65 vessels called at the port, in which 13 were general cargo vessels, one was a tanker, 25 were container vessels and 26 were coasters.

The historical change of cargo volume is shown in Figure 2.5-53. The average growth rate of cargo throughput from 2000 to 2009 is 7.3% and that of container throughput is 14.1%. Thus the port has recorded remarkable growth particularly in container traffic. The breakdown of cargo handled in Pemba Port is shown in Figure 2.5-54. Main cargoes of the port are containers which account for 95% of the total cargo volume. Annual throughput of containers is 7,846 TEUs in 2009. The principal commodities transported by container vessels are timber (export), cotton (export) and cereal (shipment to domestic market). Transit or transship containers are not handled in the port. Exported timbers are produced in the forests of Cabo Delgado Province where the port is located. Timbers produced outside of the Province are not handled in Pemba Port. Exporters of timbers are Chinese firms and the main exporting destination is China. Container transport among Mozambican ports is cabotage by foreign flag vessels because of lack of Mozambican fleet. Bagged cement is transported from Nacala. Besides containers, fuel from Mozambican ports is discharged.

4) Development plans

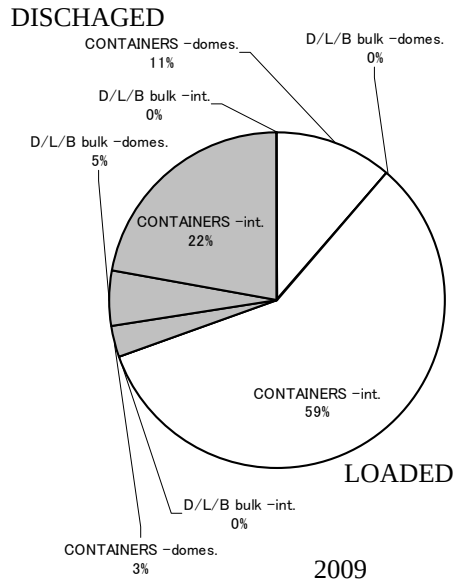
Although there is no authorized development plan of the port, CFM is considering the expansion of the CY to the beach to the east of the port in order to respond to the increase in container traffic. Extension of the jetty is also being considered.



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Cargo Volume (1000 tons)	60.4	78.0	71.3	66.6	79.7	62.5	85.3	97.4	99.1	100.6
Domestic	25.7	28.9	28.1	19.8	13.1	NA	NA	18.5	12.4	19.7
International	34.7	49.1	43.2	46.8	66.6	NA	NA	78.9	86.6	80.9
Containers (TEUs)	2,860	3,002	3,238	3,895	3,869	6,233	8,965	8,244	9,295	7,846
Domestic									1,066	537
International									8,229	7,309

Source: CFM (Reorganized by the Study Team)

Figure 2.5-53 Historical change of cargo volume handled in Pemba Port



(1000 tons)

	2008	2009
DOMESTIC	12.4	19.7
LOADED	7.7	11.6
- CONTAINERS	5.8	11.6
- OTHERS	1.9	0.0
DISCHARGED	4.7	8.1
- CONTAINERS	0.6	2.9
- FUEL	1.8	5.2
- OTHERS	2.2	0.1
INTERNACIONAL	86.6	80.9
LOADED	58.3	58.5
- CONTAINERS	52.3	58.4
- COTTON	5.9	0.0
- TRANSPORT MACHINERY	0.1	0.1
DISCHARGED	28.3	22.4
- CONTAINERS	19.2	22.3
- STEEL	4.4	0.0
- TRANSPORT MACHINERY	0.0	0.1
- OTHERS	4.6	0.0

Source: CFM (Reorganized by the Study Team)

Figure 2.5-54 Breakdown of cargo handled in Pemba Port

(5) Durban Port

1) Outline

The port of Durban is situated on the east coast of South Africa, 625 nautical miles south-south-west of the port of Maputo. The port occupies the natural expanse of Durban Bay - an area

of 1850ha, with the water area of 679 ha at low tide.

Durban Port is the main port of South Africa also serving inland countries such as Zimbabwe, Zambia, Botswana, Malawi and Swaziland. The port ranked 41st in world container throughput in 2009, and was the second largest container port in Africa after Port Said in Egypt.

In 2009, the entrance channel was widened from 122 meters to 220 meters by relocating the north breakwater and deepened from 12.8 meters to 17.0 meters in 2009.

The port is linked to the interior by the Natal rail corridor, giving rail access to Gauteng. The North Coast line provides a connection to Richards Bay and the northern and eastern interior.

All ports in South Africa including Durban Port are owned and managed by Transnet, a government-owned logistics company. Major terminals of the port including container terminals and vehicle terminals are operated by Transnet. Furthermore, Transnet owns and operates railways and pipelines in the country.

2) Facilities

The port has 57 berths as shown in Table 2.5-35. The layout of terminals is shown in Figure 2.5-55. There are ten container berths at Durban Container Terminal (DCT) and Pier 1, and three car terminal berths in the Point. There are fourteen break bulk berths in the Point, T-Jetty and Maydon Wharf. N-berth is currently used for cruise liners. There are nine liquid bulk and seven dry bulk berths at Island View and Maydon Wharf.

Berth depths at Durban range from the deepest berths at DCT, Pier 1, Point and Island View at -12.8m, to -9.9m in Maydon Wharf. A -16m container berth will be constructed by 2017.

The container terminal in Durban is one of the most congested terminals in the World. The terminal has introduced an RTG system and automatic gate system in order to increase handling efficiency. Rearrangement of the terminal, relocating all service facilities to the rear of the terminal to make room for a container stacking area is on-going. The productivity of vessel-quay operation is around 20 moves per gang per hour. Transnet plans to increase it to 28 moves.

There are a number of terminals managed and operated by private companies, including the Bluff Coaling Terminal, Island View oil and petroleum complex, the Fresh Produce Terminal at the T-Jetty and another fruit terminal at Maydon Wharf, the Sugar Terminal and Wood Chip Terminal on Maydon Wharf, SA Bulk Terminals (Rennies) on both Maydon Wharf and Island View in addition to a number of other private facilities mostly at Maydon Wharf.

In-port rail infrastructure provides services to all areas of the port, with a number of yards and terminals in the Point, Maydon Wharf, Bayhead, Kings Rest and in Fynnlands and Island View.

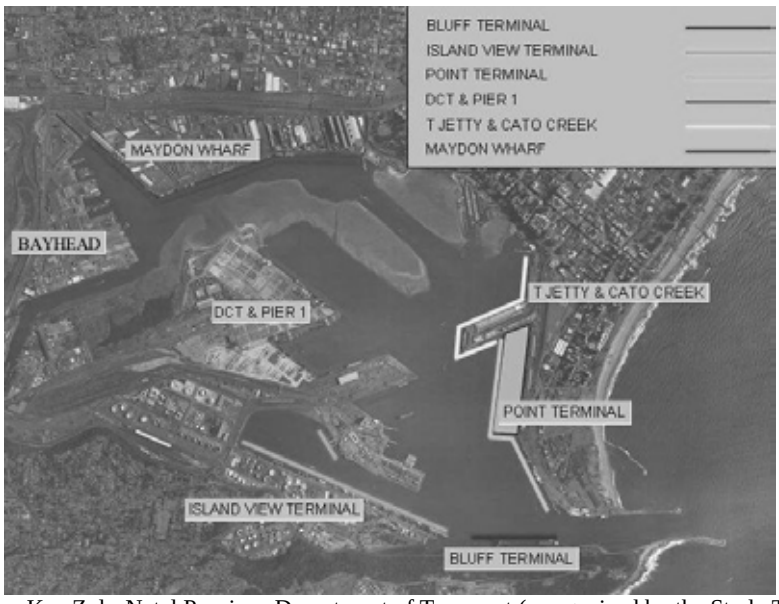
Road access to the port is problematic, with the increasing volumes of freight moved on road outpacing the capacity of the city road network. Port operations in the Point precinct are limited by the inadequacy of the CBD roads to handle heavy goods vehicles, and roads to the southern port are frequently congested, with problems arising due to heavy vehicles detouring through residential areas.

There are extensive pipeline connections between the port and the refineries in the Southern Industrial Basin. The Durban to Gauteng pipeline originates in a pump station in Island View, and the Coastal Terminal for the New Multi Products Pipeline is also being sited in Island View.

Table 2.5-35 Major berths in Durban Port

Terminal	Berth	Length (m)	Design Depth CD	Max Avail Depth	Max Depth Draught
Pier No.1	Berth100	276	-9.1	9,1	8,8
	Berth101 to 07	1714	-12.8	11.0 to 12.3	10.7 to 12.1
Island View	Berth1	230	-12.8	12,8	12,5
	Berth2	175	-10.6	10,3	10,0
	Berth3	165	-12.8	11,1	10,8
	Berth4	175	-10.6	9,7	9,4
	Berth5	175	-10.9	10,9	10,6
	Berth6	175	-10.6	9,2	8,9
	Berth7 to 9	705	-12.8	12.2 to 12.5	11.9 to 12.2
Point and T-Jetty	A berth	350	-11.7	11,5	11,2
	B berth	329	-10.5	9,9	9,6
	C berth	213	-9.1	9,1	8,8
	D/E berth	275	-8.2	7,9	7,6
	F berth	345	-7	6,4	6,1
	G berth	346	-7	7,0	6,7
	M to O berth	877	-12.2	11.4 to 11.9	11.1 to 11.6
	P to R berth	676	-10.9	10.4 to 10.9	10.1 to 10.6
Cross Berth	Berth108 to 109	545	-12.8	12,1 to 12.4	11.8 to 12.1
Pier No.2	Berth200 to 205	1583	-12.8	11.4 to 12.6	11.1 to 12.3
Bluff	Berth1	148	-9.1	8,9	8,6
	Berth2	177	-10.3	9,3	9,0
	Berth3	180	-9.1	9,1	8,8
	Berth4	238	-10.6	10,3	10,0
Maydon Wharf	Berth 1 to 7	1208	-9.9	9.0 to 9.9	9.1 to 9.6
	Berth 8	172	-10.4	9,5	9,2
	Berth 9 to 10	180	-9.9	8.6 to 9.9	8.3 to 9.6
	Berth 11	190	-10.6	10,2	9,9
	Berth 12	275	-6.1	5,4	5,1
	Berth 13 to 15	558	-9.9	9,9	9,6

Source: Transnet (Reorganized by the Study Team)



Source: KwaZulu-Natal Province Department of Transport (reorganized by the Study Team)

Figure 2.5-55 Layout of terminals in Durban Port

3) Cargo throughput and vessel traffic

The cargoes handled in Durban Port are shown in tables and a figure below. Durban is the largest container port in the Sub-Saharan region; however, it handles more bulk cargoes than containerized cargoes. Assuming that the weight of one TEU of containerized cargo is 10 tons, the total cargo handling volume in 2008 was 61 million tons.

More than 70 % of bulk and break bulk cargoes are imported petroleum and products followed by vehicles (both import and export). Durban handled 392,087 vehicles through the car terminal in 08/09.

A considerable amount of transit cargo to/from landlocked countries must be included in cargo statistics; however, statistical data specifying transit cargo is not available. Transnet Port Authority established national port master plan in 2009. But the transit cargoes are not treated in the master plan. Strategic targets of the development of the national port system are to establish an efficient logistics network for the country's import/export cargoes and to acquire transshipment cargoes on international trunk routes. Transit cargoes are not considered explicitly in the cargo demand forecast of the master plan.

Table 2.5-36 Bulk and breakbulk cargoes throughput of Durban Port in 2008

(unit: tons)

BULK CARGO	LANDED	IMPORTS	27,461,588
		COASTWISE	320,926
		TOTAL BULK LANDED	27,782,514
	SHIPPED	EXPORTS	5,575,803
		COASTWISE	1,723,859
		TOTAL BULK SHIPPED	7,299,662
		TRANSHIPMENT CARGO	22,127
	TOTAL		35,104,303
BREAKBULK CARGO	LANDED	IMPORTS	3,043,232
		COASTWISE	1,609
		TOTAL BREAKBULK LANDED	3,044,841
	SHIPPED	EXPORTS	3,021,716
		COASTWISE	36,298
		TOTAL BREAKBULK SHIPPED	3,058,014
		TRANSHIPMENT CARGO	195,337
	TOTAL		6,298,192
TOTAL	LANDED	IMPORTS	30,504,820
		COASTWISE	322,535
		TOTAL CARGO LANDED	30,827,355
	SHIPPED	EXPORTS	8,597,519
		COASTWISE	1,760,157
		TOTAL CARGO SHIPPED	10,357,676
		TRANSHIPMENT CARGO	217,464
	TOTAL		41,402,495

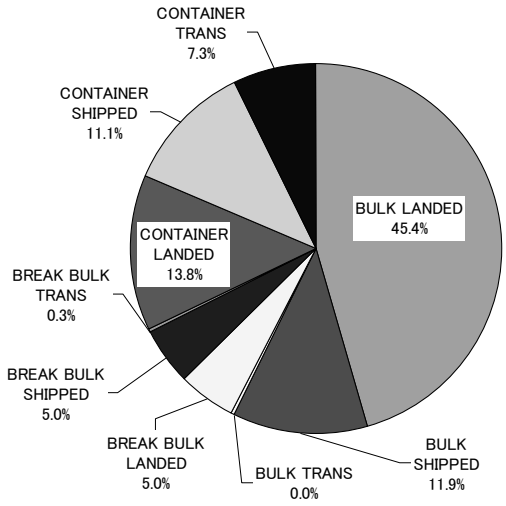
Source: Transnet (Reorganized by the Study Team)

Table 2.5-37 Container throughput of Durban Port in 2008

(TEU)

	FULL	EMPTY	TOTAL
LANDED			
DEEPSEA	839,755	140,686	980,441
COASTWISE	5,998	6,443	12,441
SUBTOTAL	845,753	147,129	992,882
SHIPPED			
DEEPSEA	668,689	358,524	1,027,213
COASTWISE	13,345	18,074	31,419
SUBTOTAL	682,034	376,598	1,058,632
TRANSHIPPED	449,133	141,518	590,651
TOTAL	1,976,920	665,245	2,642,165

Source: Transnet (Reorganized by the Study Team)



Note: The weight of one TEU of laden container is assumed to be 10 tons.
Source: Study Team

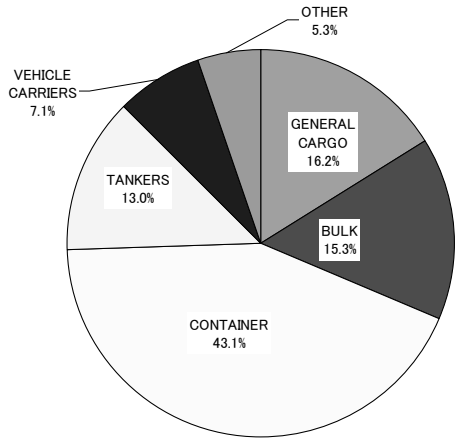
Figure 2.5-56 Breakdown of cargoes handled in Durban Port in 2008

The numbers of vessel calls and their breakdown are shown in Table 2.5-38 and Figure 2.5-57. In 2008, a total of 4,408 vessels called at the port, of which 43.1 % was container vessels. The average gross tonnage of container vessels was 28,000 GT, whereas that of bulk carrier was 24,000 GT.

Table 2.5-38 Vessels call at Durban Port in 2008

	NO	GT
TOTAL OCEAN GOING	4,135	108,745,670
TOTAL GENERAL CARGO	670	9,445,329
Breakbulk/Conv	52	1,168,111
General Cargo	618	8,277,218
TOTAL BULK	631	15,004,022
Bulk Dry	601	13,236,047
Bulk Liquid	30	1,767,975
TOTAL CONTAINERS	1,783	50,702,455
Container Cellular	1,647	45,978,709
Reefer	136	4,723,746
TOTAL TANKERS	538	14,970,152
Tanker - Oil	123	8,073,106
Tanker - Chemical	385	6,474,619
Tanker - LPG	20	387,242
Tanker - Bitumen	10	35,185
PASSENGER VESSELS	68	1,960,629
VEHICLE CARRIERS	293	13,472,712
RO-RO VESSELS	69	1,673,095
OTHER	83	1,517,276
COASTWISE	61	1,207,474
FOREIGN FISHING VESSELS	88	54,811
SA.TRAWLERS	49	22,133
MISCELLANEOUS	75	302,656
TOTAL	4,408	110,332,744

Source: Transnet (Reorganized by the Study Team)



Source: Transnet (Reorganized by the Study Team)

Figure 2.5-57 Breakdown of calling of ocean going vessels at Durban Port in 2008

4) Development plans

Although Durban is a mature port, with increasingly congested operations, there is potential to expand through the reconfiguration of existing precincts in the Point, Maydon Wharf and in Island View.

The port is surrounded by urban development, with limited options for landside expansion, and seaward expansion is not possible. Furthermore, there is ongoing pressure from the city for the port to relocate freight handling activities from the Point port precinct to allow for commercial and waterfront developments to take place.

It has been considered that the major opportunity for increasing the land area of the port lies in Bayhead to the south, where underutilized Transnet-owned land provides an extensive area that will be incorporated into port limits to allow for a future dig-out basin. However, this will face environmental resistance due to the inevitable loss of inter-tidal sandbanks. Transnet explained to the Study Team that it would be very difficult to develop this area before the cargo demand exceeds port capacity.

The second strategy to address the spatial requirements of the Port of Durban is the development of the Durban Airport site as a new dig-out port with 16 berths of which total capacity is 10 million TEUs. New Durban Airport was opened in 2010, just before the FIFA World Cup, and at present the former airport site is vacant land owned by a public corporation. Transnet explained that the airport site is not environmentally sensitive and has the advantage of being close to an automobile factory and refineries. Both of them are heavy users of the port.

Durban's container volumes are projected to increase up to 6.21 million TEUs in 2028. Even when the planned expansion of Pier 1 container terminal is implemented, container cargo demand will exceed port capacity. Therefore a new terminal must be completed at the airport site or Bayhead by this year.

Since a new hub port of Ngqura (which will be described later in detail) is targeting transshipment cargoes, it is unlikely to greatly relieve the tight supply-demand situation of container traffic in Durban.

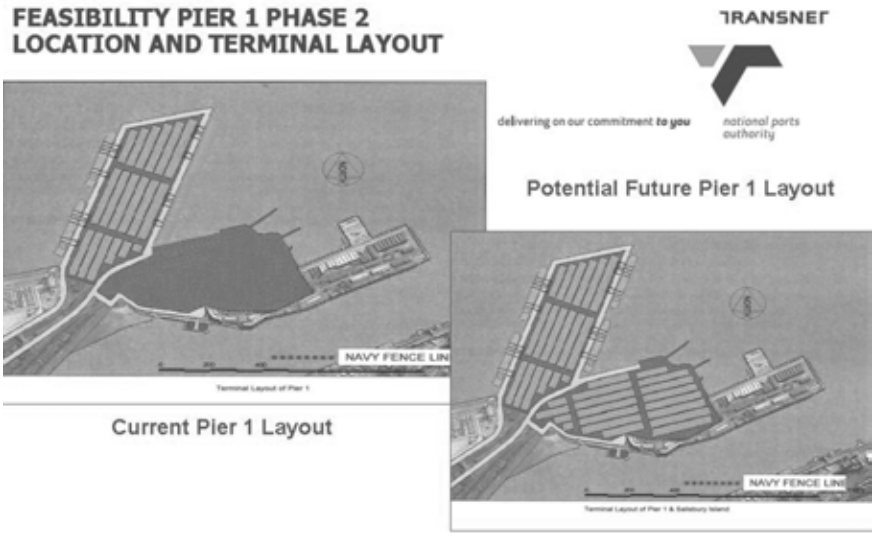
The handling volume of vehicles is forecasted to increase from 392,087 units in 2008 to 1.04 million units in 2037. Phase one of the car terminal expansion project has increased the capacity of the terminal to 560 000 units, which is adequate until around 2030, after which an increase in landside parking areas in a phase 2 expansion will further increase the capacity to 720,000 units.

The volume of break bulk cargoes is forecasted to decline as a result of both increased containerization as well as the relocation of break bulk operations to Richards Bay. The resulting

underutilization of break bulk capacity will be taken up by increased utilization for other cargo types.

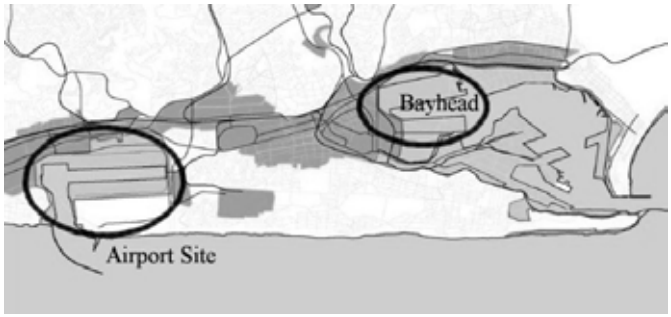
Dry bulk volumes are forecasted to grow from 7.3 million tons in 2008 to 11.91 million tons in thirty years. These volumes will continue to be handled on the Bluff, and at rationalized terminals in Maydon Wharf.

Liquid bulk volumes are forecasted to increase up to 13 million tons per year in 2037. The bulk of these volumes are petroleum products and chemicals handled at Island View, with smaller volumes handled in Maydon Wharf. Ongoing berth rehabilitation and operationalisation in Island View will provide the capacity to handle future volumes. A new port at the airport site could deliver additional deepwater bulk liquid berths in close proximity to the refineries.



Source: Transnet

Figure 2.5-58 Expansion plan of Pier 1 container terminal



Source: Transnet (Reorganized by the Study Team)

Figure 2.5-59 Options of new container terminal in Durban

(6) Richards Bay Port

1) Outline

Situated at longitude 32º 02' E and latitude 28º 48' S, Richards Bay, South Africa's most northern and easterly port, is 87 nautical miles (160 km) northeast of Durban and 252 nautical miles (465 km) southwest of Maputo. The port occupies 2,157 ha of land area and 1,495 ha of water area, but has room for expansion when required. The entrance channel is dredged to a permissible draught of 17.5m with -19.5m depth in the entrance channel.

In April 1976 the first phase of the harbor was officially opened. Built for the export of coal, it has since expanded into other bulk and break bulk cargoes. In 2008 the port handled 85 million tons of cargo, representing 64% of the country's exported bulk cargo. This makes it the country's largest port in terms of volumes handled. Richards Bay serves the coalfields of KwaZulu-Natal and Mpumalanga as well as timber and granite exporters from as far away as the Eastern Cape and Northern Cape. The port is now handling an increasing variety of bulk and break bulk. Much of the general cargo has migrated from Durban. Exports of bulk cargoes remain the main activity of the port.

Richards Bay Port is one of the largest industrial ports in Africa. But it is not a pure industrial port. The eastern part of the port is opened to the public for waterfront activities. The port is adjacent to environmentally sensitive areas.

2) Facilities

The port has six cargo handling terminals (see Figure 2.5-60 and Table 2.5-39):

- The Dry Bulk Terminal, operated by Transnet Port Terminals, imports and exports a variety of ores, minerals and woodchips
- Multi-purpose Terminal, also operated by Transnet Port Terminals, handles break bulk cargoes, including ferrochrome, pig iron, steel, forest products, granite, aluminum, bagged cargo, containers, heavy lifts and abnormal loads
- Coal Terminal, operated by Richards Bay Coal Terminal Company Limited, is one of the largest single export coal terminals in the world with the capacity to export 91 million tons per annum
- Island View Storage, operated by Richards Bay Bulk Storage, handles a wide range of bulk liquids stored in tanks

The five 300-series berths at Die Duine are -18.7m, with the potential for two additional berths. A liquid bulk dolphin berth, with two additional berths planned, is located between the coal berths and the entrance channel.

Berths on the northern shoreline are the Umhlatuzi 600-series general cargo berths which are -14.2m deep, and the Bayview 700 and 800-series berths with depths ranging from -14.4 to -18.7m.

Source: KwaZulu-Natal Province Department of Transport

Figure 2.5-60 Layout of terminals in Richards Bay Port

Table 2.5-39 Major berths in Richards Bay Port

Terminal	Berth	Type	Length	Dredge Depth	Max Draft
Die Duine	209	Bulk Liquids	300 m	-14.0 m	12.5 m
	301 to 305	Coal	1584 m	-19.0 m	17.5 m
Umhlatuzi	606 to 608	General	646 m	-14.5 m	13,5 m
	609	Bulk	300 m	-14.5 m	14,0 m
Bayview	701	Bulk	300 m	-14,5 m	14,0 m
	702 to 704	Bulk	720 m	-19,0 m	17,5 m
	705	Bulk/ General	280 m	-19,0 m	17,5 m
	706 to 708	General	600 m	-14,7 m	13.5 m
	801, 804	Bulk/ General	520 m	-19,0 m	17,5 m

Source: Transnet (Reorganized by the Study Team)

3) Cargo throughput and vessel calls

Exported bulk cargo accounts for 87% of the total cargo volume of the port. The main

commodity handled in the port is exported coal. The table and figure below show the breakdown of cargo handled in 2008. Besides bulk cargo, a very small quantity of containers is handled.

The handling volume of exported coal is still below the terminal capacity due to limited rail capacity and integration problems in the new computerized terminal management system.

In 2008, a total of 1,724 vessels called at the port, of which 67% were bulk carriers. The average gross tonnage of dry bulk carriers calling at the port was 44,000 GT.

Table 2.5-40 Bulk and breakbulk cargoes throughput of Richards Bay Port in 2008

(unit: tons)

BULK CARGO	LANDED	IMPORTS	6,052,297
		COASTWISE	374,825
		TOTAL BULK LANDED	6,427,122
	SHIPPED	EXPORTS	73,910,899
		COASTWISE	26,823
		TOTAL BULK SHIPPED	73,937,722
	TRANSHIPMENT CARGO		0
	TOTAL		80,364,844
BREAKBULK CARGO	LANDED	IMPORTS	70,945
		COASTWISE	0
		TOTAL BREAKBULK LANDED	70,945
	SHIPPED	EXPORTS	4,097,733
		COASTWISE	0
		TOTAL BREAKBULK SHIPPED	4,097,733
	TRANSHIPMENT CARGO		62
	TOTAL		4,168,740
TOTAL	LANDED	IMPORTS	6,123,242
		COASTWISE	374,825
		TOTAL CARGO LANDED	6,498,067
	SHIPPED	EXPORTS	78,008,632
		COASTWISE	26,823
		TOTAL CARGO SHIPPED	78,035,455
	TRANSHIPMENT CARGO		62
	TOTAL		84,533,584

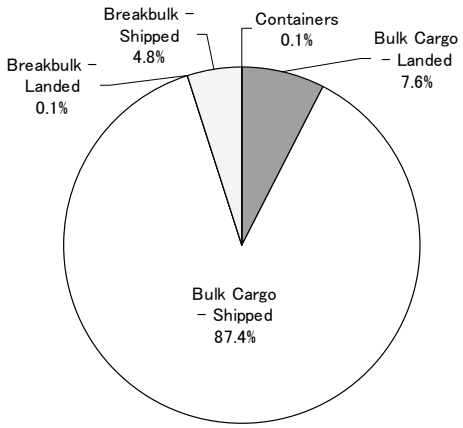
Source: Transnet (Reorganized by the Study Team)

Table 2.5-41 Container throughput of Richards Bay Port in 2008

(TEU)

	FULL	EMPTY	TOTAL
LANDED			
DEEPSEA	746	2,765	3,511
COASTWISE	0	0	0
SUBTOTAL	746	2,765	3,511
SHIPPED			
DEEPSEA	4,991	567	5,558
COASTWISE	0	217	217
SUBTOTAL	4,991	784	5,775
TRANSHIPPED	64	0	64
TOTAL	5,801	3,549	9,350

Source: Transnet (Reorganized by the Study Team)



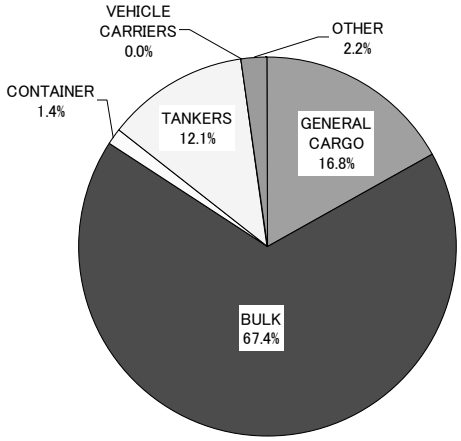
Note: The weight of one TEU of laden container is assumed to be 10 tons.
Source: Transnet (Reorganized by the Study Team)

Figure 2.5-61 Breakdown of cargoes handled in Richards Bay Port in 2008

Table 2.5-42 Vessel calls at Richards Bay Port in 2008

	NO	GT
TOTAL OCEAN GOING	1,621	58,406,188
TOTAL GENERAL CARGO	273	5,140,768
Breakbulk/Conv	10	184,886
General Cargo	263	4,955,882
TOTAL BULK	1,093	48,170,076
Bulk Dry	1,086	47,957,748
Bulk Liquid	7	212,328
TOTAL CONTAINERS	23	455,945
Container Cellular	22	450,959
Reefer	1	4,986
TOTAL TANKERS	196	3,907,652
Tanker - Oil	17	1,008,114
Tanker - Chemical	155	2,378,753
Tanker - LPG	24	520,785
Tanker - Bitumen	0	0
PASSENGER VESSELS	15	277,031
VEHICLE CARRIERS	0	0
RO-RO VESSELS	9	192,793
OTHER	12	261,923
COASTWISE	10	175,397
FOREIGN FISHING VESSELS	28	5,893
SA.TRAWLERS	44	7,832
MISCELLANEOUS	21	88,871
TOTAL	1,724	58,684,181

Source: Transnet (Reorganized by the Study Team)



Source: Transnet (Reorganized by the Study Team)

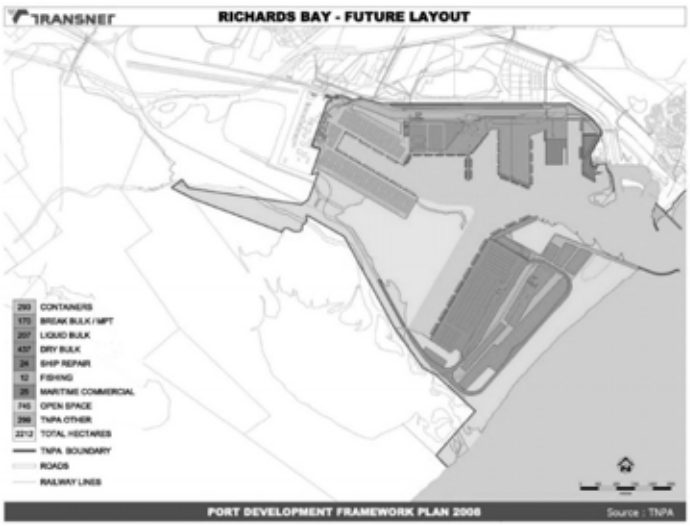
Figure 2.5-62 Breakdown of calling of ocean going vessels at Richards Bay Port in 2008

4) Development plans

Dry bulk volumes are forecasted to grow from 74 million tons handled in 2008 to 113 million tons in 2037. Break bulk and neo bulk volumes will grow from 3.9 million tons in 2008 to 8.2 million tons in 2013, and to 13.6 million tons by the end of the thirty year horizon. Liquid bulk volumes will grow from 1.6 million tons to 2.3 million tons and then to 4.9 million tons over the same timeframes. It is estimated that there will be only limited container handling in Richards Bay in the thirty year forecasting period, however, in case that the expansion of Durban Port is not implemented, the port must be furnished with container handling facilities.

Based on the demand forecast, the Port Master Plan guides the spatial development including the following development plans:

- An extension to the finger jetty to create two additional berths for dry bulk handling.
- An expansion of 700-series for break bulk, with berths 709 to 711, and then 712 to 714 providing for future needs.
- A deepening of the repair quay for enabling its use for handling passenger vehicles and citrus exports.
- Construction of container handling facility in the 600 series basin, if necessary.



Source: Transnet

Figure 2.5-63 Development plan of Richards Bay Port

(7) Port Elizabeth

1) Outline

Port Elizabeth is situated in Algoa Bay on the south-eastern coast of Africa, midway between the Ports of Durban (384 nautical miles north-east) and Cape Town (423 nautical miles west).

The entrance channel to the port is maintained at a depth of -14.5m CD and has a width of 310m. Limitations on vessels using the port are 11m draught for passenger and dry cargo vessels, 11.2m for container ships, 12.1m for ore carriers and 9.6m for tankers. Deeper vessels may be accommodated with the permission of the harbor master. Tug assistance and pilotage is compulsory.

Most of the cargo flowing through Port Elizabeth is generated in, or is destined for, the greater Algoa Bay area, however, some cargo is transported by rail and road to and from the Free State and Gauteng. The port is linked to the hinterland by the Southern Corridor, giving rail access to Gauteng and the Northern Cape. There is a rail line to East London, and a new rail access to the Port of Ngqura.

2) Facilities

The port has two container berths with a storage area of 22ha (5,400 ground slots) on Charl Malan quay. The container terminal is equipped with five quay gantry cranes and straddle carriers. The capacity of the container terminal is 375,000 TEUs. One berth on the same quay is dedicated for automobile transport.

This area is heavily industrialized and intensively farmed. Traditionally, Port Elizabeth and nearby Uitenhage, which is part of the Nelson Mandela Metropole Municipality, have been the centre of the South African motor industry. As a result the port imports large volumes of containerized components and materials for this industry.

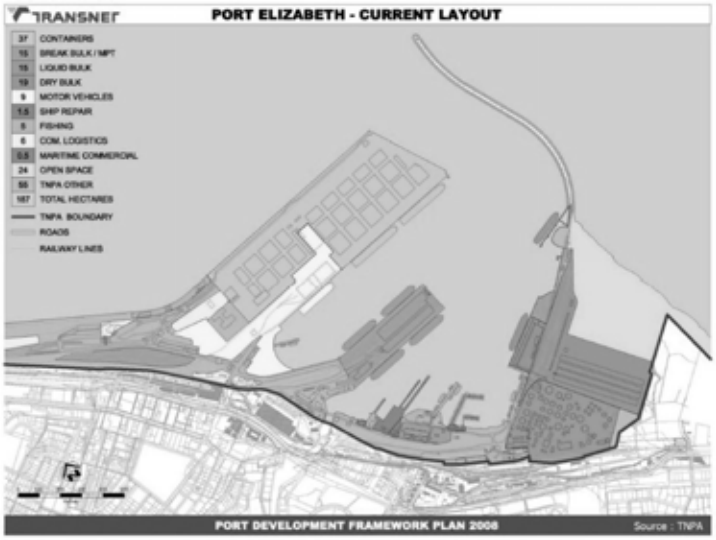
There are four break bulk berths on number two jetty, a dry bulk berth on the Dom Pedro jetty, and a dolphin liquid bulk berth on the breakwater.

The breakbulk terminal handles a variety of agricultural products including wheat imports and fruit (deciduous and citrus) exports as well as steel, scrap, timber and motor vehicles. At the bulk facility the storage bins have a capacity of 350,000 tons of manganese ore, which is the major bulk export from Port Elizabeth. Smaller volumes of other ores are also handled here.

Table 2.5-43 Major berths in Port Elizabeth

Terminal	Berth	Length (m)	Depth (m)	Remarks
CONTAINER, VEHICLES				
	101	290	11	Vehicles
	102, 103	635	12.2	Containers
GENERAL CARGO TERMINAL				
	100 (Ro-Ro)	133	11	General cargo
	8, 9	519	11	General cargo
	10, 11	396	10	General cargo
	12	122	5.5-7.0	General cargo
DRY BULK TERMINAL				
	13, 14	360	12.2	Dry Bulk cargo
TANKER BERTH				
	15 (fuel)	242	9.6	Black/white oil products

Source: Fair Play (Reorganized by the Study Team)



Source: Transnet

Figure 2.5-64 Layout of terminals in Port Elizabeth

3) Cargo throughput and vessel traffic

Tables and a figure below show cargo throughput of Port Elizabeth. The port handled 8.3 million tons of cargoes in 2008, of which 57% was bulk cargo. Container throughput in the same period was 423,000 TEUs. The number of landed laden containers was 2.4 times larger than that of shipped laden containers. As a result, the port generates a large volume of outbound empty box traffic.

Table 2.5-44 Bulk and breakbulk cargoes throughput of Port Elizabeth in 2008

(unit: tons)

BULK CARGO	LANDED	IMPORTS	212,654
		COASTWISE	884,734
		TOTAL BULK LANDED	1,097,388
	SHIPPED	EXPORTS	3,420,285
		COASTWISE	-
		TOTAL BULK SHIPPED	3,420,285
		TRANSHIPMENT CARGO	-
	TOTAL		4,517,673
BREAKBULK CARGO	LANDED	IMPORTS	354,410
		COASTWISE	-
		TOTAL BREAKBULK LANDED	354,410
	SHIPPED	EXPORTS	550,079
		COASTWISE	-
		TOTAL BREAKBULK SHIPPED	550,079
		TRANSHIPMENT CARGO	4,932
	TOTAL		909,421
TOTAL	LANDED	IMPORTS	567,064
		COASTWISE	884,734
		TOTAL CARGO LANDED	1,451,798
	SHIPPED	EXPORTS	3,970,364
		COASTWISE	-
		TOTAL CARGO SHIPPED	3,970,364
		TRANSHIPMENT CARGO	4,932
	TOTAL		5,427,094

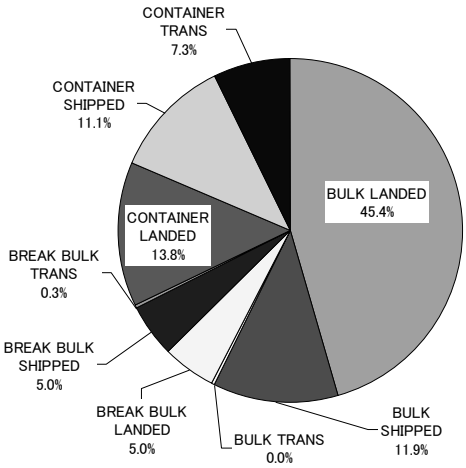
Source: Transnet (Reorganized by the Study Team)

Table 2.5-45 Container throughput of Port Elizabeth in 2008

(TEU)

	FULL	EMPTY	TOTAL
LANDED			
DEEPSEA	175,776	25,731	201,507
COASTWISE	1,440	509	1,949
SUBTOTAL	177,216	26,240	203,456
SHIPPED			
DEEPSEA	74,618	97,241	171,859
COASTWISE	188	2,038	2,226
SUBTOTAL	74,806	99,279	174,085
TRANSHIPPED	41,855	4,489	46,344
TOTAL	293,877	130,008	423,885

Source: Transnet (Reorganized by the Study Team)



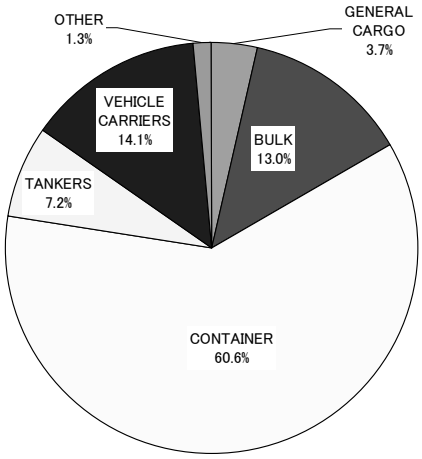
Note: The weight of one TEU of laden container is assumed to be 10 tons.
Source: Transnet (Reorganized by the Study Team)

Figure 2.5-65 Breakdown of cargoes handled in Port Elizabeth in 2008

Table 2.5-46 Vessel calls at Port Elizabeth in 2008

	NO	GT
TOTAL OCEAN GOING	831	28,875,731
TOTAL GENERAL CARGO	31	436,572
Breakbulk/Conv	6	59,832
General Cargo	25	376,740
TOTAL BULK	108	2,618,125
Bulk Dry	105	2,607,826
Bulk Liquid	3	10,299
TOTAL CONTAINERS	504	19,008,837
Container Cellular	447	18,502,885
Reefer	57	505,952
TOTAL TANKERS	60	890,488
Tanker - Oil	8	164,717
Tanker - Chemical	40	685,620
Tanker - LPG	12	40,151
Tanker - Bitumen	0	0
PASSENGER VESSELS	11	183,850
VEHICLE CARRIERS	117	5,737,859
RO-RO VESSELS	0	0
OTHER	0	0
COASTWISE	42	1,029,383
FOREIGN FISHING VESSELS	12	6,387
SA.TRAWLERS	363	105,584
MISCELLANEOUS	25	49,876
TOTAL	1,273	30,066,961

Source: Transnet (Reorganized by the Study Team)



Source: Transnet (Reorganized by the Study Team)

Figure 2.5-66 Breakdown of calling of ocean going vessels at Port Elizabeth in 2008

Port Elizabeth may lose some of its container business, and in the future all of its dry and liquid bulk traffic, to the new port of Ngqura, around 20 km to the east of Port Elizabeth, which was opened in 2009. The bulk terminals at Ngqura are however not expected to be developed for some years.

In 2009, a total of 831 ocean-going vessels called at the port, of which 60% were container vessels, and 14% were vehicle carriers.

4) Development plans

With the commencement of operation of the port of Ngqura, the role of Port Elizabeth will change from being the primary central port to one providing niche services in support of Ngqura.

Port Elizabeth's demand forecast is impacted by the potential relocation of operations and terminals to Ngqura Port. The bulk terminals will be relocated and the capacity of the container terminal will be capped at 0.5 million TEUs per annum, with future container volumes being handled in the new port. These moves will increase Port Elizabeth's capacity to handle growth in vehicle and break bulk operations.

Vehicles will grow from 68,478 units in 2008 to 120,294 units in 2013. Break bulk volumes will decrease from 0.39 million tons in 2008 to 0.14 million tons in 2013. Liquid bulk volumes will remain constant at over 1.0 million tons per annum, before being relocated to Ngqura in 2015.

In the medium term, the development of the port will be influenced by the timing and extent of relocations to Ngqura. Car terminal expansion can occur alongside the capped container operation, or in the event that all containers are relocated, the expansion of the car terminal could extend over the entire area of the Charl Malan quay, and utilize all three berths. Either option would provide long term capacity without the need for additional berth or quayside infrastructure, with investment limited to terminal superstructure.

In the event that the liquid bulk terminal is relocated, the dolphin berth could be decommissioned, and the rehabilitated tank farm site utilized for extended multi-purpose operations. In the event that the manganese terminal is relocated, the stockpile area could be utilized for other port operations.

5) Development of Ngqura Port

Ngqura is situated in Algoa Bay, some twenty kilometers from Port Elizabeth, and is the newest port in the South African ports system commencing operation in 2009.

The intended role of the Port of Ngqura has been through a number of developments since its

inception. Its relationship to the Coega IDZ, as a deepwater port to service IDZ tenants, has remained constant. Originally planned as a bulk port, it was then adapted for container handling. Recently it has been the focus of Transnet's Container Hub Strategy. As South Africa's deepwater container hub port, it has been proposed that Ngqura will attract new transshipment volumes, as well as handle an increasing number of Gauteng containers.

Two categories of potential cargo handling operations will add to the role of the Port of Ngqura.

The first is the relocated bulk operations from Port Elizabeth, which will catalyze Ngqura's role as a bulk port. These are the manganese export terminal, and the refined fuel import terminal.

The second is the IDZ generated projects, which collectively indicate a significant role for Ngqura as a bulk port servicing the IDZ's tenants. These projects include the aluminum smelter, refinery, and a range of other smaller projects.

There are three factors which will determine future demand for the Port of Ngqura. The first is the scale and timing of the relocation of existing operations from Port Elizabeth. This includes containers, and the manganese export and oil import terminals. The second factor is the scale of the ramp-up of container volumes, in particular transshipments. The final factor is the implementation of potential IDZ projects.

The container projection shows volumes growing from a terminal start-up in 2010 to 0.66 million TEUs in 2013, and thereafter 10% growth per annum. This indicates that the four berth terminal would reach its 2.0 million TEUs capacity in about 2025, and that the port, with the first outer basin complete, would be handling 6.5 million TEUs in 2037.

The break bulk forecast shows the growth of IDZ generated cargoes from current projects reaching 3 million tons in 2014, and 4 million tons in 2037. The dry bulk forecast includes manganese exports and alumina and other IDZ imports. Manganese volumes are shown to grow from a start-up in 2014 of 6.5 million tons, to 9.5 million tons in 2037. Other dry bulk cargoes are shown at more than 2 million tons per annum over the same period. It must be noted that the bulk and break bulk forecasts are based on optimistic projections of currently identified projects.

The flexibility provided by the potential for incremental development of berths in the river basin dig-out ensures that the port has the capacity to handle the long term demand for bulk cargoes. The optimistic projections of the various stakeholders suggest that planning should proceed for the start of this incremental development in the near future.

The port has five completed berths – two container berths, and three bulk and break bulk berths. The construction of two additional container berths is proceeding. Future container berths are planned in a seaward expansion to create a new basin with eight berths, possibly followed by a second phase with a further basin. This represents the natural limit to Ngqura's seaward expansion.

Expansion up the Coega River valley is planned to create additional bulk and break bulk berths. This expansion will happen in increments, as determined by demand.

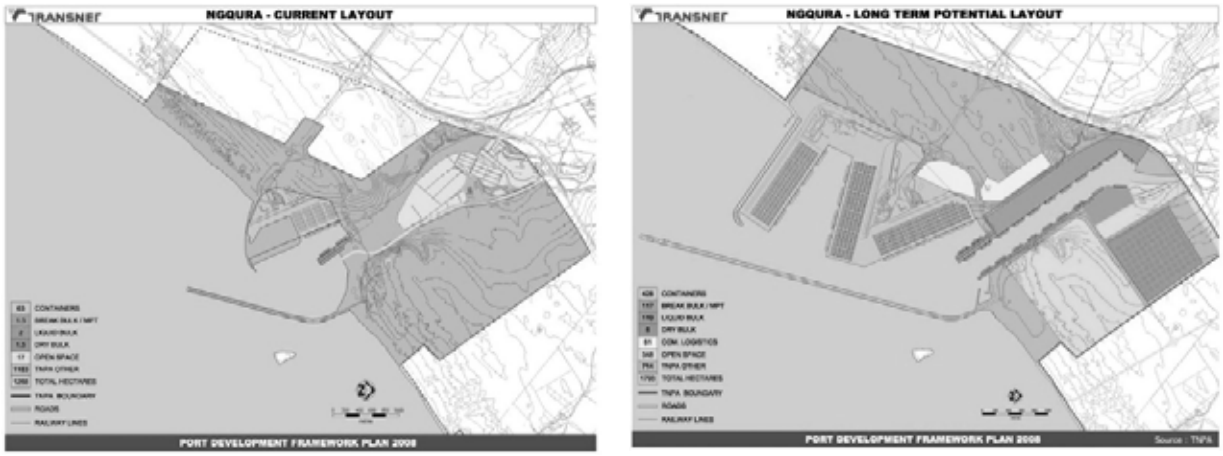
There is an area of 1,208 ha within the port limits. The future plan for the port shows the medium term development, with 87 ha dedicated to container handling, 100 ha to bulk and break bulk operations, and a large portion of the port retained for future development. While Ngqura's landside development potential is considerable, it is also limited. Current back-of-quay space for container operations is restricted and future land for container handling will need to be created on a cut-and-fill basis in seaward expansions.

The land on the eastern side of the river valley is steeply sloping, with environmental sensitivities that preclude its use for quayside activities. The western side of the river valley can provide back-of-quay space only with extensive excavation.

It is therefore critical that waterside expansion of the port is planned in conjunction with the Coega Development Corporation to ensure that IDZ land adjacent the port limits is reserved for activities that provide back-of-port services. Equally important is the need to prevent the use of future

quayside land within the port limits for stockpiling or storage.

A new rail link to the port is under construction, with a rail corridor from the mainline to the container terminal. This includes a container rail yard in the IDZ, and a rail terminal behind the container terminal.



Source: Transnet

Figure 2.5-67 Current layout and long-term potential layout of Ngqura Port

(8) Cape Town Port

1) Outline

Cape Town Port is the second largest port in South Africa in terms of container throughput. The port is located on the south-western coast of the country, providing container, bulk and general cargo handling services to the Western Cape and its agricultural hinterland. The port provides extensive ship repair services, and hosts local and foreign fishing fleets, and recreational users.

The port is connected by rail to the hinterland via the Cape Corridor, and to Saldanha Bay by the west coast line.

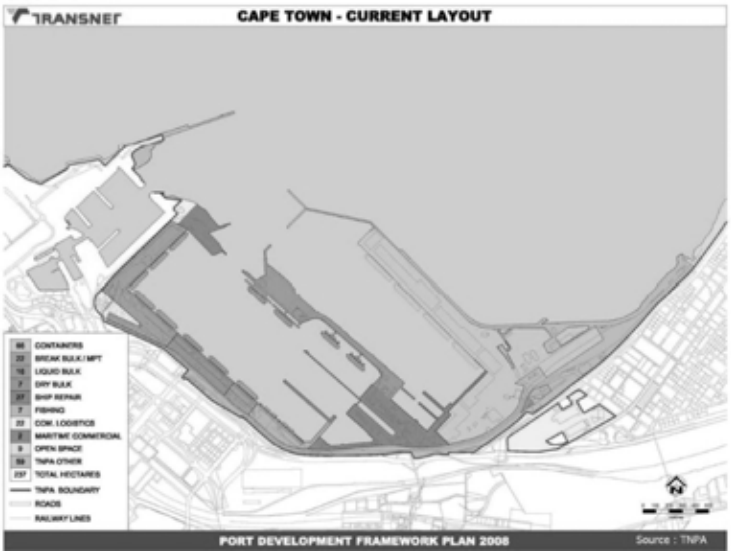
2) Facilities

Facilities of the port are summarized in Table 2.5-47, and their layout is shown in Figure 2.5-68. The port has two basins, the Duncan Dock with general cargo berths and bulk liquid dolphin berths, and the Schoeman Basin with container berths. The maximum depth alongside quays is 14 meters.

Table 2.5-47 Major berths in Cape Town Port

	Berth	Length (m)	Depth (m)	Remarks
	A	274	12	General cargo and passengers
	B	244	12	
	C	213	10.7 – 12.2	Fruit exports
	D	185	9.1 – 10.7	
	E	226	9.1 – 12.2	General cargo
	F-G	500	12.2	Combi Terminal
	H	319	12.8	General cargo
	J -M	1008	10.7	General cargo
Container Terminal	500	210	10.7	Layby mining tugs
	501	183	10.7	Coastal
	502	183	10.7	Container/Ro-Ro ships
	600	220	10.7	Container vessels only
	601	236	12.8	Container vessels only
	602 to 604	915	14	Container vessels only
	700 to 703	863	10	Lay-up berth
Tanker Basin	No 1	250	13.1	Load/discharge: crude oil, fuel oil, Discharge: benzene, toluene,
	No 2	203	13.1	Load/discharge: mogas 93/95/97, gas oil, jet A-1, ill. kerosene

Source: Transnet (Reorganized by the Study Team)



Source: Transnet

Figure 2.5-68 Layout of terminals in Cape Town Port

3) Cargo throughput and vessel traffic

Tables and a figure below show cargo throughput in Cape Town Port. The dominant cargoes handled in the port are containerized cargoes, which account for more than 60% of total cargo volume. The handling volume of break bulk is relatively small.

A total of 2,028 ocean-going vessels called at the port in 2008, of which 50% were container vessels.

Table 2.5-48 Bulk and breakbulk cargoes throughput of Cape Town Port in 2008

(unit: tons)

BULK CARGO	LANDED	IMPORTS	1,657,553
		COASTWISE	507,354
		TOTAL BULK LANDED	2,164,907
	SHIPPED	EXPORTS	209,146
		COASTWISE	491,568
		TOTAL BULK SHIPPED	700,714
		TRANSHIPMENT CARGO	-
	TOTAL		2,865,621
BREAKBULK CARGO	LANDED	IMPORTS	83,664
		COASTWISE	144
		TOTAL BREAKBULK LANDED	83,808
	SHIPPED	EXPORTS	163,850
		COASTWISE	335
		TOTAL BREAKBULK SHIPPED	164,185
		TRANSHIPMENT CARGO	91,480
	TOTAL		339,473
TOTAL	LANDED	IMPORTS	1,741,217
		COASTWISE	507,498
		TOTAL CARGO LANDED	2,248,715
	SHIPPED	EXPORTS	372,996
		COASTWISE	491,903
		TOTAL CARGO SHIPPED	864,899
		TRANSHIPMENT CARGO	91,480
	TOTAL		3,205,094

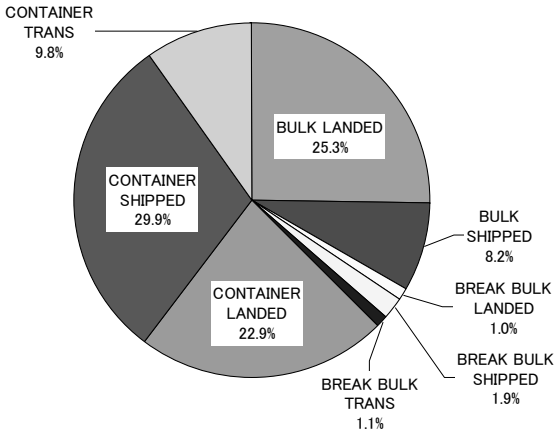
Source: Transnet (Reorganized by the Study Team)

Table 2.5-49 Container throughput of Cape Town Port in 2008

(TEU)

	FULL	EMPTY	TOTAL
LANDED			
DEEPSEA	187,380	105,445	292,825
COASTWISE	8,472	19,901	28,373
SUBTOTAL	195,852	125,346	321,198
SHIPPED			
DEEPSEA	251,432	75,990	327,422
COASTWISE	4,885	1,119	6,004
SUBTOTAL	256,317	77,109	333,426
TRANSHIPPED	84,157	28,720	112,877
TOTAL	536,326	231,175	767,501

Source: Transnet (Reorganized by the Study Team)



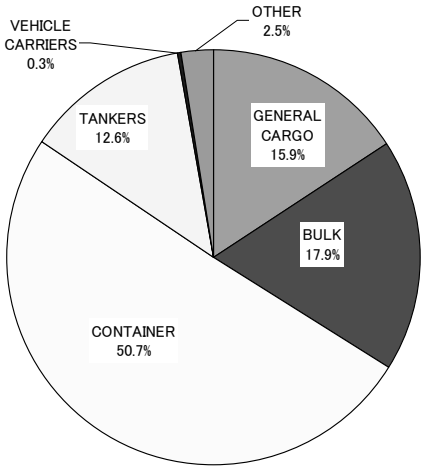
Note: The weight of one TEU of laden container is assumed to be 10 tons.
Source: Transnet (Reorganized by the Study Team)

Figure 2.5-69 Breakdown of cargoes handled in Cape Town Port in 2008

Table 2.5-50 Vessel calls at Cape Town Port in 2008

	NO	GT
TOTAL OCEAN GOING	2,028	50,615,121
TOTAL GENERAL CARGO	323	4,304,287
Breakbulk/Conv	21	303,028
General Cargo	302	4,001,259
TOTAL BULK	364	9,707,567
Bulk Dry	359	9,292,627
Bulk Liquid	5	414,940
TOTAL CONTAINERS	1,028	29,662,790
Container Cellular	832	28,238,702
Reefer	196	1,424,088
TOTAL TANKERS	255	5,798,898
Tanker - Oil	82	2,366,626
Tanker - Chemical	135	2,141,136
Tanker - LPG	37	1,284,679
Tanker - Bitumen	1	6,457
PASSENGER VESSELS	28	562,503
VEHICLE CARRIERS	7	253,661
RO-RO VESSELS	13	197,074
OTHER	10	128,341
COASTWISE	60	1,209,064
FOREIGN FISHING VESSELS	568	374,825
SA.TRAWLERS	255	190,679
MISCELLANEOUS	252	1,058,100
TOTAL	3,163	53,447,789

Source: Transnet (Reorganized by the Study Team)



Source: Transnet (Reorganized by the Study Team)

Figure 2.5-70 Breakdown of calling of ocean going vessels at Cape Town Port in 2008

4) Development plans

It is anticipated that Cape Town will continue in its existing role as primary container and general cargo port for the western region.

The container projection shows growth up to 2 million TEUs in 2030. The current container terminal reconfiguration project, which includes a rationalization of the landside of the terminal, new terminal equipment, as well as berth deepening, will increase the ports capacity from 0.8 million TEUs to 1.4 million TEUs. In terms of the forecast, this capacity will be exceeded by the demand in 2023, by which time the next phase of capacity resulting from seaward expansion must come on stream. This

will deliver an additional 3 million TEUs of capacity, which will handle demand far beyond the thirty year planning horizon.

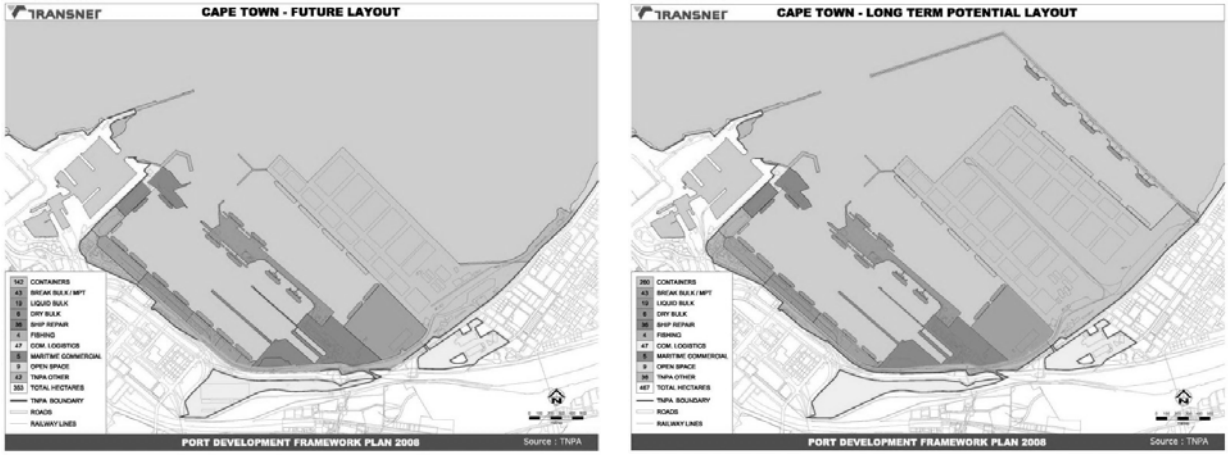
Break bulk volumes have been in decline due to increased containerization, and are not forecast to grow beyond 350 million tons per year. There is a large excess capacity of 4.2 million tons in the port.

Dry bulk volumes of largely seasonal agricultural products have historically ranged from 0.5 million tons to 1.5 million tons per annum. It is forecast that this trend will continue, and that adequate capacity can be provided at H berth and at the other general cargo berths.

Medium term developments in the port are likely to be focused on a further shift of operations from the older terminals in Duncan Dock to more modern and efficient operations around the Schoeman Basin.

In the medium term, the expansion of container handling capacity will entail seaward reclamation, without the addition of any berths to seaward.

The long term potential plan for the Port of Cape Town shows the fully developed northern basin, with new breakwater and added container and liquid bulk facilities. This conceptually drawn seaward expansion is seen to be the only practical long term expansion scenario for the port. If for environmental or other reasons this development could not take place, there will need to be an alternative scenario with Saldanha Bay Port developing container handling facilities for the western region.



Source: Transnet

Figure 2.5-71 Medium term development plan and future potential of Cape Town Port

(9) Walvis Bay Port

1) Outline

Walvis Bay Port is the primary port of Namibia, situated on the central west coast of Namibia, on the south eastern side of Walvis Bay.

Namport, the Port Authority, has a strategic goal to consolidate the Port of Walvis Bay as a regional gateway serving as a reliable and efficient interface for imports and exports to/from SADC and other sub-Saharan African countries.

The port has a geographical advantage both in inland cross border transport via Walvis Bay Corridor and international sea-borne traffic connecting with Europe, the Americas and the Far East.

Historically Durban Port and other South African ports have been serving as international gateways in the region. Although at present the handling volume of Walvis Bay is still very small

compared with those of South African main ports, the role of the port is increasing rapidly in the transit transport market. Namport is expanding port facilities and is promoting the use of Walvis Bay Port eagerly including the introduction of a strategic tariff for transit cargoes.

2) Facilities

The port has 8 berths, of which total length is 1,413 meters, handling containers, break bulk cargoes and liquid bulk. A summary of the berth information is shown in the table below.

Table 2.5-51 Berths in Walvis Bay Port

Berth	Length (m)	Depth (m)	Cargo Handled
Berth 1	504	12.8	Containerised cargo
Berth 2		12.8	Containerised cargo, Fluorspar in bulk
Berth 3		12.8	Containerised cargo, Fluorspar, salt in bulk, Ro-Ro
Berth 4	909	10.6	Cold Storage (Fish)
Berth 5		10.6	Cold Storage (Fish), Sulphuric Acid
Berth 6		10.6	General Cargo, Break bulk, Ro-Ro
Berth 7		10.6	General Cargo, Break bulk, Coal in bulk
Berth 8		10.6	General cargo, Break bulk, Manganese and lead concentrate in bag
Petro Berth	(Dolphin)	10.0	Liquid bulk petroleum products

Source: Lloyds, JICA (Reorganized by the Study Team)

3) Cargo throughput and vessel traffic

A total of 4.7 millions of cargoes were handled in Walvis Bay Port in 2008 as shown in Table 2.5-52. The average growth rate from 2004 to 2008 is 13 %. Table 2.5-53 shows container throughput in Walvis Bay Port. It indicates that container traffic, especially transit container traffic, is increasing dramatically. Average growth rate of transship containers from 2004 to 2008 is 62 %. In 2008, transship containers account for more than 60 percent of total container traffic.

Figure 2.5-72 shows the number of vessels calling at Walvis Bay Port. The number of vessel calls has been increasing rapidly since 2004.

Table 2.5-52 Cargo volume handled in Walvis Bay Port

(tons)

	2004	2005	2006	2007	2008
Import	1,496,566	1,599,383	1,936,969	2,053,733	2,725,532
Export	1,171,988	1,058,127	880,361	1,168,257	1,300,941
Transshipment	299,197	354,656	749,844	711,657	769,157
Total	2,967,751	3,012,166	3,567,174	3,933,647	4,795,630

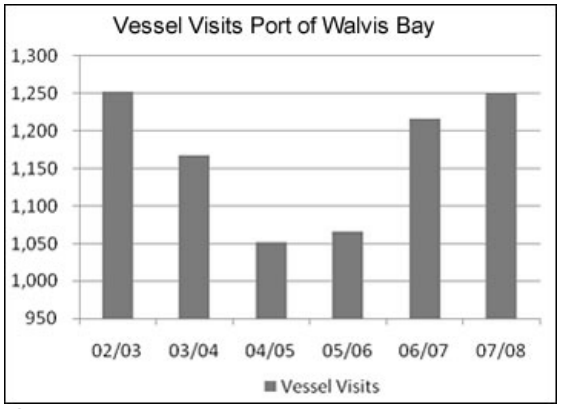
Source: JICA (Reorganized by the Study Team)

Table 2.5-53 Containers handled in Walvis Bay Port

(TEUs)

	2004	2005	2006	2007	2008
Import	19,274	21,245	23,842	28,632	35,453
Export	20,377	21,825	24,187	29,495	38,274
Transshipment	20,275	28,509	69,517	85,679	120,375
Total	59,926	71,579	117,546	143,806	194,102

Source: JICA (Reorganized by the Study Team)



Source: Namport

Figure 2.5-72 Number of vessels calling at Walvis Bay Port

4) Development Plans

In order to respond to the rapid growth of container traffic, and to realize the strategic goal of the port, enhancement of the container handling function is planned.

The expansion is planned to accommodate vessels with capacity of 5 000 to 8 000 TEUs in three phases, illustrated in Figure 2.5-73, namely:

- Phase 1 – 27.5 hectares, 550 m quay length
- Phase 2 – 27.5 hectares, 550 m quay length
- Phase 3 – 60.0 hectares, 1,200 m quay length

Source: Namport

Figure 2.5-73 Development plan of Walvis Bay Port

The capacity of berths 1 to 3 in the existing container terminal is around 250,000 TEUs per year. And it is estimated that the new terminal will handle about 632,000 TEUs in 2017/2018. The following container handling equipment will also be commissioned with Phase 1:

- Two Ship-to-Shore Gantry Cranes, post Panamax size, 18 rows,
- A minimum of 6 RTG and miscellaneous equipment such as reach stackers, tractors and haulers and empty container handlers

(10) Dar es Salaam Port

1) Outline

Dar es Salaam is Tanzania's largest city and is the commercial centre of the country. Its port is the country's principal port which handles about 95% of Tanzania's port traffic. At the same time Dar es Salaam port has an important role as a gateway port of landlocked countries including Zambia and Malawi. The port is connected with landlocked countries by railways or roads. The 1.067 m gauge single track rail link between Tanzania and Zambia is operated by TAZARA It crosses the border at Tunduma (980km from Dar es Salaam), and is connected to the Zambian Railway system at Kapiri Mposhi, some1,850km from Dar es Salaam. Zambia and Malawi have their own cargo centers located near the port to facilitate transit cargo transport. A 1,710km pipeline is installed from Dar es Salaam to the Indeni Refinery in Ndola (Zambia), which is operated by the TAZAMA Pipeline Limited, jointly owned by the Government of Zambia (66.7%) and Tanzania (33.3%). Currently it is capable of handling approximately 600,000 metric tons per annum.

Entrance to the port is through a 1.5nm (2.8km) long dredged access channel. The channel was straightened, widened and deepened in 1998 and now has a width of 140m. The water depth of the shallowest part of the channel is 10 meters.

The dwell time of imported cargoes and transit cargoes in Dar es Salaam Port is very long due to the shortage of port capacity and red tape. Since the port is located adjacent to the city center, port access roads are always very congested. Furthermore, tidal restriction of the access channel sometimes forces vessels to wait in a long queue.

The port is owned by Tanzania Port Authority (TPA). Container terminal is operated by Tanzania International Container Terminal Services (TICTS), 70% owned by Hutchison Port Holdings, whereas other terminals are operated directly by TPA.

2) Facilities

As shown in Figure 2.5-74, the port has the following facilities:

- Berths 1-7: TPA berths used for break bulk, Ro-Ro and dry bulk
- Berths 8-11: Container terminal operated by TICTS, a Hutchinson Ports Holding subsidiary
- Kurasini Oil Jetty (KOJ), for handling of liquid bulk products (KOJ-1 and KOJ-2).
- SPM, used for import of crude oil

The total quay length is about 2,000 meters including 550m of container berths. The water depths alongside quays are 10.5m for container berths, and 8.0m to 9.5m for general cargo berths.

Source: TPA

Figure 2.5-74 Layout of port facilities in Dar es Salaam

3) Cargo throughput and vessel traffic

Cargo throughput of Dar es Salaam Port is shown in the following tables. Annual growth rate of cargo throughput is around 5%, whereas that of container throughput is around 15%. The volume of imported laden containers is 2.7 times larger than that of exported containers, and this generates a large amount of empty box traffic.

Transit cargoes account for around 30% of the total cargo throughput of Dar es Salaam Port. Zambia, with which the port is connected by road, railway as well as pipeline, is the major origin or destination of the transit traffic. Around 12 % of transit cargoes to/from Zambia are transported by TAZARA railway.

As shown in Table 2.5-58, 832 ocean-going vessels called at the port in 2008. The number of vessels calling at the port is decreasing due to the increase of parcel size.

Table 2.5-54 Cargo volume of Dar es Salaam Port

(tons)

	2004	2005	2006	2007	2008
Imports					
Containerised Cargo	1,265,159	1,371,970	1,347,186	1,915,714	2,171,699
Convetional Cargo	652,910	548,103	701,701	556,967	588,804
Dry Bulk Cargo	839,095	972,342	1,115,885	1,129,423	904,341
Liquid Bulk Cargo	2,006,373	1,936,594	2,060,676	2,074,384	2,142,309
Sub Total	4,763,537	4,829,009	5,225,448	5,676,488	5,807,153
Exports					
Containerised Cargo	673,312	801,158	757,026	987,375	1,068,129
Convetional Cargo	187,361	172,793	205,561	282,415	122,000
Liquid Bulk Cargo	54,252	77,233	41,387	47,202	52,570
Sub Total	914,925	1,051,184	1,003,974	1,316,992	1,242,699
Grand Total	5,678,462	5,880,193	6,229,422	6,993,480	7,049,852
Transhipment	375,557	404,867	428,074	433,794	354,543
Bunkers	0	-	-	-	16,809
Total all Cargo	6,054,019	6,285,060	6,657,496	7,427,274	7,421,204

Source: TPA

Table 2.5-55 Container throughput of Dar es Salaam Port

(TEUs)

		2004	2005	2006	2007	2008
IMPORTS	Full	99,648	108,760	121,635	147,031	161,430
	Empty	5,946	5,568	3,173	748	597
	Total	105,594	114,328	124,808	147,779	162,027
EXPORTS	Full	43,936	53,275	49,056	54,252	58,685
	Empty	49,794	59,766	68,823	81,039	95,686
	Total	93,730	113,041	117,879	135,291	154,371
TRANSHIPMENT	Full	55,580	60,997	60,376	56,787	38,189
	Empty	0	0	0	0	0
	Total	55,580	60,997	60,376	56,787	38,189
TOTAL	Full	199,164	223,032	231,067	258,070	258,304
	Empty	55,740	65,334	71,996	81,787	96,283
	Total	254,904	288,366	303,063	339,857	354,587

Source: TPA

Table 2.5-56 Breakdown of transit cargo handled in Dar es Salaam Port

(tons)

		2004	2005	2006	2007	2008
ZAMBIA	Imports	607,965	538,415	587,561	786,517	821,567
		(59.3%)	(52.6%)	(52.0%)	(56.4%)	(43.2%)
	Exports	168,503	145,862	158,792	169,509	197,421
		(50.6%)	(40.9%)	(39.7%)	(35.4%)	(36.3%)
	Total	776,468	684,277	746,353	956,026	1,018,988
		(57.1%)	(49.6%)	(48.8%)	(51.0%)	(41.6%)
D.R. CONGO	Imports	151,575	164,439	247,236	329,403	535,928
		(14.8%)	(16.1%)	(21.9%)	(23.6%)	(28.2%)
	Exports	18,987	47,557	86,895	97,610	96,225
		(5.7%)	(13.3%)	(21.7%)	(20.4%)	(17.7%)
	Total	170,562	211,996	334,131	427,013	632,153
		(12.6%)	(15.4%)	(21.8%)	(22.8%)	(25.8%)
BURUNDI	Imports	80,114	128,268	85,869	89,587	178,561
		(7.8%)	(12.5%)	(7.6%)	(6.4%)	(9.4%)
	Exports	12,571	18,660	10,023	25,116	9,152
		(3.8%)	(5.2%)	(2.5%)	(5.2%)	(1.7%)
	Total	92,685	146,928	95,892	114,703	187,713
		(6.8%)	(10.6%)	(6.3%)	(6.1%)	(7.7%)
RWANDA	Imports	55,871	79,575	72,998	79,635	167,095
		(5.4%)	(7.8%)	(6.5%)	(5.7%)	(8.8%)
	Exports	7,521	3,931	4,920	8,821	10,162
		(2.3%)	(1.1%)	(1.2%)	(1.8%)	(1.9%)
	Total	63,392	83,506	77,918	88,456	177,257
		(4.7%)	(6.1%)	(5.1%)	(4.7%)	(7.2%)
MALAWI	Imports	22,004	26,697	75,057	45,295	104,792
		(2.1%)	(2.6%)	(6.6%)	(3.2%)	(5.5%)
	Exports	2,555	1,833	2,300	5,960	2,479
		(0.8%)	(0.5%)	(0.6%)	(1.2%)	(0.5%)
	Total	24,559	28,530	77,357	51,255	107,271
		(1.8%)	(2.1%)	(5.1%)	(2.7%)	(4.4%)
UGANDA	Imports	91,284	68,377	46,009	33,998	64,084
		(8.9%)	(6.7%)	(4.1%)	(2.4%)	(3.4%)
	Exports	20,527	15,215	846	3,454	3,218
		(6.2%)	(4.3%)	(0.2%)	(0.7%)	(0.6%)
	Total	111,811	83,592	46,855	37,452	67,302
		(8.2%)	(6.1%)	(3.1%)	(2.0%)	(2.8%)
OTHERS	Imports	17,210	17,634	14,264	30,974	31,395
		(1.7%)	(1.7%)	(1.3%)	(2.2%)	(1.6%)
	Exports	102,123	123,638	136,493	168,787	224,924
		(30.7%)	(34.7%)	(34.1%)	(35.2%)	(41.4%)
	Total	119,333	141,272	150,757	199,761	256,319
		(8.8%)	(10.2%)	(9.9%)	(10.7%)	(10.5%)
TOTAL	Imports	1,026,023	1,023,405	1,128,994	1,395,409	1,903,422
	Exports	332,787	356,696	400,269	479,257	543,581
	Total	1,358,810	1,380,101	1,529,263	1,874,666	2,447,003

Source: TPA (Reorganized by the Study Team)

Table 2.5-57 Share of railway in the hinterland transport of imported containers

	2004	2005	2006	2007	2008
Tanzania	2.4%	2.9%	2.0%	0.6%	0.8%
Transit	26.2%	19.8%	15.7%	14.7%	13.7%
Zambia	7.1%	2.4%	3.2%	10.5%	12.1%
D. R. Congo	27.2%	16.4%	10.5%	10.8%	14.1%
Burundi	38.6%	38.4%	37.0%	35.0%	25.1%
Rwanda	26.9%	32.2%	27.8%	19.5%	9.9%
Malawi	0.0%	0.0%	0.0%	0.0%	0.0%
Uganda	43.7%	22.2%	14.3%	11.8%	6.8%
Others	35.0%	1.6%	78.7%	73.9%	67.4%
TOTAL	9.7%	9.0%	7.2%	6.0%	5.7%

Source: TPA (Reorganized by the Study Team)

Table 2.5-58 Number of vessel calls at Dar es Salaam Port

SHIP TYPE	2004	2005	2006	2007	2008
DEEP SEA					
Dry Cargo Vessels					
Break Bulk	160	138	147	160	99
Dry Bulk	43	47	53	55	50
Car Carrrier	74	93	96	93	136
Container	460	468	582	530	378
Roro Container	25	23	27	41	40
Other vessels (Inter. Pass.)	6	14	14	1	0
Sub Total	768	783	919	880	703
Liquid cargo Vessels					
Crude Oil	9	6	7	8	5
LPP (KOJ)	107	91	100	115	111
Edible Oil (KOJ)	0	23	21	10	13
Sub Total	116	120	128	133	129
Total Deep Sea	884	903	1,047	1,013	832
COASTERS	796	835	709	608	593
Miscellaneous	2,814	2,748	2,442	2,759	2,773
G-TOTAL	4,494	4,486	4,198	4,380	4,198

Source: TPA

4) Development plans

Figure 2.5-75 shows the development plan of the present port area of Dar es Salaam. The access channel and basin will be deepened to -12 m or deeper. Development of the new quay described in the plan refers only to the construction of container berths 13/14 due to geographical and social restriction of the existing port area. TPA is seeking a private partner for the implementation of the 13/14 container terminal project. TICTS's had possessed exclusive right to operate all container terminals in Dar es Salaam including a terminal to be constructed in the future. However, this exclusive right was terminated in 2009 after extensive discussions between the Government and TICTS. Accordingly, TICTS has right and obligation to operate only the existing container terminal, and doesn't have any right regarding the planned container berths 13/14.

Considering the future growth of container traffic in Tanzania, existing port area doesn't have enough capacity to accommodate all of the port functions required in the future. Even in the low forecast case, cargo demand exceeds the capacity of the existing port area in 2020. Therefore a new port development in Mbegani of Bagamoyo District, 60km north-west of Dar es Salaam, is planned as shown in Table 2.5-76.

Mbegani is earmarked by TPA and national government as a green-field port, as part of a bigger scheme including EPZ and airport development. The plan for development of the area is promoted by a government committee led by the Ministry of Trade and Industry with support from the Planning and Infrastructure ministries. A railway link from the new port and the EPZ to the main line of railway along Central Corridor is also planned.

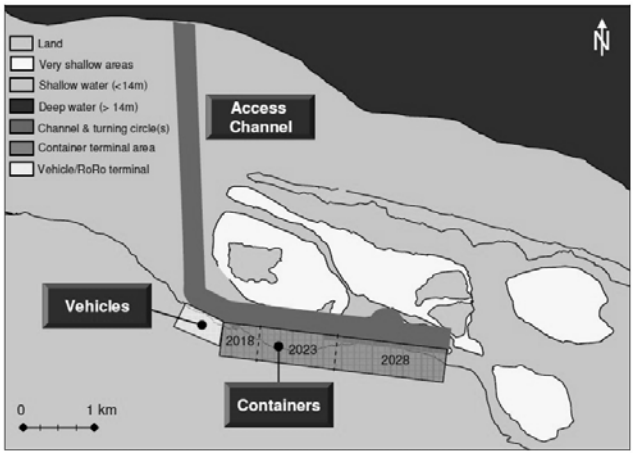
The port of Mbegani can be constructed within a bay that is protected with a natural breakwater. Waves in the shelter of the natural breakwater will be very low, and are not expected to affect navigation or port operations. The water depth in the bay is 6m to 9m, therefore, a considerable amount of dredging is required. The maintenance of the channel and basin will be an important technical issue to be coped with.

Container throughput at Mbegani is estimated to be around 3.5 million TEUs in 2028, and the required quay length is 2,350m in the same year. A feasibility study for Mbegani port is on-going as of the date of interview by the Study Team in August 2010.

In addition to the Bagamoyo Port development, sharing of port function with Mwambani Bay, 200 km north of Dar es Salaam, is also considered.

Source: TPA

Figure 2.5-75 Development plan of present port area of Dar es Salaam



Source: TPA

Figure 2.5-76 Development plan of Mbegani Port in Bagamoyo

(11) Mtwara Port

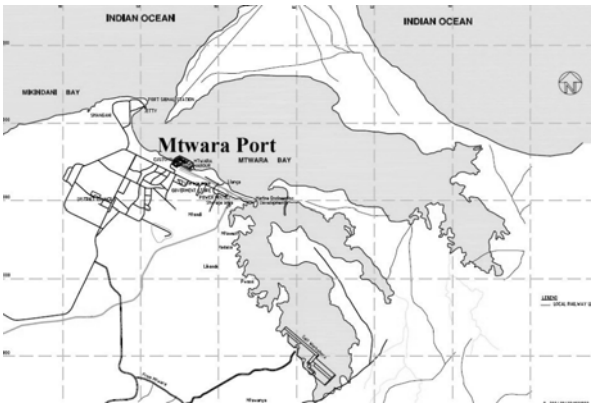
1) Outline

Mtwara is located in the south of Tanzania near the border with Mozambique, about 700 km south of Dar es Salaam and 480 km north of Nacala. The port is a natural basin port with water depth of more than 10m –CD in a large part of the bay. There are no tidal restrictions for vessels entering and leaving the harbor, but there is an enforcement length restriction of 175 meters due to the shape of the access channel. The port is the gateway of Mtwara Corridor, which is less developed, and of which prospect is uncertain.

2) Facilities

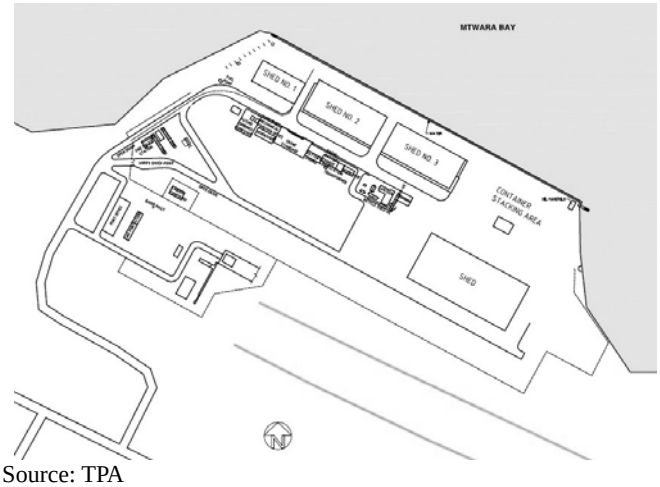
The port has a 385m continuous quay constructed in the 1950s. The water depth alongside the quay is 9.8 meters. The present port area is some 70 ha. An area of 2,650 ha has recently been acquired by the port for future development. This new area is located all around the basin.

Containers are presently handled using ships gear. Port equipment includes mobile cranes and container handling equipment. Mtwara Port can handle 400,000 metric tons of imports and exports per annum.



Source: TPA

Figure 2.5-77 Location of Mtwara Port



Source: TPA

Figure 2.5-78 Layout of facilities in Mtwara Port

3) Cargo throughput

The statistical data of cargoes handled in the port is shown in the tables below. The volume has been decreasing.

Around half of the traffic has traditionally been coastal, using mixed passenger/freight ferries from Dar es Salaam. These provided an important link to the outside world during the rainy season, when the road to Mtwara became impassable. The paving of the coast road in 2007 has resulted in a significant fall in this traffic.

The main commodity handled in the port is raw cashew nuts for export. This trade is seasonal, starting in September and continuing up to March. During the season raw cashews are transported to the port by trucks in bags, and stored in one of the warehouses. A container vessel brings empty containers, which are unloaded and stuffed while the vessel waits in port. Vessels stay in port for about four days. There is limited containerized import cargo. Other exports include cement among others. When a member of the Study Team visited Mtwara Port in a previous assignment in 2009 there was no activity in the port (quay or land side) due to a lack of cargo.

As shown in Table 2.5-61, only 23 ocean-going vessels called the port in 2007.

Table 2.5-59 Cargo handled in Mtwara Port

(1000 tons)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Imports										
Liquid bulk	20.1	15.6	23.1	21.4	20.2	10.7	12.2	11.6	8.2	5.6
Dry bulk	-	-	-	-	-	-	-	-	-	-
Break bulk	53.9	62	49.1	37.3	48	53.4	44.2	33.9	45.2	33.9
Container	2.6	3.4	6.7	12.6	10.5	5.8	9.3	9.8	9.3	6.6
Total imports	76.6	81	78.8	71.3	78.7	70	65.8	55.3	62.6	46.2
Exports										
Liquid bulk	-	-	-	-	-	-	-	-	-	-
Dry bulk	-	-	-	-	-	-	-	-	-	-
Break bulk	128.3	70.7	51.3	30.8	14.1	46.7	21.4	19.8	37.2	28.8
Container	5.6	17	43.2	79.7	86.6	24.6	67.8	35.1	55.1	14.8
Total exports	133.9	87.7	94.5	110.5	100.7	71.4	89.1	54.9	92.3	43.6
Total:	210.5	168.8	173.4	181.8	179.5	141.3	154.9	110.2	154.9	89.7

Note: The above listed data include domestic cargoes
Source: TPA

Table 2.5-60 Containers handled in Mtwara Port

(TEU)

TEU	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Imports full	11	27	126	93	120	64	46	13	11	8	16
empty	94	172	2,287	3,209	4,360	3,240	3,552	2,086	3,118	2,920	4.573
Exports full	17	139	1,429	5,795	5,057	3,295	3,707	2,235	5,850	2,186	4,633
empty		5	255	47	36	58	71	87	14	43	52
Total	122	343	4,067	9,144	9,573	6,658	7,376	4,421	8.963	5,157	9,247

Source: TPA

Table 2.5-61 Vessel calls at Mtwara Port

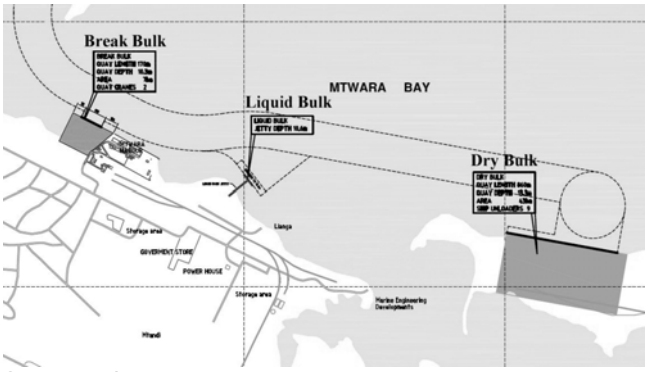
SHIP TYPE	2003	2004	2005	2006	2007
DEEP SEA					
Break Bulk	35	32	26	27	23
Sub Total	**35**	**32**	**26**	**27**	**23**
COASTERS					
General cargo	99	100	105	76	59
Passenger/Cargo	0	0	0	2	0
Tanker LPPC	7	9	10	6	3
Sub Total	**106**	**109**	**115**	**84**	**62**
Miscellaneous	12	27	19	27	12
G-TOTAL	**153**	**168**	**160**	**138**	**97**

Source: TPA

4) Development Plan

Although the port has remaining capacity, TPA has a development plan to cope with the growth of cargo demands as shown in Figure 2.5-79. The major sources of the cargoes considered in the development plan are:

- Export of CNG, wood chip, coal, and fertilizer made from natural gas
- Import and export of SEZ related cargoes.



Source: TPA

Figure 2.5-79 Development Plan of Mtwara Port

2.5.3 Demarcation of Mozambican ports

In this sub-section the demarcation of role and function of Mozambican ports is assessed for the purpose of providing basic information in the formulation of the development strategy and development plan of Nacala Port in the next chapter.

The present function and the expected role in the future of ports in Mozambique are summarized as follows:

<u>Nacala Port</u>
(Status quo)

- The domestic hinterland of the Port is Northern Mozambique, of which the industrial development is falling behind. Consequently, the handling volume of the Port is the smallest among the three major ports in the country.
- The Port serves only for the landlocked country of Malawi besides its domestic hinterland, though the handling volume of transit cargoes is rather small despite the geographical proximity due to the poor conditions of Nacala Corridor as well as the inefficient port operation.
- The deep water bay of Nacala is suitable for bulk cargo handling for which large vessels has an

economic advantage. However, the Port doesn't have a dedicated bulk terminal with deep-water quays, and the handling volume of bulk cargoes is very limited.
- Container trunk lines connecting Asia call at the Port. However, the provision of feeder service connected with Durban is still an important function of the Port.
- Nacala Port is the sole Mozambican port which handles transshipment containers.

(Expected role)
- Industrial development in the Northern Provinces is one of the highest priorities in the country. The Port is expected to be a driving force of the industrial development of the region. Above all, the role of the Port is crucial for SEZ development in Nacala, agricultural development in Nampula Province, forestry development in Niassa Province, and mineral development in Tete Province and Niassa Province.
- Rehabilitation and upgrading of the road and railway network in Nacala Corridor are on-going. This is expected to increase the share of Nacala Port in the transit cargo market in Malawi and Zambia, if the Port is efficiently operated and its deteriorated infrastructure is rehabilitated or reconstructed.
- Fully utilizing the advantage of the depth of the basin, the Port is expected to become a bulk hub which serves a larger region than the Port's present hinterland. Some commodities such as grains can be transshipped at the Port.
- Coupled with Dar es Salaam and Mombasa, the Port is expected to increase the main line container service connecting Asia.
- The Port is located at the place where the Eastern African loop and the Southern African loop of international maritime container network cross each other. The location is advantageous for transshipment of containers, and the Port is expected to enhance its container transship function using this geographical advantage.

Maputo Port

(Status quo)
- Maputo Port is the largest port in the country in terms of total cargo handling volume.
- The port has two functions. One is the function as a commercial port serving for the metropolitan area. The other is the function as an industrial port serving for Matola Industrial Zone, the largest industrial zone in the country.
- The port also serves for landlocked northern region of South Africa including its metropolitan area, as well as Zimbabwe and Swaziland. In the past, Maputo port was the principal gateway for the northern region of South Africa. However, the current share of the port in the South African market is much smaller than at its peak, although a substantial amount of transit cargoes (virtually export only) are still handled in the port.
- Coupled with Durban, Maputo Port provides main line container service connecting with Asia and Europe. Provision of feeder service connected with Durban is also an important function of the port.

(Expected role)
- Maputo Port is expected to continue to be the gateway port for the metropolitan area, and to be the industrial port supporting the country's key industries.
- The port is expected to increase its share in transit cargo market by facilitating transit traffic and increasing port capacity (especially depth of the basin). Existence of Maputo Port providing an alternative route to the other continents would accelerate productivity improvement in Durban
- Port and contribute to the development of the regional economy.
- Maputo Port has enjoyed advantageous location in the maritime network as trunk lines can call with little detour from Durban Port. Although some hub port functions will be shifted to Ngqura Port, Durban Port will continue to be a hub port, and the advantage of Maputo in the maritime network will remain unchanged basically.
- Increase of coal production in the Northern Provinces of South Africa (Limpopo and Waterberg) and recovery of the Zimbabwean economy are important opportunities for Maputo Port.
- Botswana is seeking alternative access to the world's maritime network, and the two Governments

agreed to develop a new deep sea port in a green field in Maputo Province and to construct its railway link. It is expected that the port will be able to serve for Botswana in the long run, though it requires a huge amount of investment in infrastructure.

Beira Port

(Status quo)

- Beira Port is the second largest port in the country in terms of total cargo handling volume, but the port is the largest port as a container port.
- Beira functions as the principal gateway for Zimbabwe utilizing its railway link and fuel pipeline, though the cargo volume is smaller than that in the period before the dislocation of Zimbabwean economy. Beira Port also serves for Malawi and Zambia. Beira is the sole Mozambican port which serves for mineral rich Zambia at present, and is dominant in the transit market in Malawi because the condition of its competitor, Nacala Corridor, is extremely poor.
- The principal function of the port on maritime container network is the provision of feeder service connected with Durban or Maputo, though the direct service to Asia is available.
- The growth of the port has been hindered by the shallowness of basin due to sedimentation.

(Expected role)

- Centrally located in the country, Beira will have to keep competing with other Mozambican ports in the transit cargo market as well as domestic market. The competition among the country's ports would improve overall efficiency and competitiveness of the port network in Mozambique and would bring economic benefit to the country as well as to the Southern African region.
- It would not be easy to continue to enjoy Beira's dominant status in the Malawian market because the present conditions of Nacala Corridor and Nacala Port are the poorest, and the share of Nacala will increase somewhat even in the pessimistic scenario of efficiency improvement in Nacala. But it can be expected that the both ports can increase their share in the transit market when the competitiveness of the country's port system is improved through the fair competition among Mozambican ports. Despite the forecasted decrease in market share in Malawi, the cargo handling volume of the port is expected to keep increasing due to economic development of the domestic hinterland driven by agriculture and agro-industry, and recovery of the Zimbabwean economy from the long lasting recession.
- Considering the shallowness of basin and the distance from the main container ports on the Southern African loop and Eastern African loop, namely Durban and Mombasa, the port is expected to remain as a feeder port, though some direct service to Asia would be available. .
- Beira Port, as well as Nacala Port, is expected to play an important role in the development of mineral resources in Tete Province.

Quelimane Port

(Status quo)

- The port is serving partially for the second most populous province of Zambezi in central Mozambique.
- Despite the completion of rehabilitation, the cargo throughput of the port is decreasing sharply due to the suspension of cabotage transport service provided by Navique (former state owned shipping company).
- In the past, the port handled a substantial amount of domestic transshipment cargoes between river transport on Zambezi and maritime transport. However, this flow has ceased completely due to improvement of the land transport network connecting the Zambezi valley directly with Beira Port.
- The port has newly acquired transit cargoes from Malawi, though the cargo volume is still very small. Quelimane Port is the nearest seaport from Malawi.

(Expected role)

- Despite the proximity to Malawi, it is difficult to expect that the port will become a principal international gateway due to shallowness of basin and navigation channel.
- Development of the Zambezi waterway has been discussed; however, it would be very difficult to materialize the project due to serious environmental impacts cased by the dredging of the river.

Difficulty of the control of water level for navigation due to the existence of Cahora Bassa hydropower station, which is the country's most important energy source, has also been pointed out. Accordingly, the Zambezi waterway will not become a catalyst for growth of the port.

- The port is expected to be a local port for Zambezia Province providing feeder services connecting the region with Nacala, Beira, Maputo and Durban.

Pemba Port

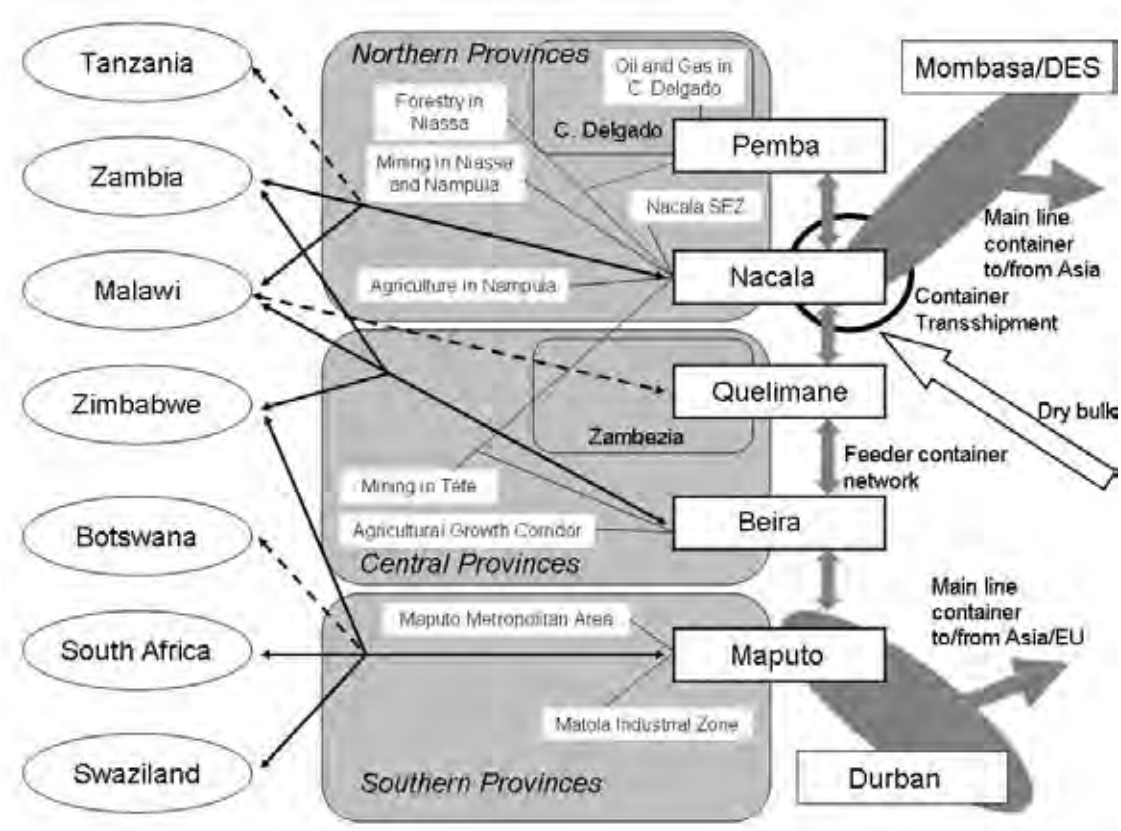
(Status quo)

- The port serves only for a part of Cabo Delgado Province mainly to export timber to China.
- The port also functions as a supply base for offshore hydrocarbon development in the Northern area of Cabo Delgado Province.

(Expected role)

- The on-going development project of Pemba Corridor connecting the port with Niassa Province which is expected to become a center of forestry production will expand the hinterland of the port. Although the capacity of Pemba Port is limited, competition with Nacala Port for the transport market of Niassa Province will occur to some extent. This will improve the market access of the provincial industry, and will benefit the regional economy.
- Further hydro-carbon development is planned in the basin off the coast of Cabo Delgado Province, and the port is expected to strengthen its function as an offshore supply base. There is a possibility of establishment of facility for industries utilizing hydro-carbon such as fertilizer plants in the future, and the port located in the deep-water bay of Pemba has a potential to become an industrial port.

Figure 2.5-80 shows schematic views of future functional demarcation of the ports in Mozambique.



Source: Study Team

Figure 2.5-80 Functional demarcation of Mozambican ports in the future

2.6. Natural condition

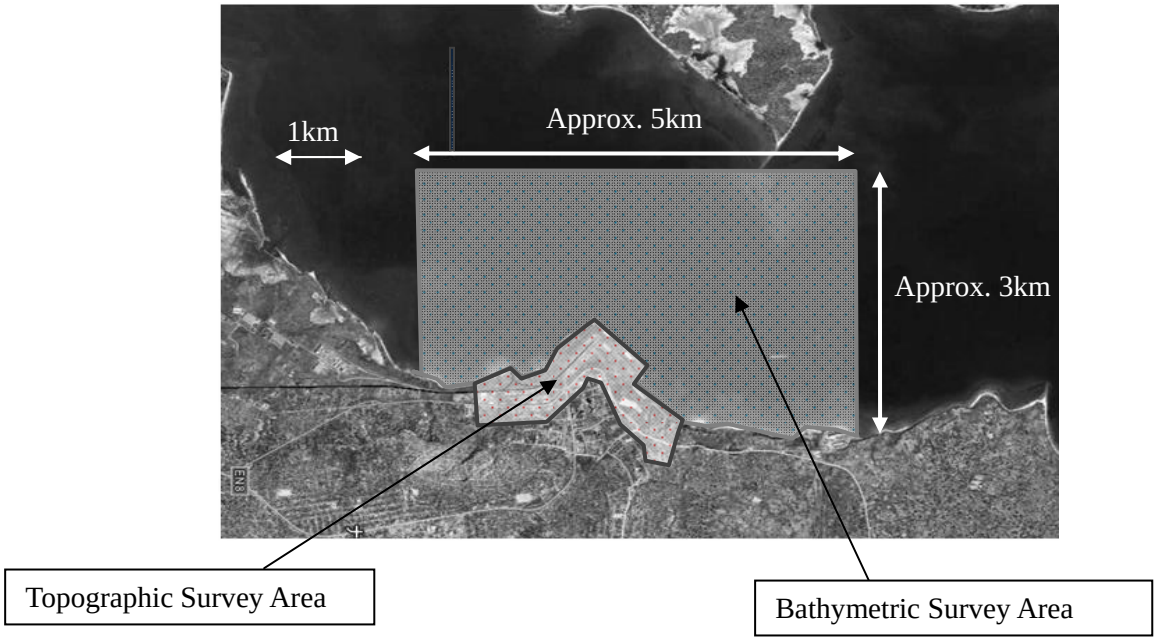
2.6.1 Topography and bathymetry

Topographic survey was conducted in the project site. The total area surveyed was approximately 1,000,000m^2 as shown in Figure 2.6-1. Topographic map is shown in Figure 2.6-2.

According to the result of the topographic survey, the elevation of the container berth is about 5.8m, which is about 20 cm lower than the design elevation of 6.0 m. The elevation of the general cargo berth is about 5.9 m which is about 10 cm lower than the design elevation.

Bathymetric survey was conducted in the project site. The total area surveyed was approximately 13,000,000m^2 as shown in Figure 2.6-1. Bathymetric maps are shown in Figure 2.6-3 and Figure 2.6-4.

According to the bathymetric survey, the water depth in front of the container terminal is more than 15 m at the north side and about 11 to 14 m at the south side. The water depth at the north east side in front of the general cargo terminal is about 10 m and it is about 8 to 10m at the south west side.



Source: Study Team, Google

Figure 2.6-1 Area for topographic survey and bathymetric survey

Figure 2.6-2 Topographic survey result

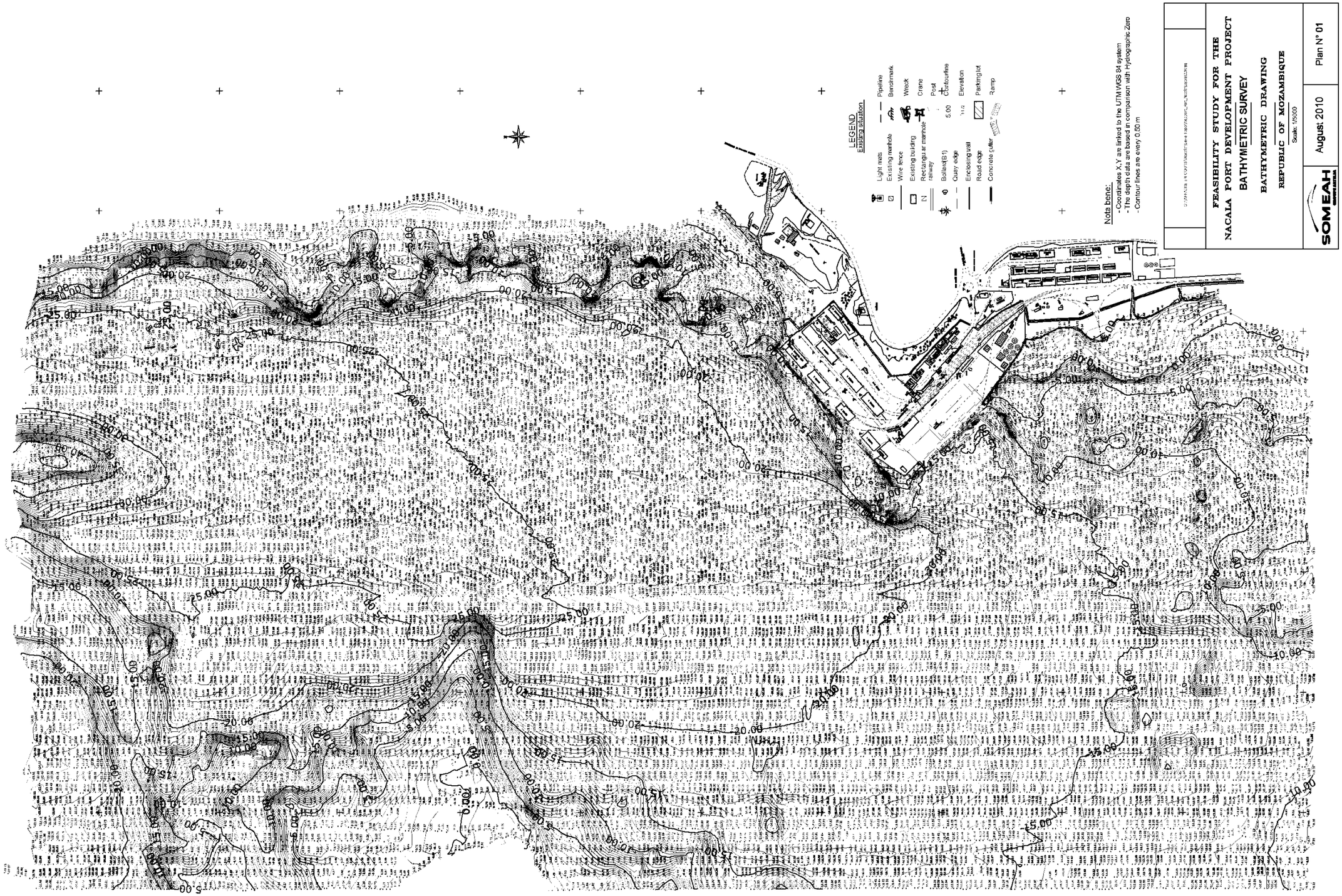


Figure 2.6-3 Bathymetric survey result (Nacala Port)

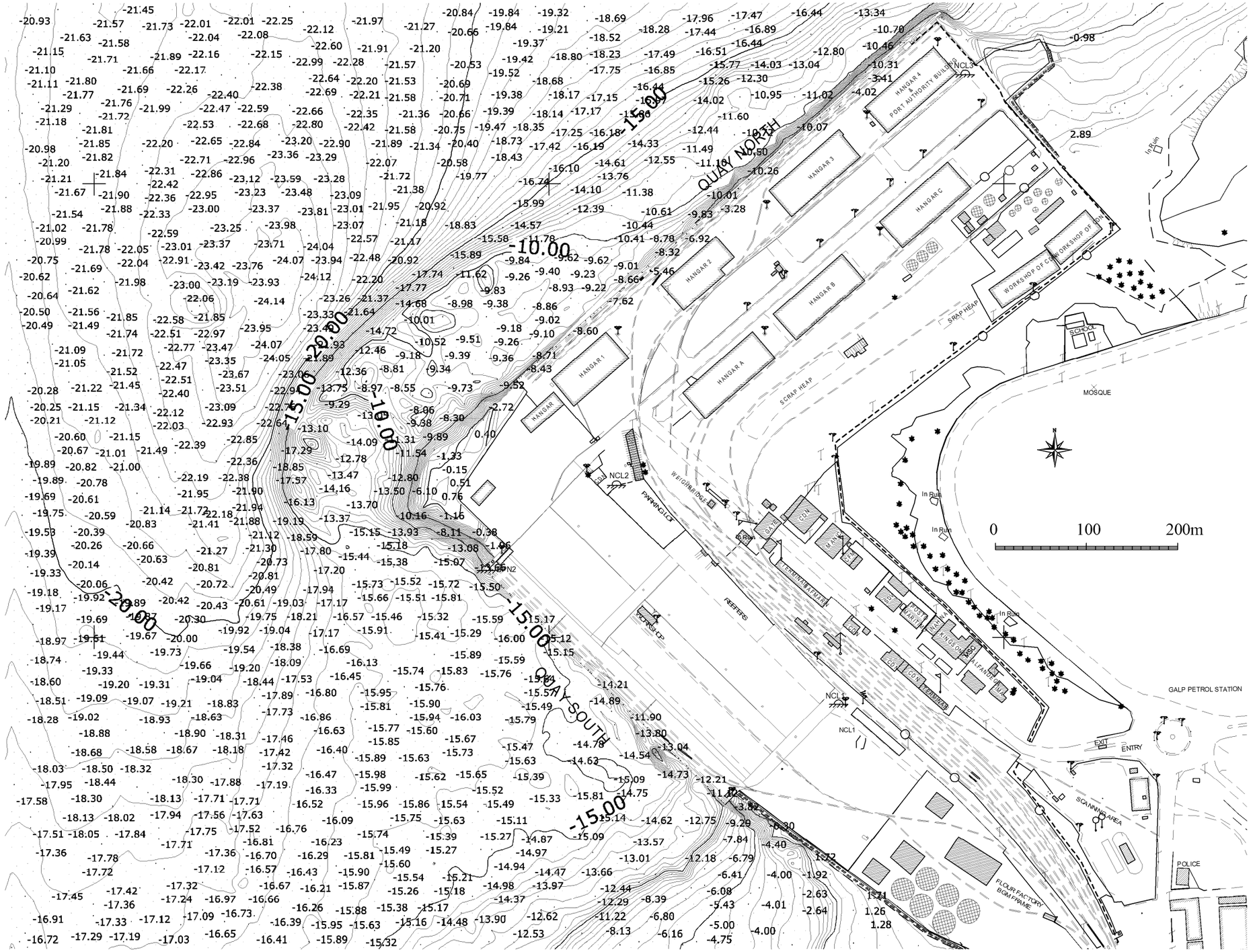


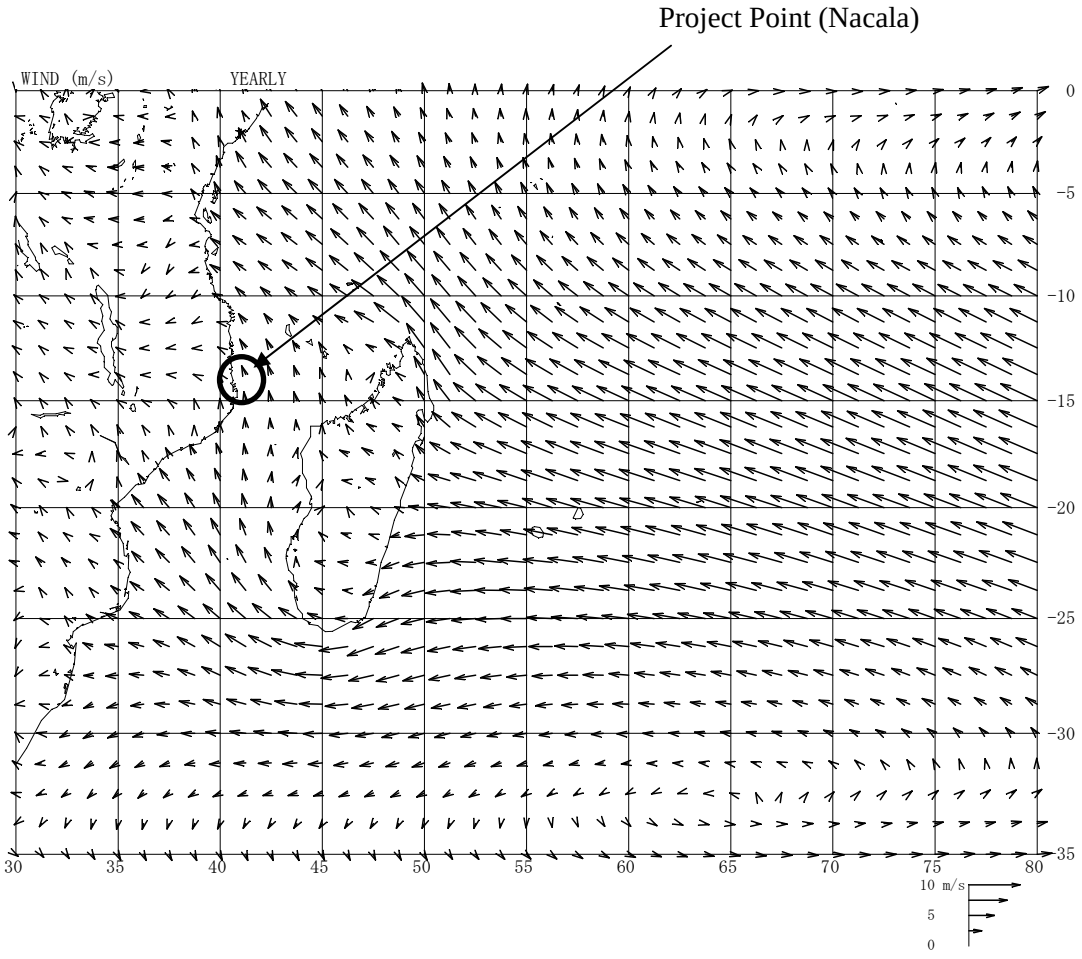
Figure 2.6-4 Bathymetric survey result (close area of Nacala Port)

2.6.2 Climate and meteorology

Figure 2.6-5 and Figure 2.6-6 show the distribution of the average wind speed and direction at West Indian Sea, which was obtained by Japan's Meteorological Agency. The project site faces the Madagascan Strait where the wind is calm. The southerly wind is predominant in the dry season (from May to October), while the north wind is predominant in the wet season (from November to April).

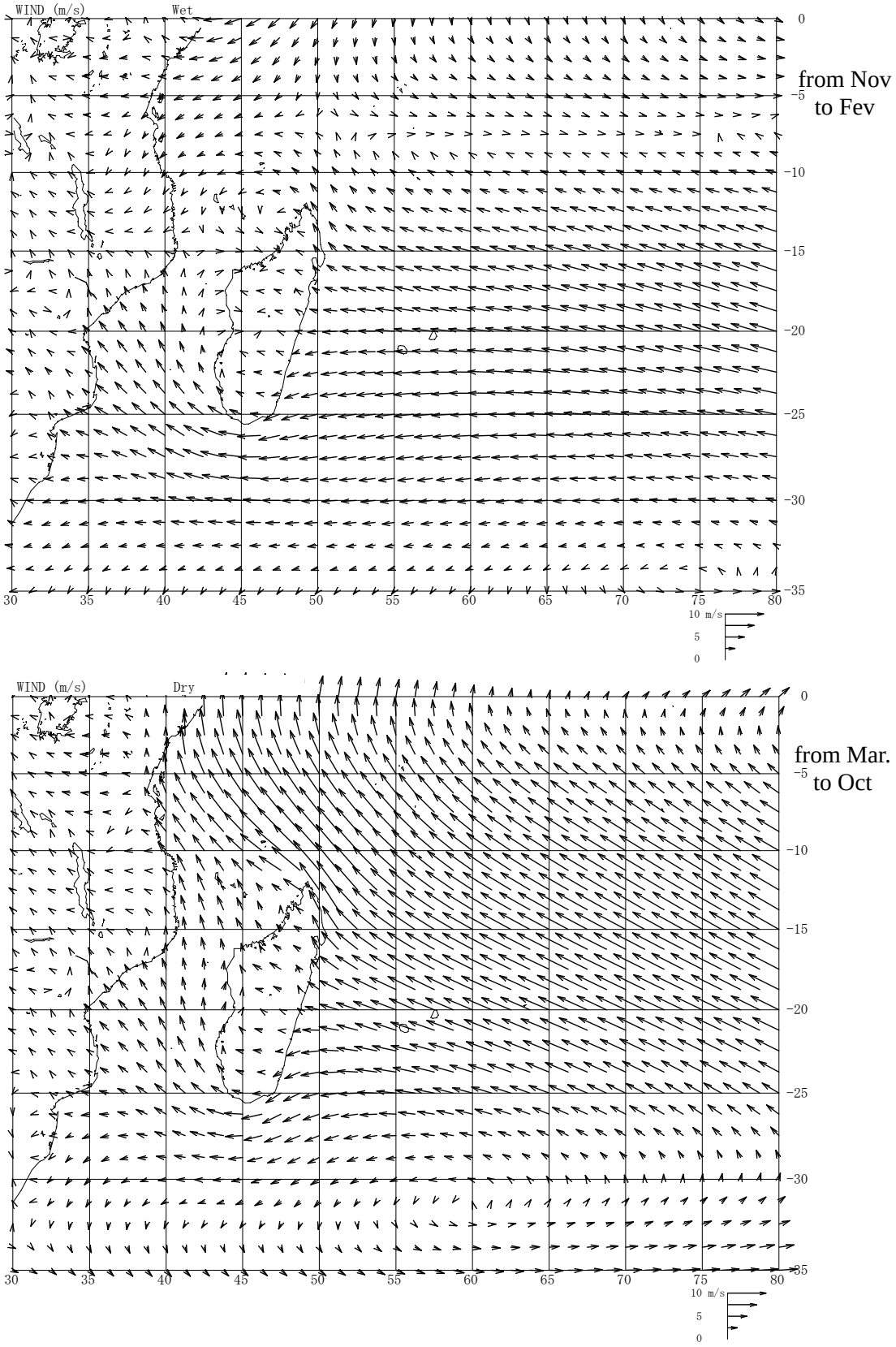
Table 2.6-1 to Table 2.6-6 show meteorological conditions in Lumbo, which is located approximately 50km to the south of Nacala; meteorological conditions in Lumbo are considered to be almost the same as Nacala. Wind rose of Lumbo is shown in Figure 2.6-7. The data were obtained from INAM (Instituto Nacional de Meteorologia).

Nacala has a tropical climate characterized by high temperatures. In the dry season, the average rainfall is 20 mm per month and the average temperature is about 24 degrees Celsius, while average rainfall is 150 mm per month and the average temperature is about 28 degrees Celsiusin the wet season. Besides wind speed, wind direction and precipitation, meteorological elements such as relative humidity and atmospheric pressure are very stable throughout a year.



Source: Japanese Meteorological Agency

Figure 2.6-5 Distribution of average wind speed and direction at Western Indian Ocean (2002 to 2006, yearly)



Source: Japan Meteorological Agency

Figure 2.6-6 Distribution of average wind speed and direction at Western Indian Ocean (2002 to 2006, seasonal)

Table 2.6-1 Monthly average temperature (Lumbo, 1999-2008)

(Unit: Celsius degree)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1999	28.4	28.6	26.9	25.8	24.0	22.5	21.8	22.5	23.5	24.3	26.0	26.2	25.0
2000	27.4	26.8	26.2	25.9	23.1	22.1	21.7	22.2	24.4	26.3	27.8	28.3	25.2
2001	28.3	28.2	27.4	26.8	25.8	23.3	22.9	23.2	24.7	26.6	28.2	28.5	26.2
2002	28.7	28.4	27.9	26.9	25.2	23.2	24.7	23.2		26.3	27.6	27.9	26.4
2003	28.1	28.4	28.3	26.7	25.3	23.5	22.8	22.8	24.3	26.1	28.6	29.4	26.2
2004	28.6		28.4	27.0	24.5	23.1	22.4	23.4	25.3	26.9	28.2	29.0	26.1
2005	28.8	28.9	28.6	27.1	25.1		23.1	23.1	25.0	26.6	28.4	29.9	26.8
2006	28.8	28.6	28.3	27.2	24.9	23.7	22.7	23.4	24.0	26.6	27.9	28.1	26.2
2007	28.4	28.1	28.5	27.4	25.9	23.8	23.3	23.4	24.5	26.3	28.3	28.6	26.4
2008	27.3	26.8	26.2	25.1	24.6	22.1	21.8	22.3	23.5	27.0	28.7	28.6	25.3
Average	28.3	28.1	27.7	26.6	24.8	23.0	22.7	23.0	24.4	26.3	28.0	28.5	25.9

Source: INAM(Instituto Nacional de Meteorologia)

Table 2.6-2 Monthly average of minimum temperature (Lumbo, 1999-2008)

(Unit: Celsius degree)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1999	23.8	23.7	22.7	20.6	18.7	16.1	16.0	16.6	17.4	18.2	20.7	20.8	19.6
2000	21.7	21.5	20.7	20.0	16.5	15.7	15.8	16.5	17.9	21.8	24.0	24.2	19.7
2001	24.1	24.1	23.4	22.2	20.6	17.5	17.4	17.3	19.3	21.8	23.8	24.4	21.3
2002	24.6	24.7	24.6	22.5	20.2	18.6	17.4	17.7		21.8	23.1	24.2	21.8
2003	24.3	24.7	24.5	21.6	20.0	18.1	17.6	17.5	18.9	20.9	24.1	25.1	21.4
2004	24.6		24.1	22.9	19.9	17.6	16.9	17.9	20.3	21.6	23.4	24.6	21.3
2005	24.1	24.3	24.3	21.9	20.0		17.8	17.3	20.0	21.8	23.3	25.6	21.9
2006	24.7	24.6	24.0	22.6	20.0	18.1	17.5	17.7	18.3	21.4	22.1	22.0	21.1
2007	24.0	23.6	23.5	22.8	20.7	17.9	17.6	16.3	17.8	20.3	21.4	23.0	20.7
2008	22.4	22.0	20.8	18.9	17.8	15.3	15.3	15.8	17.6	21.4	23.6	23.8	19.6
Average	23.8	23.7	23.3	21.6	19.4	17.2	16.9	17.1	18.6	21.1	23.0	23.8	20.8

Source: INAM(Instituto Nacional de Meteorologia)

Table 2.6-3 Monthly average of maximum temperature (Lumbo, 1999-2008)

(Unit: Celsius degree)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1999	33.0	33.4	31.2	31.1	29.5	28.7	27.7	28.3	29.7	30.4	31.4	31.5	30.5
2000	33.2	32.4	31.8	31.8	29.7	28.5	27.7	28.0	29.5	30.9	31.6	32.3	30.6
2001	32.6	32.2	31.4	31.4	30.9	29.1	28.3	29.1	30.1	31.4	32.7	32.6	31.0
2002	32.7	32.1	31.6	31.3	30.2	27.8	28.4	28.6		31.0	32.1	31.5	30.7
2003	31.9	32.0	32.2	31.7	30.6	28.9	28.0	28.5	29.6	31.3	33.1	33.6	31.0
2004	32.5		32.7	31.0	30.0	28.4	27.8	28.9	30.2	32.2	32.9	33.5	30.9
2005	31.5	33.4	33.0	32.3	30.2	28.9	28.2	28.9	30.1	31.4	32.5	34.2	31.2
2006	32.8	32.6	32.7	31.9	29.4	29.2	28.9	29.0	29.7	31.8	33.6	34.2	31.3
2007	32.8	32.6	33.6	32.0	31.1	29.6	28.9	30.5	31.2	32.1	33.9	34.2	31.9
2008	32.1	32.0	31.3	31.2	30.7	28.8	28.3	28.8	30.9	32.5	33.6	33.5	31.1
Average	32.5	32.5	32.2	31.6	30.2	28.8	28.2	28.9	30.1	31.5	32.7	33.1	31.0

Source: INAM(Instituto Nacional de Meteorologia)

Table 2.6-4 Monthly rainfall (Lumbo, 1999-2008)

(unit:mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1999	131.2	79.5	338.4	135.0	10.1	21.5	21.9	7.8	0.0	0.3	100.5	146.4	992.6
2000	49.9	83.0	253.3	61.9	6.6	36.7	10.7	21.9	0.0	62.5	108.1	98.9	793.5
2001	209.5	134.2	339.7	65.2	7.2	0.2	8.9	2.2	0.5	52.5	0.0	31.9	852.0
2002	113.9	180.8	205.4	78.8	5.0	117.9	7.0	8.0		0.5	110.8	116.8	944.9
2003	489.5	224.0	141.7	23.0	0.0	45.7	63.4	0.0	0.0	14.5	0.0	130.5	1132.3
2004	188.8		127.6	171.5	49.4	71.3	31.6	17.2	0.0	0.0	0.0	143.5	800.9
2005	215.6	203.5	56.0	8.4	59.0	116.4	21.9	0.0	0.0	0.9	12.5	2.6	696.8
2006	268.6	99.1	196.6	136.0	0.0	31.2	37.1	126.5	1.5	5.2	21.7	48.5	972.0
2007	917.6	592.6	197.1	347.7	17.3	30.5	23.7	28.0	36.4	5.3	1.0	440.7	2637.9
2008	261.3	517.1	361.9	10.0	15.0	52.1	60.8	23.0	0.0	1.8	16.0	180.5	1499.5
Ave.	284.6	234.9	221.8	103.8	17.0	52.4	28.7	23.5	4.3	14.4	37.1	134.0	1132.2

Source: INAM(Instituto Nacional de Meteorologia)

Table 2.6-5 Monthly average of relative humidity (Lumbo, 1999-2008)

(unit:%)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1999	82	80	82	79	67	84	84	85	79	76	76	85	79.9
2000	81	83	90	86	93	91	82	84	82	68	75	82	83.1
2001	79	83	85	81	79	81	80	83	77	73	73	73	78.9
2002	58	79	83	61	79	83	77	85		77	74	79	75.9
2003	81	81	81	83	80	83	84	85	77	78	71	69	79.4
2004	77		78	87	84	82	86	79	74	83	72	73	79.5
2005	76	77	78	75	79		92	84	71	74	75	78	78.1
2006	77	79	76	85	91	84	81	83	84	75	67	79	80.1
2007	79	79	79	82	82	83	84	81	85	78	72	76	80.0
2008	86	79	88	75	75	87	86	89	84	71	73	65	79.8
Average	77.6	80.0	82.0	79.4	80.9	84.2	83.6	83.8	79.2	75.3	72.8	75.9	79.6

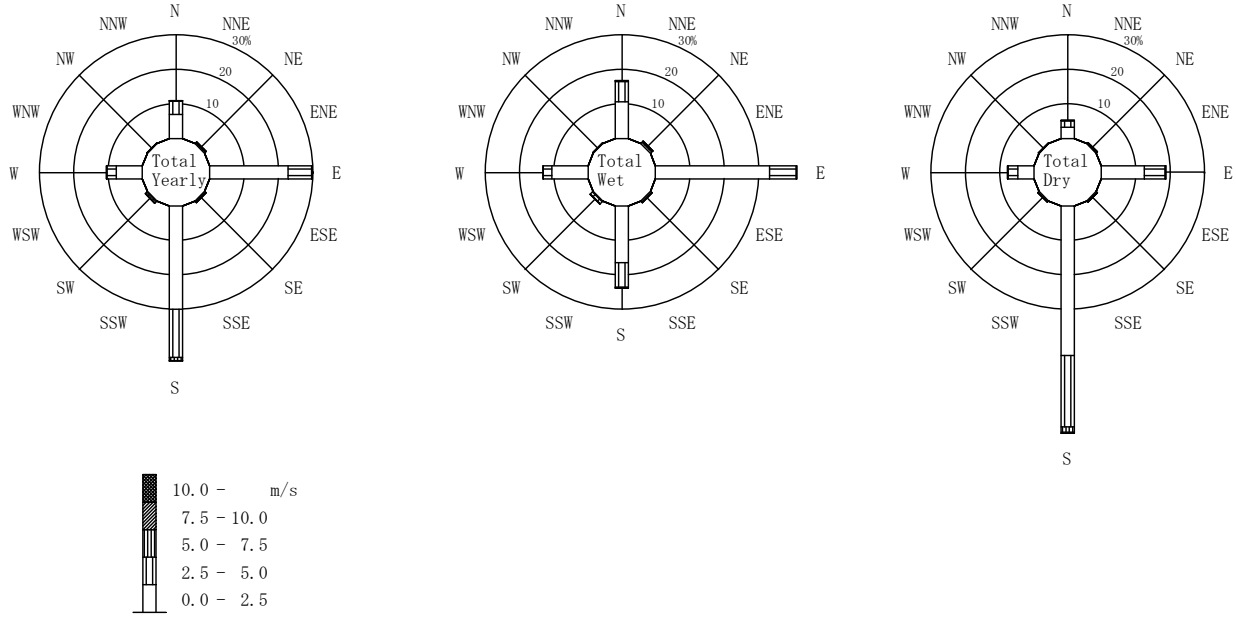
Source: INAM(Instituto Nacional de Meteorologia)

Table 2.6-6 Monthly average of atmospheric pressure (Lumbo,1999-2008)

(Unit: hPa)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1999	1007.5	1008.7	1007.6	1007.3	1010.3	1012.0	1013.5	1012.6	1010.9	1009.3	1007.5	1005.7	1009.4
2000	1002.0	1002.2	1007.4	1009.7	1013.3	1015.6	1015.7	1016.3	1014.4	1012.1	1008.1	1008.0	1010.4
2001	1004.9	1006.8	1007.9	1008.9	1012.5	1014.8	1014.5	1014.8	1012.0	1011.5	1009.9	1008.5	1010.6
2002	1006.4	1007.3	1007.2	1008.8	1011.3	1014.3	1015.0	1015.0		1011.4	1009.7	1008.7	1010.5
2003	1005.8	1005.1	1006.0	1008.2	1011.1	1013.0	1015.5	1014.3	1013.0	1010.1	1008.0	1006.3	1009.7
2004	1004.5		1005.9	1008.4	1011.4	1015.8	1014.3	1014.8	1011.5	1011.0	1008.9		1010.7
2005					1014.2	1016.0	1018.2	1016.7	1015.7	1014.1	1012.0	1009.4	1014.5
2006	1005.2	1008.5	1009.5	1011.3	1013.9	1016.8	1018.4	1016.5	1016.3	1013.9	1008.6	1009.8	1012.4
2007	1007.9	1006.1	1009.2	1010.7	1013.3	1015.2	1016.4	1015.9	1014.7	1013.0	1009.2	1007.6	1011.6
2008	1007.3	1009.0	1009.0	1012.0	1014.0	1017.0	1017.3	1015.2	1013.9	1012.3	1009.9	1008.8	1012.1
Ave.	1005.7	1006.7	1007.7	1009.5	1012.5	1015.1	1015.9	1015.2	1013.6	1011.9	1009.2	1008.1	1010.9

Source: INAM(Instituto Nacional de Meteorologia)



Source: INAM(Instituto Nacional de Meteorologia)

Figure 2.6-7 Wind rose at Lumbo (2006-2008)

2.6.3 Oceanography

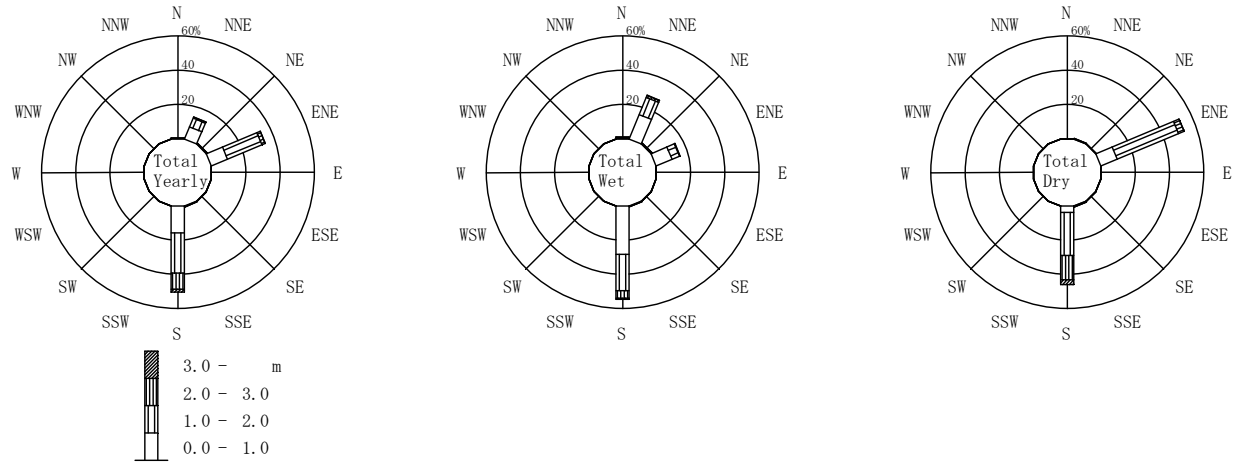
(1) Waves

1) Ordinary waves

The ordinary offshore waves at Nacala Bay were hindcasted using "One Point Spectral Method" The hindcasting was carried out with winds distribution in West Indian Sea area from 2002 to 2006. The results are shown in Figure 2.6-8. Predominant wave direction is S which has an occurrence rate of approximately 50 %. Waves from NNE and ENE are also present at rates of approximately 34 % and 14% respectively. Waves in which heights exceed 1m, 2m, 3m occupy 65.7%, 14.1%, and 1.8% respectively. Wave periods spread from 5 to 11 seconds while the predominant wave period is 6 to 9 seconds.

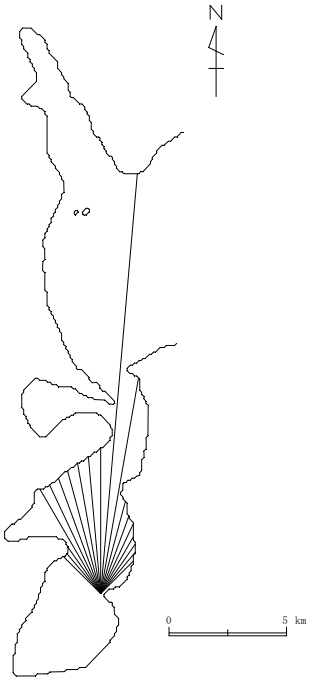
Nacala Bay is open to the North, and a wind fetch to this direction has a certain distance. However, this direction is also surrounded by a land area (see Figure 2.6-9). Because offshore waves are sheltered by land area, the wave situation in Nacala Bay is considered rather mild. Meanwhile waves generated in Nacala Bay are hindcasted by SMB method using the wind data observed at Lumbo. Fetch for each direction is calculated by the effective fetch method, and is shown in Table 2.6-7.

Results are shown in Table 2.6-8 and Figure 2.6-10. Predominant wave direction is from S which represents approximately 40 % of all waves. Waves from E, N and W are also present at rates of approximately 25 %, 9 % and 8% respectively. Waves in which heights exceed 0.25m and 0.5m occupy 0.5% and 0.1% respectively. The wave periods spread from 0 to 5 seconds while the predominant wave period is 1 to 2 seconds. The maximum wave occurred on March 8th, 2008 when cyclone "JOKWE" attacked. Wave height was 2.26m, wave period was 4.2 s, and wave direction was N at the moment.



(Hindcasted by wind data from Japanese Meteorological Agency, year of 2002-2006)

Figure 2.6-8 Distribution of wave direction and wave height at offshore of Nacala Bay



Source: Study Team

Figure 2.6-9 Effective fetch (N)

Table 2.6-7 Effective fetch (Nacala Bay)

Direction	N	NNE	NE	S	SSW	SW	WSW	W	WNW	NW	NNW
Effective Fetch (km)	4.9	3.4	2.6	2.3	3.1	3.4	3.2	2.7	2.6	3.4	4.0

Source: Study Team

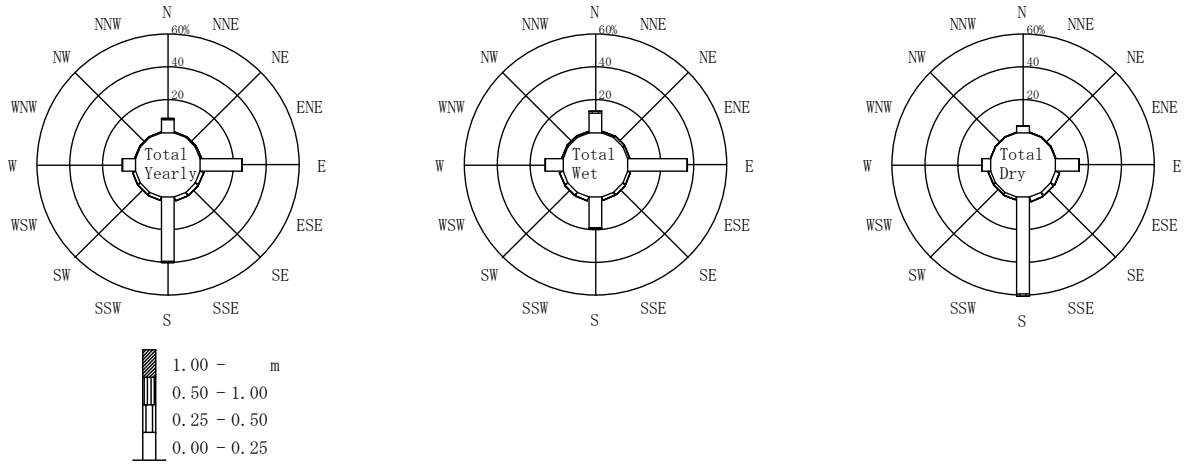
Table 2.6-8 Distribution of waves generated in Nacala Bay

(Hindcasted by wind data of Lumbo by INAM, year of 2002-2006)

WAVE DIRECTION	U.K.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
WAVE HEIGHT(M)																		
CALM	177 .7	27 .1	0 .0	0 .0	6 .0	12 .0	2 .0	0 .0	1 .0	12 .0	3 .0	0 .0	0 .0	4 .0	0 .0	1 .0	2 .0	247 .9
0.00 - 0.25	0 .0	2050 7.8	171 .7	214 .8	186 .7	6671 25.4	605 2.3	630 2.4	653 2.5	10271 39.0	570 2.2	511 1.9	496 1.9	2106 8.0	128 .5	146 .6	142 .5	25550 97.1
0.25 - 0.50	0 .0	209 .8	0 .0	4 .0	0 .0	0 .0	0 .0	0 .0	5 .0	213 .8	1 .0	14 .1	4 .0	7 .0	3 .0	9 .0	8 .0	477 1.8
0.50 - 0.75	0 .0	4 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	5 .0	0 .0	0 .0	0 .0	2 .0	1 .0	0 .0	0 .0	12 .0
0.75 - 1.00	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0	1 .0	0 .0	0 .0	3 .0
1.00 - 1.25	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0	0 .0	1 .0	0 .0	3 .0
1.25 - 1.50	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0	0 .0	0 .0	0 .0	2 .0
1.50 - 1.75	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0	2 .0	0 .0	1 .0	5 .0
1.75 - 2.00	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	1 .0	1 .0	2 .0
2.00 - 2.25	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0	2 .0
2.25 - 2.50	0 .0	1 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	1 .0
2.50 - 2.75	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0
2.75 - 3.00	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0
3.00 -	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0
TOTAL	177 .7	2291 8.7	171 .7	218 .8	192 .7	6683 25.4	607 2.3	630 2.4	659 2.5	10501 39.9	574 2.2	525 2.0	500 1.9	2127 8.1	135 .5	158 .6	156 .6	26304 100.0

WAVE PERIOD(S)	CALM	0- 1	1- 2	2- 3	3- 4	4- 5	5- 6	6- 7	7- 8	8- 9	9-10	10-11	11-12	12-13	13-14	14-	TOTAL
WAVE HEIGHT(M)																	
CALM	177 .7	70 .3	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	247 .9
0.00 - 0.25	0 .0	14960 56.9	10590 40.3	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	25550 97.1
0.25 - 0.50	0 .0	0 .0	404 1.5	73 .3	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	477 1.8
0.50 - 0.75	0 .0	0 .0	0 .0	12 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	12 .0
0.75 - 1.00	0 .0	0 .0	0 .0	3 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	3 .0
1.00 - 1.25	0 .0	0 .0	0 .0	1 .0	2 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	3 .0
1.25 - 1.50	0 .0	0 .0	0 .0	0 .0	2 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0
1.50 - 1.75	0 .0	0 .0	0 .0	0 .0	5 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	5 .0
1.75 - 2.00	0 .0	0 .0	0 .0	0 .0	2 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0
2.00 - 2.25	0 .0	0 .0	0 .0	0 .0	2 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	2 .0
2.25 - 2.50	0 .0	0 .0	0 .0	0 .0	0 .0	1 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	1 .0
2.50 - 2.75	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0
2.75 - 3.00	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0
3.00 -	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0
TOTAL	177 .7	15030 57.1	10994 41.8	89 .3	13 .0	1 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	26304 100.0

Source: Study Team



(Hindcasted by wind data of Lumbo, year of 2006-2008)

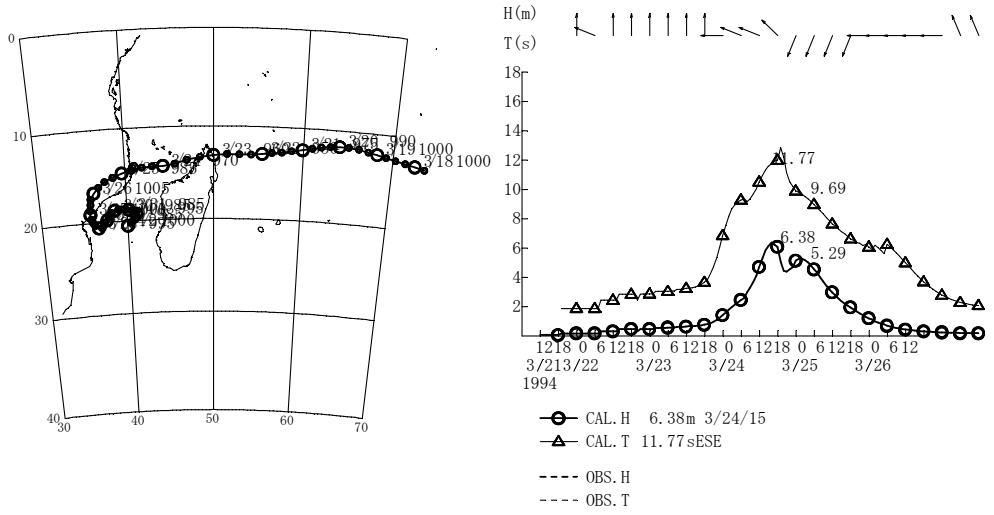
Source: Study Team

Figure 2.6-10 Distribution of wave direction in Nacala Bay

2) Storm waves

Storm waves which occur when a westward developing cyclone attacks Nacala sea area are examined. The cyclone "Nadia" attacked Nacala in March 1994, and is considered to be the largest cyclone which attacked Nacala in the past 60 years. Offshore waves of Nacala Bay are calculated using "One Point Spectral Method". Results are shown in Figure 2.6-11. Maximum significant wave height was 6.38 m and significant wave period was 11.8 s. The direction of the maximum wave was ESE. The wave direction in maximum wave height condition was ESE.

Since the offshore waves are sheltered by the land area, and the wave deformation coefficient is considered less than 10%, it is understood that the maximum wave at project point is waves generated in Nacala Bay. Therefore, the prediction of waves generated in Nacala Bay was done using wind speed of 45m/s which is the maximum wind speed generated by the maximum cyclone in last 60 years and obtained the maximum wave height of 2.35m, the wave period of 4.25s and the wave direction of N (longest fetch : 4.9 km).



(Hindcasted using the Cyclone data from Unisys Web Page)

Source: Study Team

Figure 2.6-11 Hindercasted waves at offshore of Nacala Bay generated by the Cyclone "Nadia" (March, 1994)

(2) Tide

Tide conditions in Nacala Port are described below.

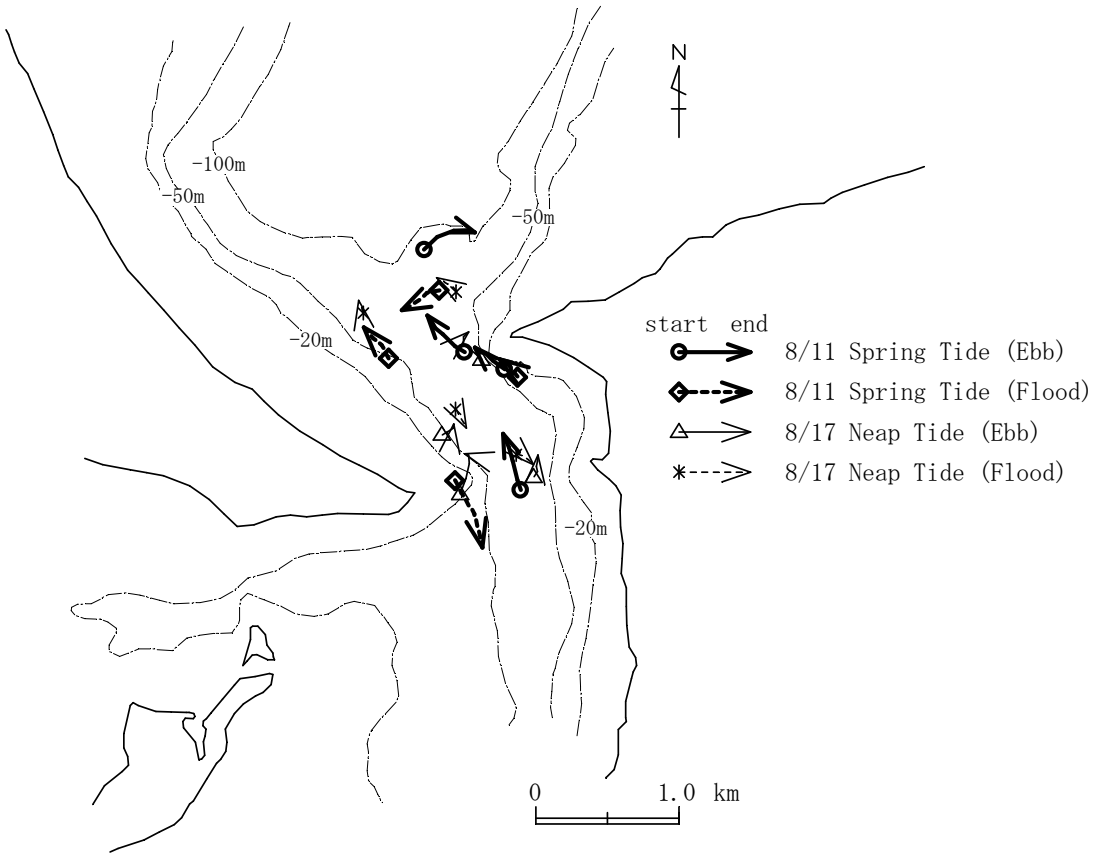
Highest High Water Level in 2010	+ 4.32 m
Mean High Water Spring (MHWS)	+ 3.88 m
Mean High Water Neap (MHWN)	+ 2.74 m
Mean Sea Level (MSL)	+ 2.25 m
Mean Low Water Neap (MLWN)	+ 1.73 m
Mean Low Water Spring (MLWS)	+ 0.62 m
Lowest Low Water Level in 2010	+ 0.26 m
Chart Datum Line (CDL)	+ 0.00 m

Source: INAHINA (Instituto Nacional de Hidrographia e Navegacao)

(3) Tidal current

Current status at the mouth of Nacala Bay was observed using floating buoy and GPS. The observation was performed at flood tide and ebb tide for the period of spring tide (11 August 2010) and neap tide (17 August 2010).

Figure 2.6-12 shows the floating buoy movement. The average current speed at spring tide was about 30 cm/sec while current speed at neap tide was about 10cm/s. Current speed is rather mild because water depth at the mouth of the bay is from 50 to 70 m which is rather deep. The direction of the current moved toward outside of the bay at ebb tide and toward inside of the bay at flood tide.

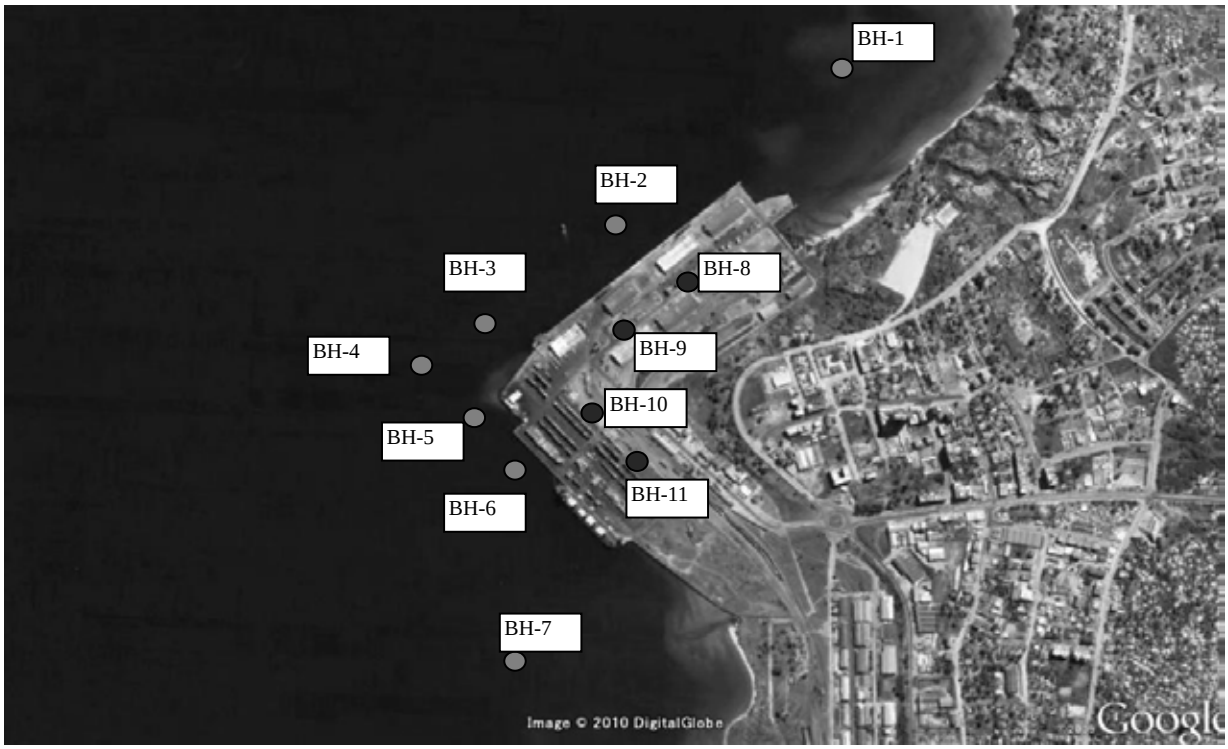


Source: Study Team

Figure 2.6-12 Tidal current at mouse of Nacala Bay

2.6.4 Geotechnical conditions

Soil investigation was conducted at 12 locations of the project site. Five points are for land boring and seven points are for marine boring. Figure 2.6-13 shows the borehole points.



(Marine Boring; BH-1 to BH-7, Land Boring; BH-8 to BH-12)
Source: Study Team, Google

Figure 2.6-13 Borehole positions

Figure 2.6-14 to Figure 2.6-16 show boring logs at each point. Results of standard penetration test are summarized below:

- It was found that sand layer in upper, silt layer in lower part with the depth of 6m to 8m and beneath that bearing layer is formed.
- A sand layer was found again beneath the silt layer at BH-3 and 4. Therefore, the bearing layer is assumed to be at deeper ground.
- BH-1 in the North-East side of the existing port facilities was composed of coral-sand with the N value from 6 to 18 at -10m to -12m, and with the N value more than 50 at depths greater than -15m.
- BH-2 is composed of silty sand with the N value more than 50 at -15m and beyond.
- BH-3 in front of the general cargo quay is composed of silty-sand with N value around 0 to 4 at 12m to -20m while N value becomes around 20 at -22m and beyond.
- BH-4 is composed of sand with some silt with N value around 0 to 12 from -14m to -32m.
- BH-5 in front of the corner of the quay is composed of sand with silt and shell fragments with N value around 0 to 10 at -8m to -20m while N value becomes more than 50 deeper than -22m.
- BH-6 in front of the container quay is composed of sand with silt, clay and shell fragments with N value around 0 to 10 at -8m to -20m while N value becomes more than 50 deeper than -22m.
- BH-7 to the south of the existing port facilities is composed of sand with silt and clay with N value more than 50 at depths greater than -11m.
- BH-8 in the land area is composed of sand and gravel with the N value more than 50 at

depths greater than 0m.

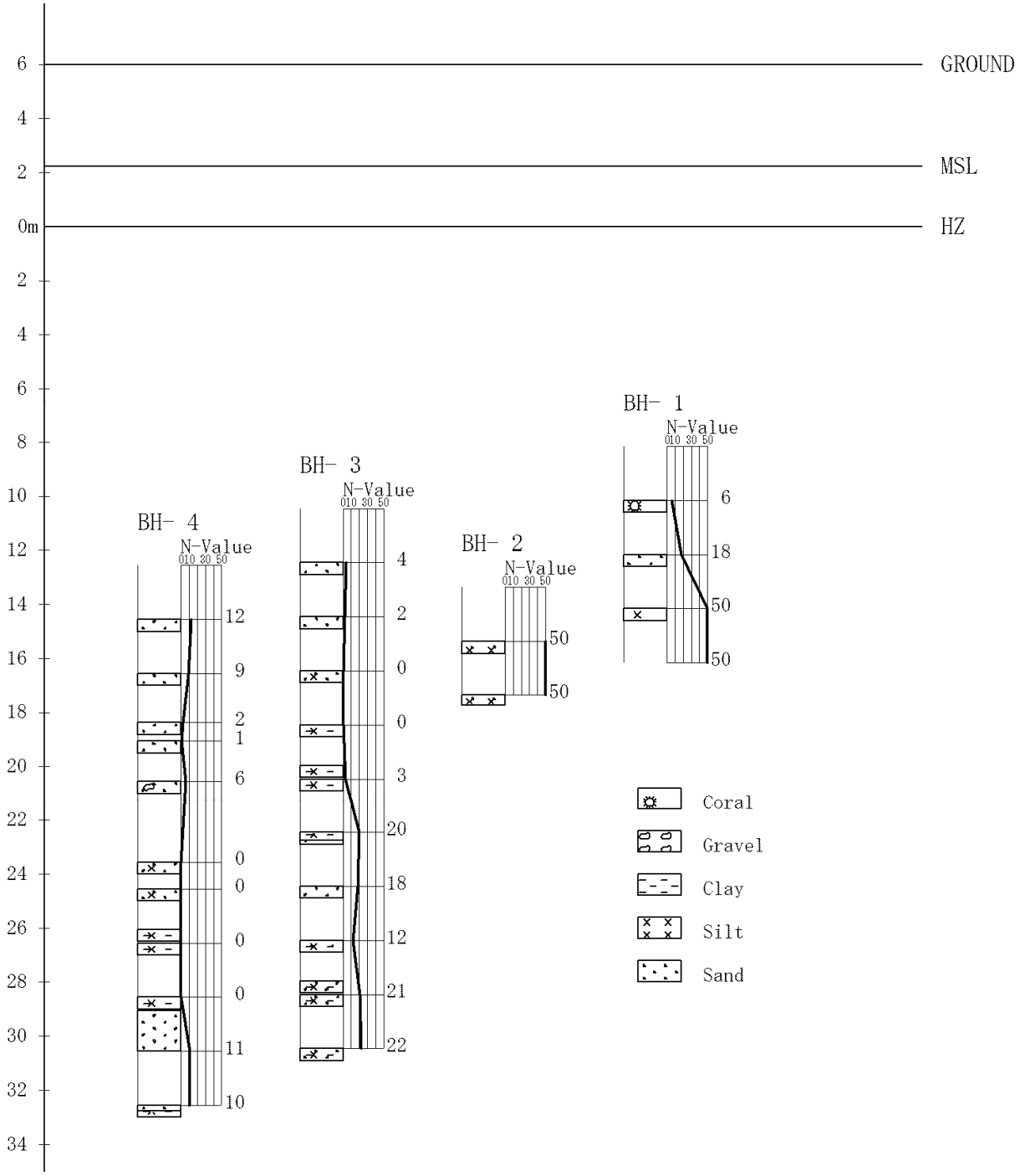
- BH-9 is composed of sand with silt and clay with N value around 20 at -1m to -8m and more than 50 at depths greater than -10m.
- BH-10 is composed of sand with silt and clay with N value around 10 between +1m to -9m while the N value becomes more than 50 at depths greater than -11m.
- BH-11 is composed of sand with silt and clay with N value from 10 to 25 at +1m to -9m, around 40 at -11m to -15m and more than 50 at depths greater than -16m.
- BH-12 is composed of sand with silt and clay with N value from 2 to 25 between +1m to -22m while the N value becomes more than 50 at depths greater than -26m.

Table 2.6-9 shows the results of sieve analysis and gravity test. The gravity of material is approximately 2.7 and the grain size varied from 0.03 to 3.0mm. The average grain size is approximately 0.3mm

Table 2.6-9 Results of sieve analysis and gravity test

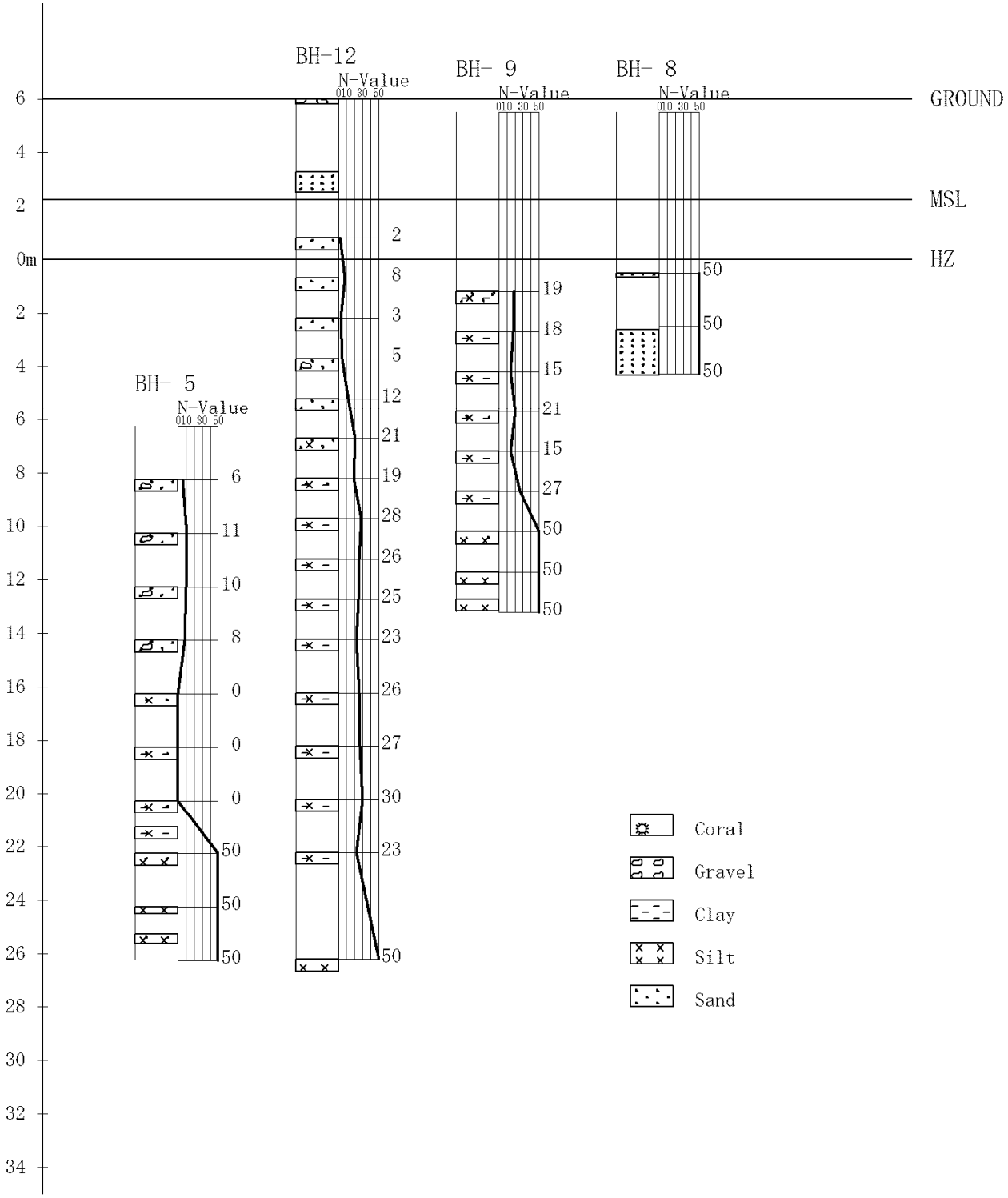
Bore Hole No.	1	2	3	3	3	4	4	4	5	5	5
Depth(m)	-10.15	-15.35	-14.45	-18.45	-26.45	-16.55	-26.55	-30.55	-8.25	-20.25	-21.25
Gravity	2.66	2.7	2.77	2.69	2.74	2.73	2.65	2.74	2.65	2.68	2.69
Grain size(mm)	3.4	0.1	0.29	0.068	0.17	0.36	0.044	0.25	0.43	0.16	0.1
Bore Hole No.	6	6	6	7	7	8	9	9	9	10	10
Depth(m)	-8.25	-14.25	-29.05	-8.85	-12.85	-0.5	-2.7	-5.7	-8.7	0.0	-2.2
Gravity	2.77	2.73	2.73	2.78	2.79	2.8	2.69	2.74	2.79	2.66	2.66
Grain size(mm)	0.095	0.11	0.2	0.078	0.075	0.45	0.035	0.22	0.066	0.5	0.24
Bore Hole No.	10	10	10	11	11	11	11	11	12	12	12
Depth(m)	-2.2	-6.2	-10.2	-1.0	-3.7	-8.2	-12.7	-14.2	-0.7	-6.7	-12.7
Gravity	2.66	2.67	2.81	2.66	2.65	2.65	2.65	2.77	2.66	2.67	2.77
Grain size(mm)	0.24	0.29	0.048	0.27	0.31	0.46	0.032	0.094	0.3	0.3	0.025

Source: Study Team



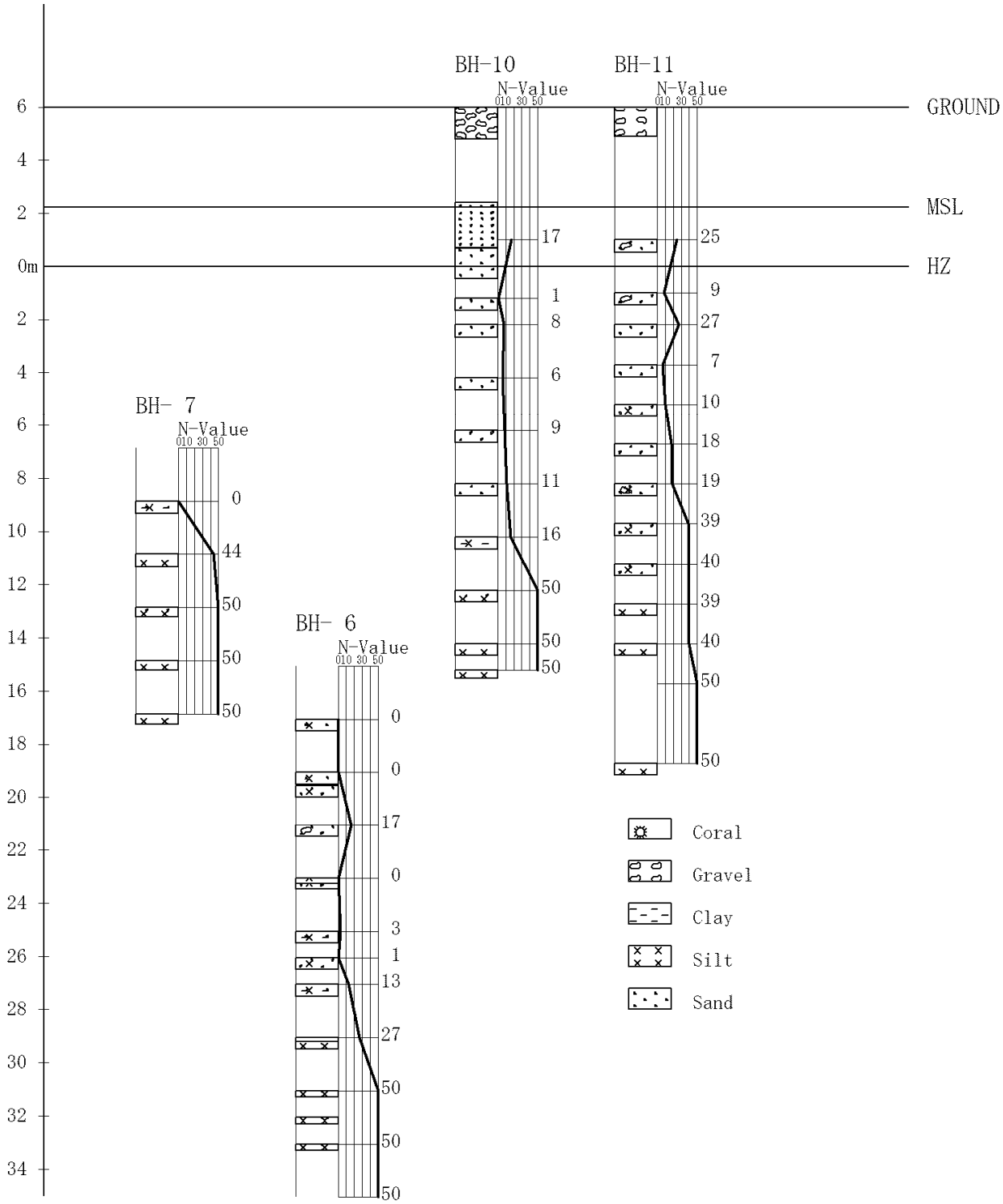
Source: Study Team

Figure 2.6-14 Borehole logs (BH-1, BH-2, BH-3, BH-4)



Source: Study Team

Figure 2.6-15 Borehole logs (BH-5, BH-8, BH-9, BH-12)



Source: Study Team

Figure 2.6-16 Borehole logs (BH-6, BH-7, BH-10, BH-11)

2.7. Baseline information of natural and social environment

2.7.1 Natural environment

(1) General description of the coastal environment of Nacala Bay

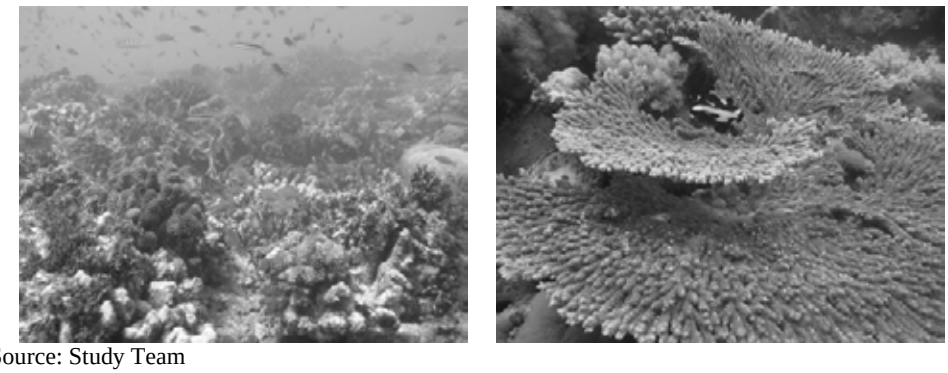
The coastal area of Nacala Bay contains a wide variety of important marine habitats such as seagrass bed, coral reef, mangrove, intertidal flat and sandy beach. Significant features are briefly described below.

Seagrass bed: Seagrass beds have important roles in the marine ecosystem as they are used as habitats, spawning grounds and nursery grounds by various marine organisms. Seagrass beds are widely distributed in Nacala Bay, particularly along shallow waters with sandy substrate.

Source: Study Team

Figure 2.7-1 Seagrass bed north of the Port

Coral reef: Coral reefs are known to have extremely high biodiversity and are also popular for marine recreational activities such as snorkeling and scuba-diving. In Nacala Bay, small patches of coral reefs are distributed along the coast of Naherengue. Coral reefs are also distributed in Fernão Veloso Bay.



Source: Study Team

Figure 2.7-2 Coral reef in Fernão Veloso Bay

Mangrove: Mangroves have important roles in the marine ecosystem as they are used as habitats, spawning grounds and nursery grounds by various marine organisms. The roots of the mangroves also protect shorelines from erosion. Mangroves are distributed throughout Nacala Bay, particularly along shorelines with sandy and muddy substrate.

Source: Study Team

Figure 2.7-3 Mangroves north of the Port

Source: Study Team

Figure 2.7-4 Juvenile fish in between mangrove roots

Intertidal flat: Due to the relatively large tidal range, Nacala Bay has a relatively large intertidal flat zone, particularly in the low gradient inner bay areas. Intertidal flats support many burrowing organisms such as crabs, clams and worms.

Sandy beach: There are many sandy beaches in Nacala Bay, and certain areas are used by local residents as fish-boat landing areas. The beaches are also used for relaxation, bathing and swimming by local residents and tourists.

(2) General description of the coastal environment around the Port

Field reconnaissance was conducted around the Port to obtain a broad understanding of the marine environment that surrounds the Port. The main findings are summarized below:

Coastal area north of the Port (approximately 0-4 km north of the Port): The shoreline of this area is comprised mainly of relatively narrow sandy beaches. Small patches of mangroves were present in the shore adjacent to the Port. Seagrass beds were found along the shallow waters with varying density and species composition. However, some patches appeared to be in a stressful state or even dead due to excessive sedimentation. Observed marine fauna included sea cucumber, sea urchin, sea star, goby, damsel fish, soft coral and so on.

Coastal area south of the Port (approximately 0-4 km south of the Port): The shoreline of this area is a mix of sandy beaches and muddy intertidal flats. Small and medium size patches of mangrove were distributed along the shore. Many fiddler crabs were observed in the intertidal zone. The seafloor was composed of either muddy or sandy substrate. Catches from the beach seine fisheries that was conducted in the area included juvenile trevally, octopus, prawns and numerous other small fishes.

Waters in front of the Port (0-100 m from quay wall): The seafloor in front of the port is sandy muddy substrate. Observed fauna included goby, sea cucumber, octopus, soft coral and so on. Few hard corals were found on the quay wall. Many fishes including large trevally was observed near the piles.

(3) Marine mammals

The Study Team observed whales near Cape Naherengue. According to local tour operators, humpback whales come inside Nacala Bay during their winter migration season (August-October). Dolphins are also present in Nacala Bay, most notably humpback dolphins. Neither of the above species is classified as threatened under the IUCN Red List.

2.7.2 Social environment

(1) Demography

According to the 2007 census, Nacala District has a population of 206,449 (male: 102,342, female: 104,107), which is growing at an average rate of 4% annually. The population of Maiaia sub-district, where the Port is located is 14,270.

(2) Land use

The Municipality of Nacala has recently approved Land Use Plan of Nacala District, which covers the upcoming 15 years. The plan will become official after approval of the central government. Figure 2.7-5 shows the proposed Land Use Plan of Nacala District.

According to the proposed plan, the coastline north and south of the Port is allocated for port/industrial activities. However, from north of Point Zuani, the area is reserved for eco-tourism.

(3) Fisheries

1) General description of fisheries in Nacala Bay

Fisheries in Nacala Bay are conducted only at an artisanal or subsistence level (i.e. no industrial fishing). According to the Institute of Developing Small-scale Fisheries (IDDPE) 2007 census, there are 3,793 fishermen and 350 fishing boats based in Nacala District, and 676 fishermen and 101 fishing boats based in Nacala-a-Velha (note that not all of the above fishermen or boats operate inside Nacala Bay). While the majority of fishermen are full-time, some are part-time fishermen. Several types of fishing boats are used in Nacala Bay, such as dugout canoe, rowing boat (approx. 10 crews), sailboat and so on. Motorized boat appears to comprise a minor portion. There are 9 and 6 main fish-boat landing centers (centros de pesca) in Nacala District and Nacala-a-Velha, respectively.

There are mainly 6 types of fishing methods practiced in Nacala Bay, namely beach seine (Arrasto para a praia), surface gill net (Emalhe superfície), bottom gillnet (Emalhe fundo), encircling gill net (Cerco), handline and set net (Gamboa). More minor fishing methods practiced include: dredge (Draga), cage (Gaiola), bottom line (Musinja), spear fishing and shellfish collection. Some of the above fishing practices are conducted also during nighttime. Following is a brief description of some of the above fishing methods (note that some descriptions may not be accurate as it is partly based on field observation).

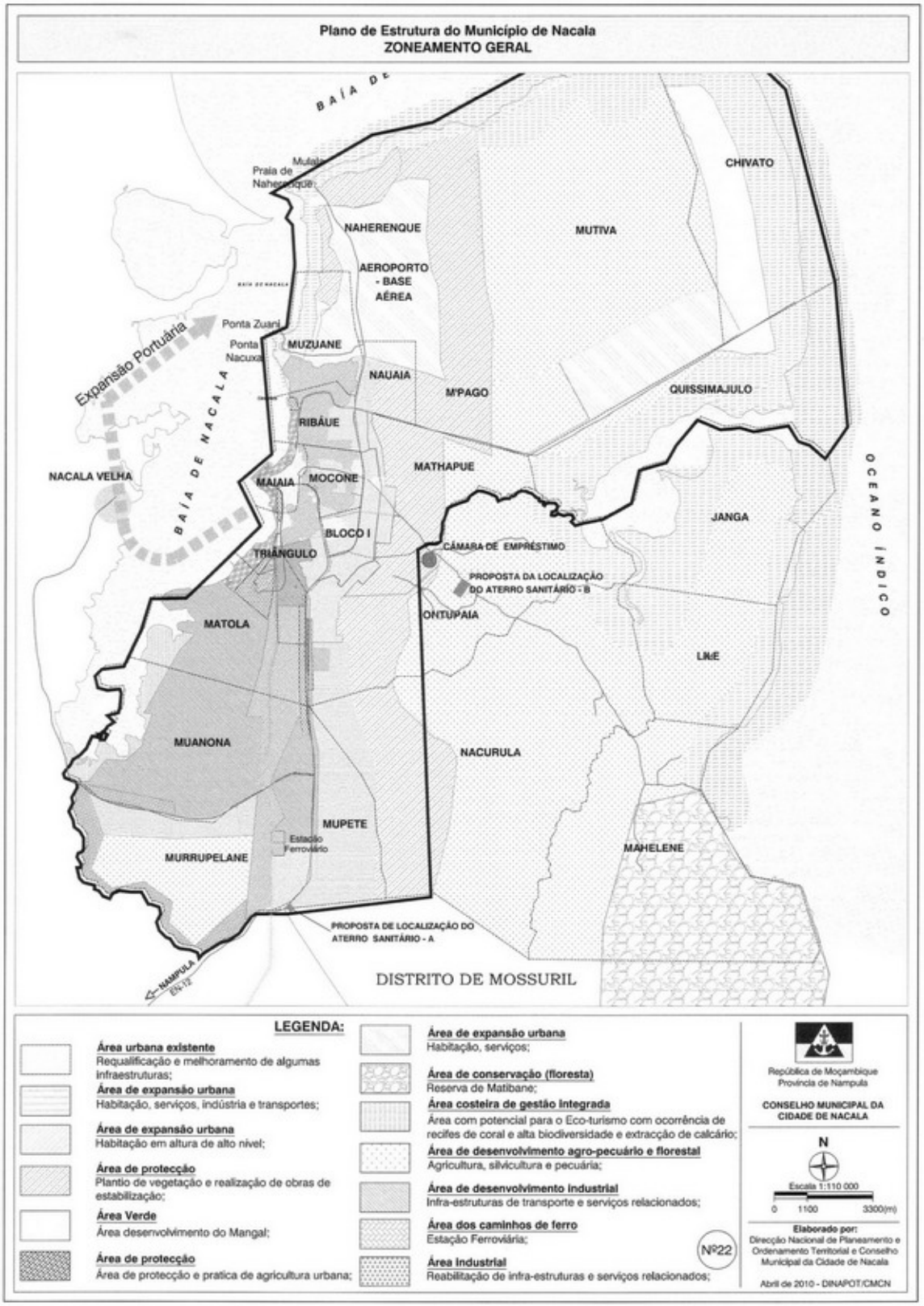
Beach seine (Arrasto para a praia): Practiced throughout the bay along shallow sandy beach areas. The length of the net is about 100 m and is usually conducted by a unit consisting of about 10 crews and one rowing-boat. Mesh size under 38 mm is prohibited to avoid indiscriminate catch of juvenile fishes. There are 30 and 33 licensed units[1] that practice beach seine in Nacala District and Nacala-a-Velha, respectively (IDDPE's 2007 census).

Surface/bottom gill net (Emalhe superfície/fundo): Practiced throughout the bay usually in waters around 3-10 m depth. There are 50 and 34 licensed units that practice surface/bottom gill net in Nacala District and Nacala-a-Velha, respectively (ibid).

Encircling gill net (Cerco): Practiced throughout the bay by an unit consisting of about 10 crews and one motorized-boat. There are 26 and 6 licensed units that practice encircling gill net in Nacala District and Nacala-a-Velha, respectively (ibid).

Hand line: Practiced throughout the bay with dugout canoe. The most common fishing method observed during field reconnaissance. Some dugout canoes were observed even during nighttime. There are 220 and 20 licensed units that practice hand line in Nacala District and Nacala-a-Velha, respectively (ibid).

[1] In accordance with Decree No. 43/2003, fishermen are required to obtain a fishing license from the fisheries authority. Fishing boats must also be registered with Maritime Administration.



Source: Plano de Estrutura Urbana do Município de Nacala

Figure 2.7-5 Proposed Land Use Plan of Nacala District

Set net (Gamboa): Fishes are caught by temporary setting a trap (consisting of sticks, net) of about 50-150 m length in shallow waters, such as along mouth of mangrove channels. The trap is usually set during high tide and retrieved during ebb tide.

Dredge (Draga): Fishes are caught by dragging a hand-held net over very shallow waters by foot. Practiced usually in shallow beach areas by an unit of 2-4 women. This practice is prohibited as it uses very fine mesh size nets, which indiscriminately catches juvenile fishes.

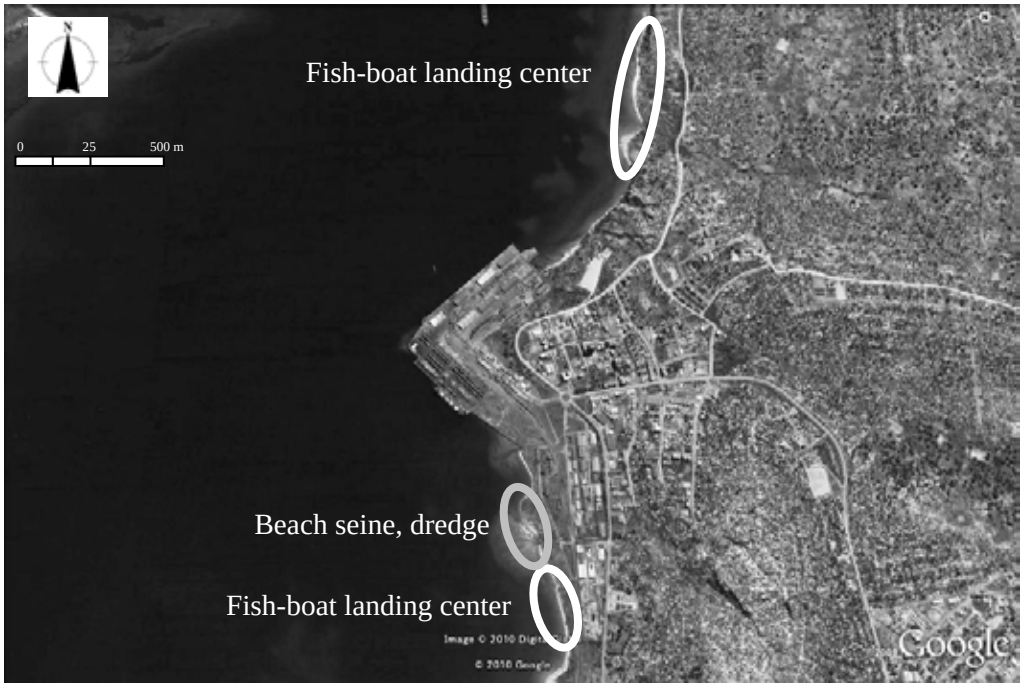
Cage (Gaiola): Fishes are caught by setting a cage on the seafloor. There are 3 and 2 licensed units that practice cage in Nacala District and Nacala-a-Velha, respectively (ibid).

2) General description of fisheries near the Port

Beach seine and dredge were often observed at the beach immediately south of the Port. Also, hand line and encircling gill net were often observed offshore of the Port. Although prohibited, some fishermen even pass or fish inside the port jurisdiction area.

According to IDDPE, fishermen sometimes lose their nets when large shipping vessels overrun them. No collision incidents between fishing boats and merchant vessels have been recorded thus far.

Certain sections of the beaches north and south of the Port are used as fish-boat landing centers. Figure 2.7-6 shows the broad location of fishing activities conducted near the Port.



Source: Study Team, Google

Figure 2.7-6 Broad location of fishing activities conducted near the port

(4) Ferry service

Three ferry lines (with sailing boats) exist in Nacala Bay to transport passengers and goods between Nacala District and Nacala-a-Velha District. On the Nacala District side, ferries depart from three locations namely, beach south of the Port (the same location as the fish-boat landing centers shown in Figure 2.7-6), beach near the cement factory and Naherengue. There are currently four boats in operation for the ferry line that departs from the beach south of the Port.

2.7.3 Pollution

(1) Water quality

To understand the water quality status around the Port and Nacala Bay, the Study Team conducted a water quality survey on July 16-17th, 2010. The field works and laboratory analysis were sub-contracted to PARETO, a consultant based in Reunion.

1) Methodology

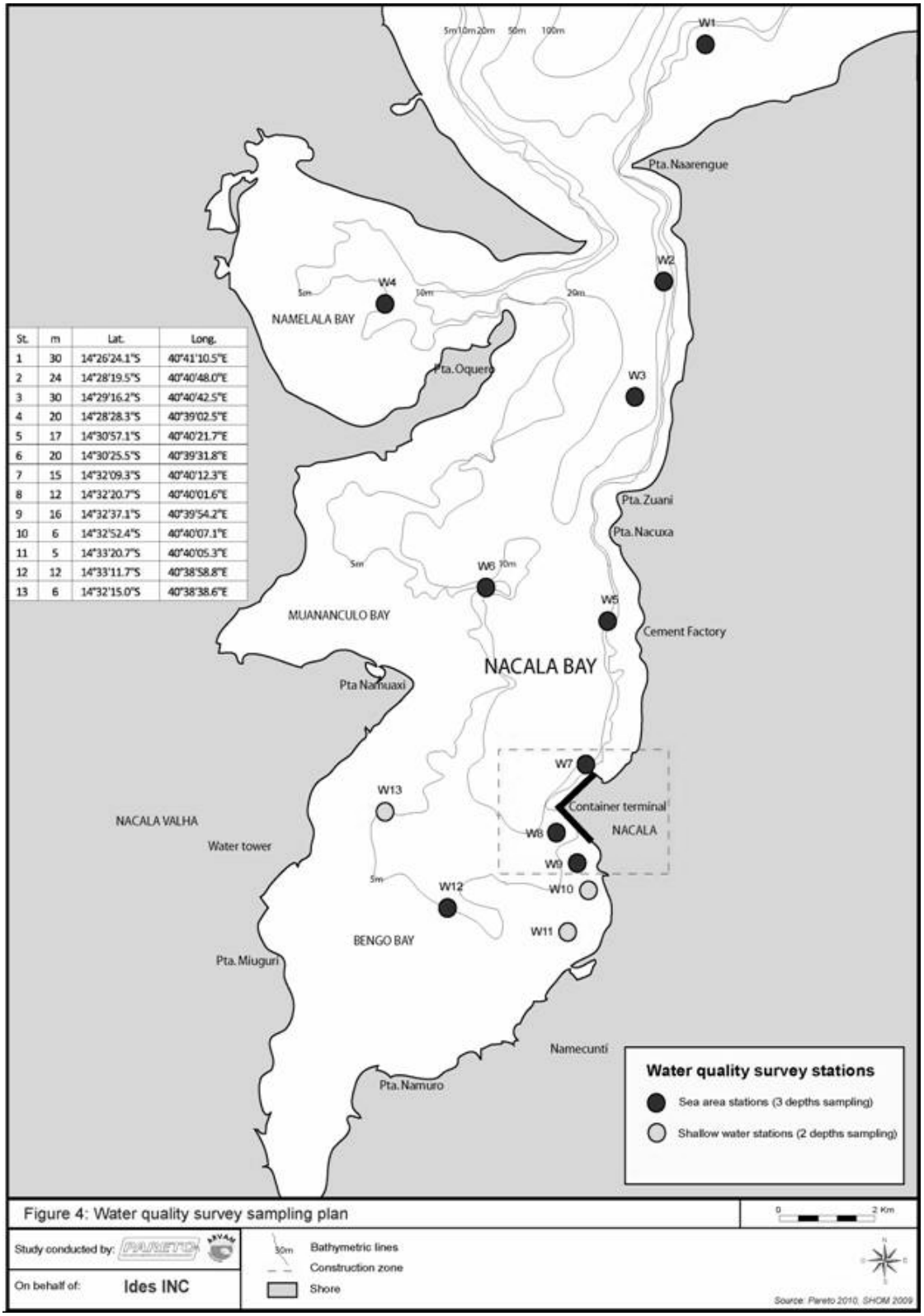
Table 2.7-1 shows the surveyed water quality parameters and employed methodologies. Water temperature, pH, salinity, dissolved oxygen (DO) and transparency were measured *in situ*, by using specialized equipment. The other parameters were analyzed at certified laboratories.

Figure 2.7-7 shows the location of the surveyed sites (total of 13 sites). Water quality was measured at the surface, middle and bottom layers. However, in shallow areas (St. 10, 11 and 13), measurements were conducted only with the surface and bottom layers.

Table 2.7-1 Surveyed water quality parameters and employed methodologies

Parameter	Unit	Measurement/sampling method	Analysis method	Quantification limit
Water temp.	℃	*In situ* (YSI 600 QS multi-parameter probe)	-	-
pH	-	*In situ* (YSI 600 QS multi-parameter probe)	-	-
Salinity	PSU	*In situ* (YSI 600 QS multi-parameter probe)	-	-
Dissolved Oxygen (DO)	mg/l	*In situ* (YSI 600 QS multi-parameter probe)	-	-
Transparency	m	*In situ* (Secchi disk)	-	-
Turbidity	FNU	Niskin bottle	NF 27027	0.01 FNU
Total Suspended Solids (TSS)	mg/l	Niskin bottle	NF UN 872	0.02 mg/L
Total Nitrogen (T-N)	mg/l	Niskin bottle	NF EN ISO 25663	0.2 mg/L
Total Phosphorus (T-P)	mg/l	Niskin bottle	NF EN ISO 6878	0.02 mg/L P
Total Hydrocarbon (THC)	mg/l	Niskin bottle	NFT 90-202	1 mg/L
E. coli	CFU/100 ml	Niskin bottle	IDEXX method	0.01 CFU/100 ml

Note: T-N, T-P and THC were analyzed at Laboratory of Rouen, a COFRAC accredited (French accreditation) laboratory. Turbidity, TSS and *E.coli* were analyzed at PARETO's laboratory.
Source: Study Team



St.	m	Lat.	Long.
1	30	14°26'24.1"S	40°41'10.5"E
2	24	14°28'19.5"S	40°40'48.0"E
3	30	14°29'16.2"S	40°40'42.5"E
4	20	14°28'28.3"S	40°39'02.5"E
5	17	14°30'57.1"S	40°40'21.7"E
6	20	14°30'25.5"S	40°39'31.8"E
7	15	14°32'09.3"S	40°40'12.3"E
8	12	14°32'20.7"S	40°40'01.6"E
9	16	14°32'37.1"S	40°39'54.2"E
10	6	14°32'52.4"S	40°40'07.1"E
11	5	14°33'20.7"S	40°40'05.3"E
12	12	14°33'11.7"S	40°38'58.8"E
13	6	14°32'15.0"S	40°38'38.6"E

Source: Study Team

Figure 2.7-7 Location of the water quality survey sites

2) Results

General water quality parameters

Table 2.7-2 shows the results of general water quality parameters. Following are the main findings.

- Water temperature ranged between 25-26 ℃, and tended to be higher at shallow waters (St.10, 11 and 13). Although water temperature was generally slightly higher at the surface layer, the temperature difference between the layers was small (less than 0.5 ℃).
- Salinity ranged between 34-35 PSU, and tended to be slightly higher at the surface layer, probably due to evaporation. An exception was St. 9, where the surface layer salinity was lower than the mid- and bottom layers by almost 1 PSU. This may be due to the freshwater input from the runoffs south of the Port.
- Except St.13, pH ranged approximately from 7.3-8.2. pH at St.13 was below 7 (6.78-6.90), which is low compared to typical marine waters.
- DO concentration ranged approximately from 5.7-6.1 mg/l. There were no sites or layers with signs of oxygen depletion.
- As expected, turbidity tended to be high in the inner bay and shallow areas (St. 10-12). However, there were no strong correlations between turbidity and TSS values.

Other water quality parameters

Table 2.7-3 shows the analysis results of T-N, T-P, THC and E. coli. Following are the main findings.

- T-N and T-P were measured as an indicator of nutrient enrichment. T-N concentration was highly variable between sites and layers, and was particularly high at the bottom layer of St. 6 (0.96 mg/l). T-P concentration ranged between <0.02-0.04 mg/l and was less variable between sites and layers compared to T-N. According to the Japanese water quality standard, water quality will be unsuitable for benthic organisms when T-N and T-P concentration constantly exceed 1 mg/l and 0.09 mg/l, respectively.
- THC was measured as an indicator of oil pollution. While oil films were often observed near the shore south of the Port, total hydrocarbon concentration was either below or near the quantification limit (0.2 mg/l), except the middle layer of St. 6.
- The highest numbers of *E. coli* was recorded at the surface layer of St. 10, which is located near a small runoff. However, the numbers were still low (246 CFU/100 ml) enough that it satisfied the European water quality standard (Directive 2006/7/EC) for ‘excellent quality’, which is 250 CFU/100 ml.

Table 2.7-2 Results of general water quality parameters

St.	Depth (m)	Trans. (m)	Layer	Temp. (C°)	Salinity	pH	DO-sat. (%)	DO-conc. (mg/l)	TSS (mg/l)	Turbidity (FNU)
1	30.0	15.0	S	26.07	34.87	7.86	90.60	6.03	7.33	0.26
			M	26.04	34.80	7.78	92.50	6.11	4.71	0.25
			B	26.30	34.64	7.62	91.30	6.05	6.86	0.23
2	24.0	11.0	S	25.78	34.97	8.20	87.90	5.87	2.76	0.31
			M	25.77	34.97	8.20	87.20	5.85	9.83	0.25
			B	25.67	34.98	8.20	87.20	5.81	2.68	0.24
3	30.0	10.5	S	25.98	34.98	8.16	91.60	6.13	9.69	0.12
			M	25.79	34.95	8.14	86.10	5.79	0.93	0.22
			B	25.73	34.93	8.14	86.20	5.78	2.36	0.27
4	20.0	10.0	S	26.23	35.06	7.68	89.80	5.80	4.14	0.39
			M	25.87	34.86	7.56	85.90	5.68	1.04	0.38
			B	25.92	34.82	7.52	91.00	5.89	3.07	0.47
5	17.0	12.0	S	26.01	34.97	8.15	89.80	5.99	1.31	0.32
			M	25.92	34.95	8.12	87.90	5.84	9.20	0.24
			B	25.89	34.94	8.12	87.60	5.84	1.93	0.23
6	20.0	13.5	S	26.50	35.01	7.91	88.50	5.86	8.85	0.26
			M	26.09	34.83	7.80	86.80	5.75	3.93	0.27
			B	26.10	34.77	7.74	86.70	5.72	3.86	0.28
7	15.0	10.0	S	26.38	35.00	8.03	88.50	5.92	8.64	0.23
			M	26.02	34.87	7.97	88.10	5.85	1.07	0.10
			B	26.06	34.84	7.94	88.10	5.85	2.73	0.30
8	12.0	>12.0	S	26.14	34.92	7.88	92.10	6.08	2.57	0.23
			M	26.11	34.89	7.86	89.30	5.94	9.50	0.22
			B	26.12	34.79	7.82	89.10	5.94	6.07	0.30
9	16.0	8.5	S	26.45	34.02	7.81	88.70	5.87	13.28	0.39
			M	26.18	34.93	7.86	89.70	5.94	1.40	0.32
			B	26.04	34.82	7.79	89.60	6.00	7.64	0.31
10	6.0	>6.0	S	26.99	34.89	7.47	90.80	5.92	2.79	0.60
			M	-	-	-	-	-	-	-
			B	26.70	34.68	7.28	88.80	5.83	7.43	0.33
11	5.0	3.0	S	26.77	34.88	7.74	91.70	6.04	4.21	1.40
			M	-	-	-	-	-	-	-
			B	26.65	34.57	7.58	89.10	5.87	7.36	0.37
12	12.0	7.0	S	26.06	34.92	7.51	89.60	5.85	6.32	0.32
			M	26.00	34.82	7.44	89.70	5.87	9.07	0.65
			B	26.11	34.72	7.38	86.90	5.71	2.35	0.94
13	6.0	>6.0	S	26.93	34.78	6.90	90.00	5.98	3.79	0.25
			M	-	-	-	-	-	-	-
			B	26.95	34.40	6.78	88.50	5.86	4.29	0.56

S: surface layer, M: middle layer, B: bottom layer
Source: Study Team

Table 2.7-3 Results of other water quality parameters

St.	Depth (m)	Layer	Total Nitrogen (mg/l)	Total Phosphorus (mg/l)	Total Hydrocarbon (mg/l)	*E. coli* (CFU/100ml)
1	30.0	S	0.25	<0.02	<0.20	10
		M	0.24	<0.02	<0.20	<10
		B	0.41	<0.02	<0.20	74
2	24.0	S	0.31	0.03	<0.20	<10
		M	0.58	0.04	<0.20	<10
		B	0.26	0.03	<0.20	<10
3	30.0	S	<0.20	0.04	<0.20	<10
		M	<0.20	0.04	<0.20	<10
		B	0.26	0.03	<0.20	10
4	20.0	S	0.29	0.02	<0.20	20
		M	0.26	<0.02	<0.20	31
		B	0.30	0.03	0.28	74
5	17.0	S	0.27	0.03	<0.20	<10
		M	0.53	0.03	<0.20	<10
		B	<0.20	0.04	<0.20	<10
6	20.0	S	0.38	0.02	<0.20	20
		M	0.44	0.03	0.59	<10
		B	0.96	<0.02	<0.20	20
7	15.0	S	<0.20	0.03	<0.20	20
		M	<0.20	0.04	<0.20	10
		B	<0.20	0.03	<0.20	<10
8	12.0	S	<0.20	0.03	<0.20	20
		M	0.29	0.03	<0.20	<10
		B	<0.20	0.03	<0.20	20
9	16.0	S	<0.20	0.03	<0.20	10
		M	0.31	0.03	<0.20	<10
		B	0.33	0.03	<0.20	20
10	6.0	S	0.49	0.03	<0.20	246
		M	-	-	-	-
		B	0.33	0.02	<0.20	85
11	5.0	S	0.31	0.03	<0.20	<10
		M	-	-	-	-
		B	0.23	0.02	<0.20	20
12	12.0	S	0.24	0.02	<0.20	20
		M	0.44	0.02	<0.20	<10
		B	<0.20	0.02	<0.20	31
13	6.0	S	0.22	0.02	<0.20	10
		M	-	-	-	-
		B	0.28	0.02	<0.20	31

S: surface layer, M: middle layer, B: bottom layer
Source: Study Team

(2) Sediment quality

To understand the sediment quality status around the Port, the Study Team conducted a sediment quality survey on July 14th, 2010. The field works and laboratory analysis were sub-contracted to PARETO, a consultant based in Reunion.

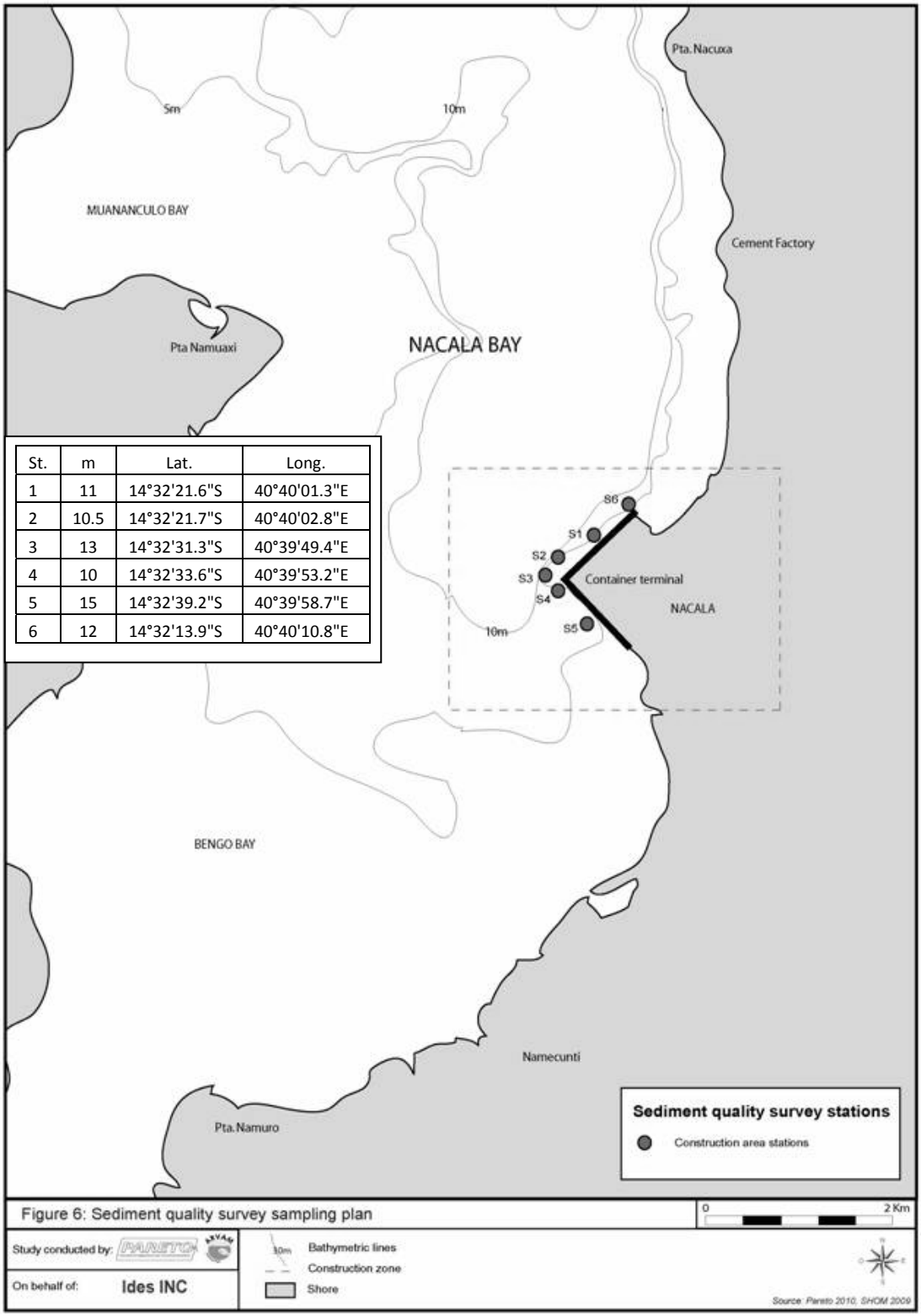
1) Methodology

Sediment samples were collected from the surface layer at 6 sites around the Port as shown in Figure 2.7-8. Samples were collected by scuba divers by scooping the sediment with plastic bottles. Several samples were collected from each site, which were mixed and then preserved in a one litre (1 L) container. Samples were then sent to Laboratory of Rouen (COFRAC accredited (French accreditation) laboratory) for analysis. Table 2.7-4 shows the surveyed sediment quality parameters and employed methodologies.

Table 2.7-4 Surveyed sediment quality parameters and methodologies

Parameter	Analysis method	Quantification limit
Specific gravity	Measure apparent	-
Moisture content	NF ISO 11465	-
Particle size distribution	NF ISO 13320-1	2 µm-2 mm
Total Nitrogen (T-N)	NF ISO 11261	500 mg/kg
Total Phosphorus (T-P)	NF EN ISO 6878 mod.	100 mg/kg
Total Sulphur (T-S)	ISO 13358 mod.	10 mg/kg
Heavy metals		
Arsenic (As)	NF EN ISO 11969 mod.	0.1 mg/kg
Cadmium (Cd)	NF EN ISO 5961	0.1 mg/kg
Chromium (Cr)	NF EN ISO 11885	2 mg/kg
Copper (Cu)	NF EN ISO 11885	3 mg/kg
Lead (Pb)	FD T 90-112	1 mg/kg
Mercury (Hg)	NF EN ISO 17852	0.02 mg/kg
Nickel (Ni)	NF EN ISO 11885	2 mg/kg
Zinc (Zn)	NF EN ISO 11885	5 mg/kg
Organics		
DDT	XP X 33-012	1.0 µg/kg
Total PCBs	XP X 33-012	1.0 µg/kg
Total PAHs	XP T 90-250 mod.	2.0 µg/kg
TBT	XP X 33-012	1.0 µg Sn/kg

Source: Study Team



St.	m	Lat.	Long.
1	11	14°32'21.6"S	40°40'01.3"E
2	10.5	14°32'21.7"S	40°40'02.8"E
3	13	14°32'31.3"S	40°39'49.4"E
4	10	14°32'33.6"S	40°39'53.2"E
5	15	14°32'39.2"S	40°39'58.7"E
6	12	14°32'13.9"S	40°40'10.8"E

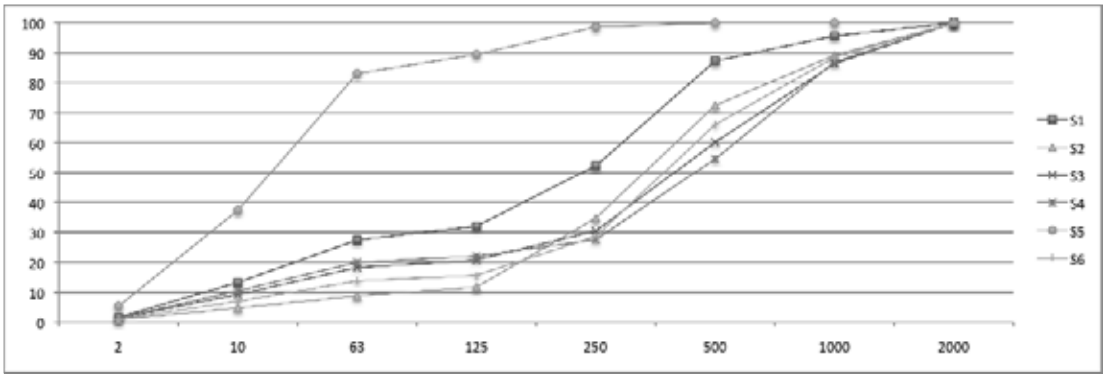
Source: Study Team

Figure 2.7-8 Location of the sediment quality survey sites

2) Results

Physical properties

Figure 2.7-9 shows the particle size distribution of the sampled sediments. Note that the sediment of St. 5 was predominantly composed of silt (over 80%), whereas sediment of the other sites were mostly composed of fine sand. Table 2-7.5 shows the specific gravity and moisture content of the samples.



Source: Study Team

Figure 2.7-9 Results of particle size distribution analysis

Table 2.7-5 Results of specific gravity and moisture content analysis

	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6
Specific gravity	1.78	1.86	1.91	1.89	1.36	1.85
Moisture content	31.3%	25.8%	23.3%	23.4%	55.0%	25.8%

Source: Study Team

T-N, T-P and T-S

T-N, T-P and T-S were measured as an indicator of nutrient enrichment. Table 2-7.6 shows the concentrations of T-N, T-P and T-S at the 6 sites. T-N, T-P and T-S concentration were all highest at St. 5, which was also the site with the highest silt content. The concentrations of St. 5 are for example comparable to inner area of Tokyo Bay, which is generally considered as polluted area. Possible sources may include runoffs from the south side of the Port and spillage from bulk commodity (e.g. wheat) handling.

Table 2.7-6 Analysis results of T-N, T-P and T-S

	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6
T-N (mg/kg)	836.6	<500.0	823.3	621.6	1945.0	531.6
T-P (mg/kg)	735.0	230.0	311.0	295.0	920.0	365.0
T-S (mg/kg)	110.0	167.0	404.0	350.0	1310.0	383.0

Source: Study Team

Heavy metals

Table 2.7-7 shows the concentration of heavy metals at the 6 sites. St. 1, 5 and 6 were contaminated by high levels of one or more heavy metals (chromium, lead or nickel). Lead concentration was high at St. 1 (125 mg/kg dw) and 6 (85 mg/kg dw). Possible sources may include ship paint (lead has been used a stabilizer, pigment and biocide in antifouling paint), leakage of leaded gasoline from the oil-handling berth and so on. Chromium and nickel concentrations were high only at St. 5. Possible sources may include clinker spillage (clinker may contain chromium and nickel

depending on the raw material, by-product and fuel used in the manufacturing process), runoffs from the south side of the Port and so on.

Table 2.7-7 Analysis results of heavy metals

Unit: mg/kg dw

	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	Screening level*	SQG-high*
Arsenic	9.7	9.4	5.9	3.2	4.7	4.0	20	70
Cadmium	0.1	<0,1	<0,1	<0,1	0.2	<0,1	1.5	10
Chromium	79.0	21.0	39.0	40.0	**116.0**	32.0	80	370
Copper	47.0	7.0	9.0	11.0	33.0	14.0	65	270
Lead	**125.0**	18.0	25.0	26.0	41.0	**85.0**	50	220
Mercury	0.04	0.09	0.02	0.02	0.09	0.02	0.15	1
Nickel	12.0	6.0	12.0	10.0	**40.0**	8.0	21	52
Zinc	118.0	17.0	31.0	35.0	139.0	44.0	200	410

*: The values of the screening level and SQG-high are referred from National Assessment Guidelines for Dredging, Australian Government. Sediment is considered to be uncontaminated if no analytes exceed screening level. Sediment is considered to be significantly contaminated if one or more analyte is above the 'Screening level', and very significantly contaminated if one or more analyte is above the 'SQG-high' level.

Note: The bold Figures indicate that the concentration is above 'Screening level'.

Source: Study Team

Organics

Table 2.7-8 shows the concentration of harmful organic compounds at the 6 sites. All the sites were contaminated by high levels of one or more harmful organic compound. Contamination was most significant at St. 1, in particular for DDT, PCBs and TBT. Although the source of these pollutants are uncertain, one possible source would be ships, as all these substances were or are still used as ingredients of ship antifouling paint[2]. This may explain the high contamination level at St. 1, as the adjacent berth is the oldest in the Port, and therefore had more time to accumulate pollutants from ship antifouling paint than the other sites.

Table 2.7-8 Analysis results of harmful organic compounds

	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	Screening level*	SQG-high*
Total PAHs (µg/kg dw)	<10	<10	<10	<10	<10	<10	10,000	45,000
DDT (µg/kg dw)	**2057.6**	**90.3**	**41.4**	**12.8**	**43.0**	**27.3**	1.6	46
Total PCBs (µg/kg dw)	**89.1**	<7.0	<7.0	<7.0	<7.0	**25.1**	23	-
TBT (µg Sn/kg dw)	**193.0**	6.7	5.4	5.6	**25.6**	**54.0**	9	70

*: The values of the screening level and SQG-high are referred from National Assessment Guidelines for Dredging, Australian Government. Sediment is considered to be uncontaminated if no analytes exceed the 'Screening level'. Sediment is considered to be significantly contaminated if one or more analyte is above the 'Screening level', and very significantly contaminated if one or more analyte is above the 'SQG-high' level.

Note 1: The bold Figures indicate that the concentration is above 'Screening level' or 'SQG-high' level.

Note 2: The above values are dry weight concentration and not normalized to 1% total organic carbon (TOC), as required by the National Assessment Guidelines for Dredging.

Source: Study Team

[2] Anti-fouling paints are used to coat the bottoms of ships to prevent sealife such as algae and molluscs attaching themselves to the hull.

3) Countermeasures

Since the sediments around the Port are significantly contaminated by heavy metals and harmful organic compounds, it is highly recommended to implement pollution prevention measures during dredging activities, so to prevent any adverse impacts on marine life and humans. Following are some recommendations:

- A detailed sediment quality survey should be conducted once the dredging location is decided. The purpose is to understand in more detail the level and spatial extent of contamination at the dredging site.
- Unless effective control measures are available, ocean disposal of contaminated dredged material should be avoided to prevent further contamination of the ocean.
- Appropriate methods (e.g. installation of silt curtain) should be used to prevent/minimize sediment dispersion during dredging.
- An appropriate disposal method and location should be determined (e.g. disposal into confined disposal facilities) to prevent/minimize contamination of the surrounding environment.

2.7.4 Environmental management of the Port

At the time when CDN was newly consigned as the operator of the Port, under the EIA Law (Decree 45/2004), CDN was required to obtain an Environmental License from the Ministry for Coordination of Environmental Affairs (MICOA) to conduct its operation. The Environmental License must be renewed every 5 years by submitting an updated Environmental Management Plan (EMP). The Port's latest Environmental License has been issued in July 2009. The Port also has obtained ISO14001 accreditation in June 2009.

The Environment, Health and Safety (EHS) Department of CDN is responsible for overseeing the environmental management and health and safety issues of the Port. The EHS Department has currently 4 administrative staff members. The Port also has staff for first aid, environmental inspection, fire-fighting and cleaning.

(1) Environmental issues of the Port

According to the EHS Department, major environmental issues of the Port are oil spillage from the oil terminal and pipeline, and dust emission from bulk-commodity handling, in particular clinker.

The oil terminal receives four types of oil, namely diesel, kerosene, petrol and palm oil. Diesel, kerosene and petrol are transported to Petromoc and BP oil tanks via one single pipeline (two new pipelines are newly installed and are now under testing phase). Since there is only one operational pipeline, the pipeline requires washing every time the product changes. Washing is done by sea water, which enhances corrosion of the pipeline, and results in oil spillage. Vandalism of the oil pipeline is also a cause of oil spillage. The EHS Department conducts regular inspections of the pipeline, and at least 9 spillage incidents have been recorded inside the Port area in 2010. The soil at the spillage sites appeared to be heavily contaminated, which consequently could be contaminating the surrounding groundwater and seawater. Furthermore, oil films were observed at the beaches and tributary south of the Port. While the source of these oil is uncertain, it could well come from the pipeline that runs adjacent to the shore. Although the situation is expected to improve once the two new pipelines become operational, the existing pipeline should be repaired immediately by the owner to prevent further contamination. Strengthening security to prevent vandalism is also important to prevent oil spillage.

Clinker is handled by using a grabber and hopper. Large amount of dust dispersion was observed during one operation. According to the EHS Department, the problem was mainly due to failure of the opening/closing of the hopper. Since dust dispersion may cause health problems to the workers as well as local residents, the clinker handling operation must be conducted in a more controlled manner.

Source: Study Team

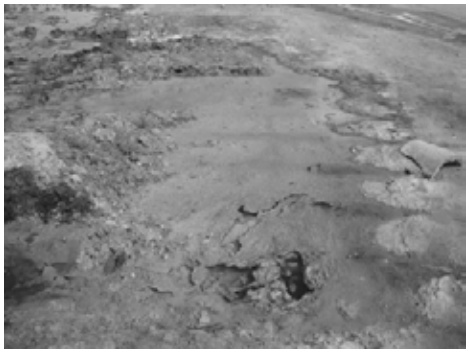
Figure 2.7-10 Spillage of washwater at oil terminal

Source: Study Team

Figure 2.7-11 Oil spillage from oil terminal

Source: Study Team

Figure 2.7-12 Oil spill from pipeline



Source: Study Team

Figure 2.7-13 Contamination near pipeline

Source: Study Team

Figure 2.7-14 Dust dispersion from clinker handling

Source: Study Team

Figure 2.7-15 Dust accumulation on the terminal

2.8. Environmental laws and regulations

2.8.1 Environmental Impact Assessment (EIA)

The "Environment Law (Law no. 20/97)" is the fundamental law regarding the preservation of the environment. Chapter V of the Environment Law stipulates the requirement of environmental license for any activity with potential environmental impact, and is acquired through submission of an EIA report and approval from the environmental authority. The EIA process is set out in detail in "Regulations on the EIA Process (Decree No. 45/2004[3])", which is slightly different depending whether the project is classified as Category A, B or C. The EIA process is described below and is summarized in Figure 2.8-1.

(1) Categorization of project (screening)

As an initial step, a project proponent is required to submit an application form (Annex IV of Decree No. 45/2004) to the respective Provincial Directorate for Coordination of Environmental Affairs (DPCA). The proposed project is then categorized into either category A, B or C. Appendices I, II and III of Decree No. 45/2004 show the type of activities that are classified as Category A, B or C, respectively. Following are the main characteristics of each category.

- Category A: Projects which may have a significant impact on the environment and therefore require an EIA. The EIA process is governed by MICOA. Prior to implementation of the EIA, the proponent is required to submit TOR of the EIA together with Environmental Pre-Viability Report and Scope of Definition (EPDA). Public participation is also mandatory during the EIA process.
- Category B: Projects which do not significantly affect communities or environmentally sensitive areas. The likely negative impacts are expected to be of minor duration, intensity, extent, magnitude and significance compared to Category A projects and few impacts are likely to be irreversible. The impacts which may occur can readily be mitigated. Therefore, only a Simplified Environmental Report (SER) is required. The process is governed by DPCA.
- Category C: Projects which are likely to have an insignificant, negligible or minimal effect on the environment, none of which are likely to be irreversible. The benefits of the project clearly outweigh the negative impacts. Therefore these projects do not require either an EIA or SER.

(2) Review of EIA

The content of the EIA or SEA and their respective TORs are reviewed by Technical Evaluation Committee (TAC), which is composed of representatives from the EIA authority (chairman), relevant ministry, local authority, research institutes, experts, and so on. The report submitted by TAC will form the basis of the decision in issuing environmental license.

(3) Public participation

Public participation is mandatory for Category A projects, and is conducted by the proponent during implementation of the EIA. Public participation may also be requested for Category B projects if deemed necessary. A public meeting must be advertised to the public at least 2 weeks in advance.

(4) Environmental license

Environmental license is granted after approval of EIA or EAS. The proponent is required to pay a fee for the environmental license in accordance to the following rate:

- Category A or B project: 0.2% of project investment
- Category C project: 0.02% of project investment

The environmental license will become invalid, if the project does not commence within 2 years

[3] Articles 5, 15, 18, 20, 24, 25 and 28 of Decree No. 45/2004 have been amended in year 2008 through Decree No. 42/2008.

after issuance of the license. However, the proponent may apply for an extension within 90 days before the date of expiry.

Environmental license of Category A projects must be renewed every 5 years by usually submitting updated Environmental Management Plan. An application for renewal must be submitted to MICOA 180 days before the expiry date of the environmental license.

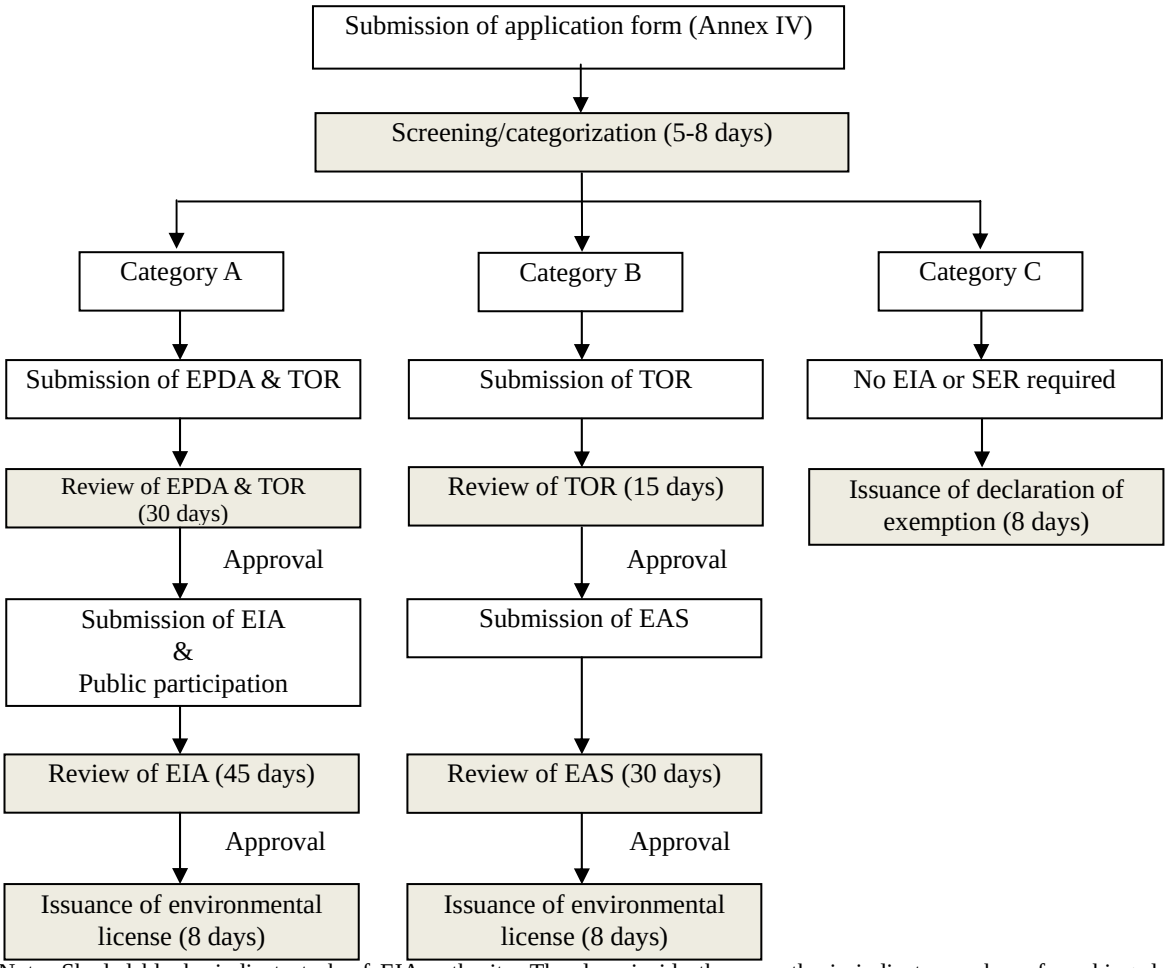
(5) Timeframe for decision-making

Table 2.8-1 shows the time (working days) required for each decision-making stage of the EIA process.

Table 2.8-1 Time (working days) required for each decision-making stage of the EIA process

EIA component	Category A	Category B	Category C
Screening of application form	5 days	8 days	8 days
Review of EPDA&TOR	30 days	—	—
Review of TOR	—	15 days	—
Review of EIA	45 days	—	—
Review of EAS	—	30 days	—
Issuance of environmental license	8 days	8 days	—
Issuance of declaration of exemption	—	—	8 days
Total	88 days	61 days	16 days

Source: Decree No. 45/2004



Note: Shaded blocks indicate task of EIA authority. The days inside the parenthesis indicate number of working days required for decision making by the EIA authority.

Source: Decree No. 45/2004

Figure 2.8-1 EIA procedure of Category A, B and C projects

(6) Environmental consultant

The EPDA, EIA and EAS must be conducted by a consultant registered under MICOA. Appendix-5 is a list of registered EIA consultants.

(7) Time schedule of EIA

Assuming this project is classified as Category A, the EIA process is estimated to take in total approximately 10 months. Table 2.8-12 shows the breakdown of the estimated time schedule and responsible entities for each of the main EIA process.

Table 2.8-2 Breakdown of estimated time schedule and responsible entities for each of the main EIA process

EIA task	Estimated time schedule	Responsible organization
Screening (categorization of the project)	0.5 months	EIA authority
Tendering/selection of EIA consultant	2 months	Project proponent
Preparation/submission of EPDA & TOR	1 months	EIA consultant & project proponent
Review/approval of EPDA & TOR	1.5 months	EIA authority
Preparation/submission of EIA	3 months	EIA consultant & project proponent
Review/ approval of EIA	2 months	EIA authority

Note: The time schedule of the EIA authority was estimated to take slightly longer than the period stated in the EIA regulation.

2.8.2 Other relevant laws and regulations

Table 2.8-3 shows the environmental laws and regulations that are relevant to port development.

Table 2.8-3 Environmental laws and regulations relevant to port development

Category	Title
Pollution	Decree No. 18/2004 Regulation on Environmental Quality and Effluent Emission
	Decree No. 45/2006 Regulation for the Prevention of Pollution and Protection of Coastal and Marine Environment
	Decree No. 25/2008 Regulation for the Control of Invasive Alien Species
Flora/fauna	Law No. 10/99 Law on Forestry and Wildlife
	Decree No. 12/2002 Regulation of the Law of Forestry and Wildlife
Waste	Decree No. 13/2006 Regulation on Waste Management
Fisheries	Law No. 3/90 Law on Fisheries
	Decree No. 43/2003 Regulation on Marine Fisheries
Land	Law No. 19/97 Land Law
	Decree No. 66/98 Regulation on Land Law

Article 3 of the Land Law (Law no. 19/97) states that all land in Mozambique is state property. Although citizens may acquire the right to use state land, their rights can be extinguished for reasons of public interest through fair compensation (Article 18 of Law no. 19/97). When resettlement becomes necessary due to public projects, the following procedures are commonly taken.

- Implementation of socioeconomic survey
- Appraisal of assets and prediction of impacts
- Analysis of compensation methods
- Provision of alternative land and compensation

2.9. Design standard and construction conditions for port facilities

2.9.1 Design standard

Design standards applied to port facilities will be discussed in Chapter 4.

2.9.2 Supply of construction materials and equipment

(1) General description

No construction firm exists in Nacala that is capable of managing a port construction project. There are, however, local construction firms established by South Africa and Portugal in Maputo. Since a large scale project requires the procurement of various materials and equipment, it is important to select a firm that both offers quality service and has sufficient supply capacity. The Study Team made surveys on the condition for the cost estimation in Mozambique and South Africa.

(2) Construction material

1) Armor rocks and aggregate

Rock quarries are operated at Nacala-a-Velha and Namialo where sufficient production and supply are secured for port construction in Nacala.

2) Cement

One cement factory is in operation and two cements factories are under construction at this moment in Nacala. Therefore, it's possible that the supply volume will have increased by the time construction begins but the current supply volume is running short. The cost was estimated assuming that cement is imported from overseas.

3) Steel products

Reinforcing bars (D13, D16) are produced in Beira and they can be procured. However, Steel pipe sheet pile and Steel pipe pile are not produced in Mozambique.

The procurement of pipes with the length of 18 m or longer and the thickness of 19 mm or thicker is difficult even in South Africa and thus pipes exceeding these sizes shall be procured in Japan, EU or others. In view of securing sufficient quality, pipes with less butt welding are required and when they are delivered their length should be as long as possible.

4) Ready-mixed concrete and asphalt

There is no commercial concrete plant in Nacala; therefore it is necessary to bring the plant into project site for the production of concrete and asphalt.

5) Fender

Fenders are not produced in Mozambique and South Africa. For the port development project in Nacala, procurement from overseas shall be basically necessary.

(3) Construction equipment

There is no firm in Mozambique which is specializing in manufacturing or rental of large construction machinery. Although, construction firms from overseas hold general construction machinery around Maputo, these machineries are small in number and in type and expensive compared with Japan.

Therefore, it is necessary to purchase or rent the construction machinery from overseas. Even in South Africa, there is no firm specializing in manufacturing or rental of large scale construction machinery although each construction firm possesses them. The purchase or rental prices are higher than those in Japan. In addition to this, the delivery costs must also be considered.

Similarly there is no firm in Mozambique which has the vessels and boats required for the construction work. Some firms in South Africa have barges with cranes but the number and types of such vessels and boats are very limited. A grab dredger for hard soil and a piling barge which are supposed to be adopted in this project shall be purchased or leased from overseas.

The cost estimation for construction work and delivery cost for these vessels and boats shall be made assuming they will be purchased or rented from Japan where quality is high and quantity is not an issue.