No.

Namibian Ports Authority
Republic of Namibia

Preparatory Survey on the Walvis Bay Port Container Terminal Development Project in the Republic of Namibia

Final Report

March 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.
Oriental Consultants Co., Ltd.

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Preface

In response to the request from the Government of Namibia, the Government of Japan decided to conduct the Preparatory Survey on the Walvis Bay Port Container Terminal Development Project and entrusted the Survey to the Japan International Cooperation Agency (JICA).

JICA sent the study team headed by Mr. Nobuo Endo, PADECO Co., Ltd. to Namibia twice during the study period from February, 2009 to October, 2009.

The team held discussions with the officials concerned of the Government of Namibia and conducted field surveys, investigations, and also held seminars. In succession, the team made further study and the present report was prepared.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Namibia for their close cooperation with the study.

March 2010

Atsufumi Konishi
Director General
Economic Infrastructure Department

Summary

After its harbour was deepened in 2000, the Port of Walvis Bay began attracting more container cargo. It is expected that throughput will reach 260,000 TEU per year in 2009. Although the container stacking yard is being expanded, the throughput may reach the limit of the handling capacity of the exiting port facilities in 2012 if this trend continues. To ensure that the Port of Walvis Bay will play a role as a container transhipment hub on the southwest coast of Africa as well as a gateway to land-locked countries, the Namibian Ports Authority (Namport) has launched a new container terminal project laid offshore at the south end of the port premises in 2007. In 2008, Namport conducted the pre-feasibility study of the project, which proposed to divide the project into three phases. Following to the results of the pre-feasibility study, this study has been conducted in order to conclude the feasibility of the Phase 1 Project.

This “Final Report” details all the aspects of the development of the new container terminal ranging from the demand forecast of container throughput to the determination of the physical dimensions of the container terminal, from the site investigations of subsoil, waves and currents to the basic design of the port facilities and cost estimate of both the initial investment and terminal operation, and from the economic and financial analyses of the project to the recommendations for project implementation. The report also studies contingent alternatives, which will be useful in case the new container terminal has to be located at a different site to avoid excessive environment impacts to the lagoon protected by the Ramsar Convention.

(1) Current Transport Network with Respect to Walvis Bay

The JICA Study Team collected shipping routes and schedules of all the shipping lines who have scheduled calls as of August 2009 on the west, south and east coasts of Africa. It was found that, when the new container terminal is built, Walvis Bay is a potential container transhipment port to the west coast of Africa as well as the gateway port to the land-locked countries of Southern Africa in transporting cargo from Asia. Also it shows that the current land transport network will be strategically important for Walvis Bay to consolidate its status as the gateway port to the landlocked countries of the southern Africa.

(2) Demand Forecast of Container Throughput

Demand forecast of the total container throughput consists of two separate forecasts. One is the growth of the container throughput due to the socio-economic growth of the groups of countries contributing to the import, export, transhipment and transit at the Port of Walvis Bay. This estimate takes into account the container growth from 1996 to 2008, a trend of growth. The other estimate is the container throughput the new container terminal can capture from other ports on the south and west coasts of Africa. These two estimates are summed up as the total demand forecast of the new container terminal.

(3) Physical Principles

It is necessary to deepen the port for larger ships in order to attract Panamax container vessels for Phase 1, which is the most popular type of container mother ships on the southern African Coast. In the later future, it is very probable that an 8000 TEU post-Panamax container vessel will call at the Port of Walvis Bay. Also, the new container terminal will need a longer berth which can simultaneously accommodate one mother and one feeder container vessels.

(4) Layout of Port Facilities

The alignment of the existing approach channel should be maintained, as use of the existing channel is economical and no issues with ship manoeuvring. A new turning basin should be

provided in front of the new container terminal. The current alignment Namport has envisaged is technically reasonable in consideration of the prevailing wind direction, which is mainly southern.

(5) Layout of Container Terminal

The total throughput of container cargo at Walvis Bay is estimated to increase from 625,000 TEUs in 2015 to 801,000 TEUs in 2025. A cargo handling system using rubber-tired-gantry (RTG) cranes is preferable to other cargo handling systems like a straddle carrier system and a chassis system. An RTG system can utilize the area effectively and, as a result, is the most popular system in the world. The total ground slots accommodate 3,132 TEU, among which 576 TEU slots will be used for reefer containers. The rail gauge of STS cranes is 30 m and the distance between the centres of the wheels of the RTG is 23.45 m spanning 6 bays and one truck lane.

(6) Layout of Railway Terminal

Based on the result of demand forecast of railway in 2025, the railway container terminal should have an annual capacity to handle 168,000 TEUs for 300 days with total handling time of 4 hours per train to operate 4 trains per day.
As the length of the terminal is not sufficient to operate a 35 wagon train at the phase 1 stage, three rail tracks will be provided. A railway terminal is provided for the reach-stacker operation and the temporary stacking of containers.

(7) Major Civil Works

Dredging and Reclamation: A combined deployment of CSD (cutter suction dredger) and THSD (trailing hopper suction dredger) is the optimal solution for the dredging and reclamation. Also, the existing approach channel is to be deepened to a depth of CD −14.1 m from CD −13.1 m on average, with a length of about 7km and a width of 134m. The reclamation volume is approximately 3.53 million m^3, of which about 2.081 million m^3 will be the sands to be dredged by CSD within 1.5 km from the reclamation.

Quay Wall: The depth of the quay wall is designed at CD -15.5 m for an 8,000 TEU container vessel. In Phase 1, a 550 m length of the quay wall should be completed by 2015 to meet the demand of Panamax vessels.

Slope Protection: The Northwest and Northeast Revetment (Seawall) is installed upon the seabed at an elevation of around CD −3.5 to −4.5 m.

Other civil works included in the package of Phase 1 are: (i) road, (ii) yard pavement and lighting, (iii) railway, (iv)buildings (terminal office, workshop gate and fence); (v) water supply; (vi) power supply; (vii) fire fighting / sewerage; (viii) electrical works; and (ix) landscaping.

(8) Construction and Equipment Cost

The Construction Cost is estimated for the Phase-1 Project and the terminal yard expansion project. The Equipment Cost is estimated for procurement and maintenance for 30 years. The cost estimate is based on the information collected at Walvis Bay in June and July 2009. Quotations submitted by contractors to Namport are also used.

(9) Terminal Operator

In administering and managing the new container terminal, Namport has three alternatives: (a) to administer and operate by itself, (b) introduce private operators, or (c) contract management

and operation out to operating companies. In this study, the financial feasibility of the project was estimated based on the following two scenarios:

Scenario A: Namport constructs the container terminal and operates the terminal by itself. Namport will gain income from the users.

Scenario B: Namport constructs the container terminal and entrusts the terminal operation to a private operator. Namport will gain income from the operator as concessions.

(10) Financial Analyses

The cost and revenues of Namport from the new container terminal project in scenarios A and B are calculated based on the result of the demand forecast, estimated unit incomes, construction and equipment costs, and operation and maintenance costs. In addition, 10% of construction cost is added as a physical contingency, as with administration cost. The total project cost estimated is N$ 2,748.75 million. Then, FIRR is analysed in a 35 year project evaluation period, including 5 years for construction. The result of the calculation for Scenarios A and B are as follows.

Scenario A:	FIRR =	11.52 %
	NPV =	N$ 192.16 million
	B/C =	1.06
Scenario B:	FIRR =	3.98 %

Obviously, FIRR in Scenario A is larger than the opportunity cost of capital, 10.5%, while that in Scenario B is not. Scenario B was analysed assuming Namport gives a concession to a private operator to cover only the necessary costs of this project. However, again, this assumption is preliminary and tentative so it should not be interpreted as conclusive.

(11) Economic Analyses

The EIRR is 12.1% and the NPV and the B/C to be discounted by 12% indicate N$ 19.6 million and 1.01, respectively. The EIRR is high enough over 12% to consider the project feasible. The NPV and the B/C show that the present values of the economic benefits are higher than the present values of the economic cost.

(12) Environmental Issues

EIA Consultants submitted the final version of the Interim Report in October 2009 (dated September 2009). The EIA Interim Report covers a broad range of concerns about the original port expansion plan from environmental aspects to hydrodynamic analyses, ship manoeuvring simulation and impacts caused by dredging and reclamation works. Status of the environmental impact assessment (EIA) is as follows:

- Completed and for review:
  - Traffic and roads
  - Noise
  - Socio-economic
- Baseline description completed:
  - Main ecology: to be completed once options for dredge management and disposal have been finalized.
  - Lagoon avifauna: EIA Consultants recommended additional tasks such as analysis, estimate of energy consumption, demarcation of feeding area, evaluation of potential impact and assessment of potential impact.

(13) Contingent Alternatives for Port Expansion

The major concern on the EIA Study process, raised at the public meeting, is a lack of screening procedures to choose the best project site among alternatives at the earlier stage in view of the natural and social environment. In this regard, after laying out the alternative expansion plans of the port, the JICA Study Team examined the impacts to the environment particularly to the mouth of the lagoon for the three alternatives. At the end, the alternative A would be recommended in case the new container development at the original project site were judged negative in view of EIA study results.

(14) Conclusions and Recommendations

The conclusions are as follows:

1. The port expansion project at the original site is technically feasible, for the following reasons:
   (a) The reclamation of the terminal yard can be done at a relatively low cost by use of dredged sand.
   (b) An open deck quay supported with cast-in-situ concrete piles can be built at a reasonable cost, where the subsoil has strength at about minus 47 m below CD.
   (c) A bridge at the causeway does not have positive influences on the environment.
   (d) The contingent alternative port expansion plans are found to be more expensive than the original plan.

2. The port expansion project at the original site is financially and economically feasible for the following reasons:
   (a) FIRR is estimated to be 11.52 %, larger than opportunity cost of capital (10.5%), Financial NPV is about N$ 192 million (>0), and Financial B/C about 1.06 (>1.0).
   (b) EIRR is estimated to be 12.1 % (>12% in general), NPV about 19.6 million N$ (>0), and B/C about 1.01 (>1.0).

3. The port expansion project at the original site will be environmentally feasible, as the EIA Interim Report concludes:
   (a) The new container terminal has negligible influence on the water levels in the bay and the lagoon.
   (b) Flow velocities will change only to a small extent.
   (c) The new container terminal reduced the water exchange rates in the lagoon.
   (d) Sediment transfer only changes to minor extent. No significant erosion and accretion patterns have been observed.
   (e) The suspension concentrations will be induced by dredging and reclamation activities locally and temporarily but in general at least meet acceptable levels.

The recommendations are as follows:

1. To consolidate the status as a gateway to landlocked inland countries and inland regions. To this end, to promote railway operation and cross boarder trades.
2. To plan a strategy to compete with Port of Durban and Port of Cape Town to capture transhipment containers originated from Asia and destined to the west coast of Africa.
3. To organize a Project Management Office to implement the project.

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Abbreviations and Acronyms

AAGR	Average Annual Growth Rate
AfDB	African Development Bank
B/C	Benefits Cost Ratio
BCLME	Benguela Large Marine Environment
BH	Borehole
CAF	Country Assistance Framework
CBD	Central Business District
Cc	compressive coefficient
CD	chart datum
CD (section 2.7 only)	Conservation Dependent
CIF	Cost, Insurance and Freight
CLP	Container Load Plan
COD	Chemical Oxygen Demand
CRBL	Cross-border Cargo Landed
CRBS	Cross-border Cargo Shipped
CSD	Cutter Suction Dredger
CSIR	Council for Scientific and Industrial Research
DCS	Deep Sea Cargo Shipped
DSL	Deep Sea Cargo Landed
DMU	Diesel Multiple Unit
DMC	Delta Marine Consultants
DRC	Democratic Republic of the Congo
DSCR	Debt Service Coverage Ratio
DSL	deep sea cargo landed
DSR	Draft Scoping Report
DWT	Dead Weight Tonnage
EA	Environmental Assessment
ECD	Empty Container Depot
EIA	Environmental Impact Assessment
EIR	Equipment Interchange Receipt
EIRR	Economic Internal Rate of Return
EIU	Economist Intelligence Unit
EMA	Environmental Management Act
EMC	Evergreen Line
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction
EPZ	Export Processing Zone
E/S	Engineering Study
FIRR	Financial Internal Rate of Return
FOB	Free on Board
F/S	Feasibility Study
FT	freight tonnes

ft.	foot (customary unit of measurement)
GC24	Government Internal Registered Stock Matured in 2024
GD	Grab Bucket Dredger
GDP	Gross Domestic Product
GDMC	GDP of major countries of cargo destination
GNN	GDP of Namibia and Neighbouring and Land-locked Countries
GOMC	GDP of major countries of cargo origin
GPCN	GDP per capita Namibia
GT	gross tonnage
GODMC	GDP of Major Countries of Origin and Destination
GOMC	GDP of Major Countries of Cargo Origin
GON	Government of Namibia
GPCN	GDP per capita of Namibia
GT	gross tonne
HAT	Highest Astronomical Tide
HJCL	Hanjin Container Lines
HPC	Hamburg Port Consultant
H	Height
ICB	interlocking concrete blocks
ICD	Inland Container Depot
IFC	International Finance Corporation
IMF	International Monetary Fund
IRR	Internal Rate of Return
ISO	International Organization for Standardization
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JV	joint venture
ICB	International Competitive Bid
ITR	Interim Report
KfW	Kreditanstalt fur Wiederaufbau
kg	kilogram
kN	kilonewton
K Line	Kawasaki Kisen Kaisha, Ltd.
LAT	Lowest Astronomical Tide
LC	Least Concern
L	length
LPG	Liquefied Propane Gas
m	metre
MET	Ministry of Environment and Tourism
MDP	Management and Development Plan
MHWS	Mean High Water Spring Tide
MLWS	Mean Low Water Spring Tide
MME	Ministry of Mines and Energy

MOL	Mitsui OSK Lines
MOZAL	Mozambique Aluminium Smelter
NAD	Namibian Dollar
Namport	Namibian Ports Authority
NDP3	Third National Development Plan
NPA	Nigeria Ports Authority
NPV	net present value
NSCNP	Namib-Skeleton Coast National Park
NT	Near Threatened
OD	Origin and Destination
ODA	Official Development Assistance of Japan
OLT	overland transportation
OPX	TransNamib Overnight Parcel Express
OSBP	one-stop border post
O&M	Operating and Maintenance
PA	Protected Area
PIANC	Permanent International Association of Navigation Congresses
PIL	Pacific International Lines
PPP	public private partnership
PTI	Pre Trip Inspection
PWB	Port of Walvis Bay
QGC	Quay Gantry Crane
RAP	Regional Action Plan
RCD	Reversed Circulation Drilling
ROA	Return on Assets
ROE	Return on Equity
RSA	Republic of South Africa
RTG	Rubber Tyred Gantry Crane
SABS	South African Bureau of Standards
SACU	South African Customs Unit
SADC	Southern African Development Community
SADCL	Southern African Development Community Cargo Landed
SADCS	Southern African Development Community Cargo Shipped
SANS	South African National Standards
SARA	South African Railway Association
SATS	South African Transport Services
SC	Scoping Report
SCF	Standard Conversion Factor
SDI	Spatial Development Initiatives
SHREQ	Safety, Health, Risk, Environment, and Quality
SPT	Standard Penetration Test

STBC	Swaziland/South Africa Tourism and Biodiversity Corridor
t	tonne
TCC	Trans-Caprivi Corridor
TCIT	Tincan Terminal
TEU	Twenty-foot Equivalent Unit
TEX	Export of Total Cargoes
TIM	Imports of Total Cargo
TNX	TransNamib Express
TOR	Terms of Reference
TPT	Transnet Port Terminal
TRSH	Transhipment Cargo
TSHD	Trailer Suction Hopper Dredger
UK	United Kingdom
UNDP	United Nations Development Programme
US	United States of America
VTS	Vessel Traffic Control System
W	width
WBCG	Walvis Bay Corridor Group
WBNR	Walvis Bay Nature Reserve
WQ	water quality

1 Introduction

After its harbour was deepened in 2000, the Port of Walvis Bay began attracting more container cargo. It is expected that the throughput will reach almost 260,000 TEU per year in 2009. Although the container stacking yard is being expanded, the throughput may reach the limit of the handling capacity of the exiting port facilities in 2012 if the trend continues. To ensure that the Port of Walvis Bay will play a role as a container transhipment hub on the west coast of Africa as well as the role of a gateway to land-locked countries, the Namibian Ports Authority (Namport) has launched a new container terminal project laid offshore at the south end of the port premises in 2007. In 2008, Namport conducted the pre-feasibility study for the project.

In late 2008, the Japan International Cooperation Agency (JICA) discussed with Namport the technical assistance required to conclude the feasibility study for the project and both parties agreed to the minutes of the meeting for implementing such assistance. Based on the agreed minutes, JICA dispatched a team of experts (JICA Study Team) in early March of 2009. Since then, the team has been carrying out site investigations, data collection, analyses of collected data and information and evaluation of all aspects of the project except for the environmental impacts assessment (EIA) for which Namport has employed a consulting group.

This “Final Report” details all the aspects of the development of the new container terminal ranging from the demand forecast of container throughput to the determination of the physical dimensions of the container terminal, from the site investigations of subsoil, waves and currents to the basic design of the port facilities and cost estimate of both the initial investment and terminal operation, and from the economic and financial analyses of the project to the recommendations for the project implementation. The report also covers the study on the contingent alternatives, which will be useful in case the new container terminal has to be located at a different site to avoid excessive environment impacts to the nearby lagoon protected by the Ramsar Convention.

Chapter 2 of this report will lead the reader to the comprehensive understanding of the physical and socio-economic background of the new container terminal project. Among others, this chapter details the socio-economic conditions of the Namibia and her neighbouring countries, the current transport networks both maritime and on-land in connection with the Port of Walvis Bay, the financial status of Namport, and the natural and environmental conditions at and around the vicinity of the project site.

Chapter 3 deals with the demand forecast based on the future socio-economic frameworks of Namibia and her neighbouring countries. The forecast consists of the estimated future container throughput of the Port of Walvis Bay and modal split of the future on-land container transport from the port.

Chapter 4 discusses the physical development of the new container terminal. Among others, it provides the recommended layout of the terminal facilities, basic design of main structures like the quay wall, slope protection of the reclaimed land, construction and operation costs, and the economic and financial analyses of the project. This chapter describes indicative targets as guidelines for the terminal operation as well as the project effectiveness of the new container terminal.

Chapter 5 discusses the alternative port developments which are contingent to the original one. Two potential alternatives are laid out and subjected to the construction planning, cost estimate, numerical simulation of currents, waves and seabed morphology. Pros and cons of each alternative are discussed and the recommendable alternative is selected.

All the corrections, revisions, modifications suggested by Namport and other government and non-government agencies, individuals and firms involved in the project has been incorporated into this Final Report.

2 Project Background

2.1 Current Socio-Economic Situation in Namibia and in Neighbouring Countries

2.1.1 Socio-Economic Situation in Namibia

(1) Key Economic Indicators

The main economic indicators for Namibia are summarized in Tables 2.1.1, 2.1.2 and 2.1.3.

Table 2.1.1 Main Economic Indicators of Namibia (1)

	2001 [b]	2002 [b]	2003 [b]	2004 [b]	2005 [b]	2006 [b]	2007 [b]
Real GDP (N$, bil.)[a]	27.444	28.759	29.983	33.661	34.500	36.967	38.466
Real GDP growth rate (%)	1.171	4.792	4.255	12.267	2.492	7.153	4.054
Real GDP per capita (N$) [a]	14,220	14,673	15,097	16,753	17,629	18,558	18,968
Nominal GDP (N$, bil.)	30.538	35.430	37.306	42.679	46.176	54.013	61.456
Nominal GDP (US$, bil.)	3.550	3.368	4.932	6.617	7.258	7.982	8.711
Nominal GDP per capita (N$)	15,823.19	18,075.82	18,784.83	21,241.25	23,594.98	27,115.49	30,304.00
Nominal GDP per capita (US$)	1,839.24	1,718.23	2,483.22	3,293.27	3,708.56	4,006.90	4,295.52
Inflation (Average consumer prices, %)	9.266	11.282	7.152	4.147	2.261	5.053	6.728
Population (Million persons)	1.930	1.960	1.986	2.009	1.957	1.992	2.028

	2008 [c]	2009 [c]	2010 [c]	2011 [c]	2012 [c]	2013 [c]	2014 [c]
Real GDP (N$, bil.) [a]	39.572	39.281	39.988	40.951	42.08	43.363	44.7
Real GDP growth rate (%)	2.875	–0.735	1.800	2.407	2.757	3.049	3.085
Real GDP per capita (N$) [a]	34,071.82	36,171.64	38,747.30	41,178.56	43,637.57	46,607.54	49,926.31
Nominal GDP (N$, bil.)	69.671	74.578	80.552	86.317	92.23	99.325	107.281
Nominal GDP (US$, bil.)	8.456	7.458	7.655	7.894	8.133	8.435	8.736
Nominal GDP per capita (N$)	34,071.82	36,171.64	38,747.30	41,178.56	43,637.57	46,607.54	49,926.31
Nominal GDP per capita (US$)	4,135.39	3,617.16	3,682.17	3,766.06	3,848.08	3,958.08	4,065.72
Inflation (Average consumer prices, %)	10.345	9.117	6.328	4.720	4.317	4.717	5.017
Population (Million persons)	2.045	2.062	2.079	2.096	2.114	2.131	2.149

Source: IMF, "World Economic Outlook Database", 2009
Note: a: Base year is 2000, b: Actual, c: Forecasted.

Table 2.1.2 Main Economic Indicators of Namibia (2)

	2003	2004	2005	2006	2007
Consumer price inflation (ave.; %)	7.2	4.1	2.3	5.1	6.7
Current-account balance (US$, m)	204	384	269	999	805
Exchange rate (ave.; N$:US$)	7.6	6.4	6.4	6.8	7.0
External debt (year-end; US$ m)	1,013	1,145	1,366	1,427	1,103

Source: EIU, "Country Profile 2008 Namibia"

Table 2.1.3 Real Gross Domestic Product by Sector

(Unit: % of GDP)

	2003	2004	2005	2006	2007
Agriculture & Fishing	11.4	10.4	12.1	11.4	11.7
Fishing	5.6	4.7	5.4	4.6	4.6
Industry	28.5	29.7	28.0	34.0	36.3
Mining	9.5	10.6	9.5	14.3	13.7
Manufacturing	12.4	12.1	11.3	12.7	15.8
Services	60.1	59.9	59.9	54.6	52.0
Government	22.0	21.6	21.7	19.6	18.7
Financial	12.7	13.2	13.4	12.0	11.7

Source: EIU, "Country Profile 2008 Namibia"

Significant aspects of the Namibian economy include:[1]

- The real GDP of Namibia grew steadily since Namibia was founded in 1990, and the annual growth rate of real GDP between 2000 and 2007 is more than 2.3%. Real GDP per capita steadily increased at the same time.
- Government services account for the largest contribution to GDP. However, industries, particularly mining and manufacturing, increased their share of GDP recently.
- Mining, mainly of diamonds and uranium, is the main industry in Namibia. It accounts for 60% of Namibian exports.
- Owing to low rainfall and the absence of perennial rivers except along the northern and southern borders, agriculture is highly susceptible to drought and the water supply to expanding towns and industries is increasingly threatened. Around 70% of the population in Namibia is engaged in agriculture.

(2) Key Social Indicators

Important social indicators for Namibia are summarized in Table 2.1.4.

Table 2.1.4 Significant Social Indicators of Namibia

Item	Unit	
Population in 2007	(projected, 000)	2,074
Surface area	(sq. km.)	824,292
Population density	(per square km)	2.5
Population growth rate 2005–2010	(% per annum)	1.3
Population aged 0-14 years	(%, 2006)	37.0
Population aged 60+ years	(women/men, % of total, 2006)	6.0/5.0
Sex ratio	(men per 100 women, 2006)	97.4
Life expectancy at birth 2005–2010	(women/men, 2006)	53/52
Urban population	(%, 2006)	35
Urban population growth rate 2000–2005	(% per annum, 2006)	3.0
Rural population growth rate 2000–2005	(% per annum, 2006)	0.6
Primary-secondary gross enrolment ratio	(women/men, per 100, 2006)	84/81

Source: United Nations Statistics Division

Significant points concerning Namibian society include:[2]

- Namibia won independence from South Africa in 1990.
- The territory of Namibia is one of the largest in Sub-Saharan Africa, but its population is one of the smallest. Namibia has a low average population density of 2.5 per sq km (compared to an average in Sub-Sahara Africa of 28 per sq km).
- The growth rate of the population has decreased from 2.5% to 1.0% in the period from 2000–2007. One of the main reasons is HIV/AIDS. The life expectancy fell from 63 years in 1990 to 47 in 2005.
- As Namibia's road network is generally well maintained, and its rail, harbour and air services are by and large efficiently operated, Namibia's economy is largely free from transportation bottlenecks.

(3) Export and Import

Namibia's trade composition and main trading partners are summarized in Tables 2.1.5 and 2.1.6. Total exports including others increased from 1,265 million US dollars to 3,087 million

[1] Source: EIU, "Country Profile 2006 Namibia"
[2] Source: EIU, "Country Profile 2006 Namibia"

US$ during from 2002 to 2006, a growth rate of 2.4 times. The most rapid growth rate is recorded by refined zinc at 16.7 times followed by other manufactures at 2.8 times and other exports have increased by around 2 times. The largest share is in diamonds at 32.6% followed by fish at 18.5% and refined zinc & copper at 13.5% and so on in 2006. Total imports including others increased from US$ 1,389 million to US$ 3,211 million by 2.3 times which is the almost the same growth rate of the exports. The highest growth is indicated by mineral fuels & lubricants by 4.0 times followed by vehicles & transport equipment at 2.7 times and food, live animals, beverages & tobacco at 2.5 times. The highest share of imports is occupied by machinery & electrical goods as 18.4% followed by mineral fuels & lubricants as 18.3% and so on. It could be observed that most commodities of exports and imports have grown in balance without a much different growth rate except refined zinc & copper in the exports and mineral fuels & lubricants in the imports.

Export partners principally include the UK at 25.6% followed by South Africa at 24.7%. These two countries occupy around 50% of all exports in 2006. Most imports come from South Africa at 82.4% and the shares of other countries are extremely low. It is evident that the economy of Namibia is heavily depending on products from South Africa.

Table 2.1.5 Composition of Trade of Namibia

(Unit: US$ m)

	2002	2003	2004	2005	2006	Growth Rate (2002-2006)
Exports FOB						
Diamonds	495	471	765	789	1,005	2.0
Fish	296	499	518	580	572	1.9
Refined zinc & copper	25	45	141	238	418	16.7
Other manufactures	141	219	250	367	398	2.8
Metal ores incl. uranium	162	145	196	240	349	2.2
Live animals, meat & animal products	112	159	196	260	254	2.3
Total incl. others	1,265	1,591	2,142	2,551	3,087	2.4
Imports CIF						
Food, live animals, beverages & tobacco	169	274	435	435	417	2.5
Mineral fuels & lubricants	147	221	278	406	587	4.0
Machinery & electrical goods	253	356	459	458	590	2.3
Vehicles & transport equipment	190	267	384	494	514	2.7
Total incl. others	1,389	2,217	2,561	2,818	3,211	2.3

Source: EIU, "Country Profile 2008 Namibia"

Table 2.1.6 Main Trading Partners of Namibia

(Unit: % of total)

	2002	2003	2004	2005	2006
Exports FOB to					
South Africa	25.4	22.3	25.8	30.5	24.7
UK	24.6	18.4	21.7	20.5	25.6
Angola	14.6	22.0	9.7	7.2	5.7
Spain	12.1	14.2	6.8	7.2	6.0
Imports CIF from					
South Africa	77.3	81.5	85.3	83.2	82.4
UK	2.6	1.2	2.6	1.1	0.8
Germany	3.1	2.1	1.8	1.9	2.2
Switzerland	1.2	0.5	0.4	0.8	0.8

Source: EIU, "Country Profile 2008 Namibia"

(4) Industrial Development Plans

The Namibian government approved the Third National Development Plan (NDP3) in June 2008. Namibia's Vision 2030 provides the overall framework for the development of the country and the NDP3 is the first systematic attempt to translate the Vision into actionable policies and programmes. Its main theme is "Accelerated Economic Growth and Deepening Rural Development".

NDP3 sets a GDP growth target averaging 5% per annum with no new policy interventions and a higher GDP growth target of 6.5% per annum predicated on a number of new policy interventions and actions. Secondary and tertiary industries are projected to be the main drivers of growth.

2.1.2 Socio-Economic Situation in Neighbouring Countries—Angola, Botswana, Democratic Republic of the Congo (DRC), South Africa, Zambia and Zimbabwe

The locations of Namibia and her neighbouring countries are shown in Figure 2.1.1. In comparison with Namibia, significant indicators for these countries are summarized in Table 2.1.7.

Source: Google Earth

Figure 2.1.1 Map of Namibia and Neighbouring Countries

Table 2.1.7 Main Indicators of Namibia and Neighbouring Countries

	Namibia	Angola	Botswana	DRC	South Africa	Zambia	Zimbabwe
Real GDP growth rate (2007, %)[a]	4.054	20.280	4.434	6.257	5.098	6.259	–6.092
Nominal GDP (2007, US$, bil.)[a]	8.711	59.263	12.339	9.969	283.381	11.411	11.977
Nominal GDP per capita (2007, US$)[a]	4,296	3,629	7,005	163	5,922	939	55
Export (2006, FOB, US$ m)[b]	3,087	31,084	4,587	2,319	58,255	3,819	1,680[d]
Import (2006, CIF, US$ m)[b]	3,211	8,778	3,043	2,740	67,699	3,022	989[d]
Population in 2007 (000)[c]	2,074	17,024	1,882	62,636	48,577	11,922	13,349
Surface area (square kms)[c]	824,292	1,246,700	581,730	2,344,858	1,221,037	752,618	390,757
Population density (per square km)[c]	2.5	13.7	3.2	26.7	39.8	15.8	34.2
Urban population (%, 2006)[c]	35	53	57	32	59	35	36

Source: a: IMF, "World Economic Outlook Database", 2009; b: EIU, "Country Profile 2008" for each country;
c: United Nations Statistics Division, d: The latest available data is for 2004, and these figures are for that year only.

(1) Key Economic Indicators

1) Angola

The main economic indicators for Angola are summarized in Tables 2.1.8, 2.1.9 and 2.1.10.

Table 2.1.8 Main Economic Indicators of Angola (1)

	2001[b]	2002[b]	2003[b]	2004[b]	2005[b]	2006[b]	2007[c]
Real GDP (Kwanzas, bil.)[a]	94.546	108.286	111.869	124.379	150.017	177.865	213.935
Real GDP growth rate (%)	3.142	14.532	3.308	11.183	20.613	18.563	20.280
Real GDP per capita (Kwanzas)[a]	6,885.84	7,662.01	7,690.14	8,306.68	9,733.68	11,211.95	13,101.65
Nominal GDP (Kwanzas, bil.)	197.11	497.63	1,041.23	1,652.05	2,669.89	3,629.67	4,545.86
Nominal GDP (US$, bil.)	8.936	11.386	13.956	19.800	30.632	45.168	59.263
Nominal GDP per capita (Kwanzas)	14,356	35,211	71,577	110,333	173,233	228,801	278,394
Nominal GDP per capita (US$)	650.82	805.66	959.39	1,322.32	1,987.53	2,847.20	3,629.35
Inflation (Average consumer prices, %)	152.586	108.893	98.342	43.559	22.961	13.305	12.249
Population (Million persons)	13.731	14.133	14.547	14.973	15.412	15.864	16.329

	2008[c]	2009[c]	2010[c]	2011[c]	2012[c]	2013[c]	2014[c]
Real GDP (Kwanzas, bil.)[a]	245.594	236.800	258.850	286.719	302.958	322.773	342.404
Real GDP growth rate (%)	14.798	–3.580	9.312	10.766	5.664	6.540	6.082
Real GDP per capita (Kwanzas)[a]	14,612.09	13,678.55	14,516.74	15,611.31	16,015.05	16,565.55	17,061.24
Nominal GDP (Kwanzas, bil.)	6,256.54	4,852.34	5,921.27	7,024.30	7,848.88	8,898.09	10,026.08
Nominal GDP (US$, bil.)	83.384	65.911	83.352	98.924	107.579	118.986	129.198
Nominal GDP per capita (Kwanzas)	372,245	280,291	332,075	382,460	414,910	456,674	499,578
Nominal GDP per capita (US$)	4,961.08	3,807.31	4,674.52	5,386.22	5,686.90	6,106.66	6,437.63
Inflation (Average consumer prices, %)	12.465	12.120	8.898	6.349	4.727	4.500	0.000
Population (Million persons)	16.808	17.312	17.831	18.366	18.917	19.485	20.069

Source: IMF, "World Economic Outlook Database", 2009
Note a: Base year is 2000; b: Actual; c: Forecasted

Table 2.1.9 Main Economic Indicators of Angola (2)

	2003	2004	2005	2006	2007
Consumer price inflation (ave. %)	98.2	43.5	24.8	11.7	12.2
Current-account balance (US$, m)	–719	686	5,138	10,690	14,000
Exchange rate (ave. Kwanzas: US$)	83.5	87.2	80.4	80.4	76.7
External debt (year-end; US$ m)	8,695	9,338	11,775	9,516	8,357

Source: EIU, "Country Profile 2008 Angola"

Table 2.1.10 Real Gross Domestic Product by Sector in Angola

(Unit: % of GDP)

	2003	2004	2005	2006	2007
Agriculture & Fishing	11.2	11.5	11.2	11.0	10.2
Industry	66.0	65.6	67.4	67.5	69.2
Services	22.8	22.9	21.4	21.5	20.6

Source: EIU, "Country Profile 2008 Angola"

Significant indicators of Angola's economy include:[3]

- Angola has large reserves of oil, gas, and diamonds.
- Its economy is dominated by the offshore oil sector, which accounts for 60% of GDP and 95% of exports.
- The agricultural and manufacturing sectors are not nearly as developed.

2) Botswana

The main economic indicators of Botswana are summarized in Tables 2.1.11, 2.1.12 and 2.1.13.

Table 2.1.11 Main Economic Indicators of Botswana (1)

	2001 [b]	2002 [b]	2003 [b]	2004 [b]	2005 [b]	2006 [b]	2007 [c]
Real GDP (Pula, bil.)[a]	29.742	32.405	34.449	36.499	37.096	38.997	40.726
Real GDP growth rate (%)	3.495	8.955	6.309	5.950	1.635	5.123	4.434
Real GDP per capita (Pula) [a]	17,916.70	19,301.44	20,287.68	21,261.54	21,425.19	22,344.22	23,119.91
Nominal GDP (Pula, bil.)	35.244	38.546	40.029	47.155	52.449	65.692	75.728
Nominal GDP (US$, bil.)	6.063	6.111	8.116	10.061	10.363	11.298	12.339
Nominal GDP per capita (Pula)	21,231.33	22,959.03	23,573.75	27,468.83	30,292.12	37,640.37	42,990.43
Nominal GDP per capita (US$)	3,652.51	3,639.91	4,779.56	5,860.70	5,985.00	6,473.25	7,005.10
Inflation (Average consumer prices, %)	6.565	8.026	9.185	6.988	8.610	11.553	6.565
Population (Million persons)	1.660	1.679	1.698	1.717	1.731	1.745	1.660

	2008 [c]	2009 [c]	2010 [c]	2011 [c]	2012 [c]	2013 [c]	2014 [c]
Real GDP (Pula, bil.) [a]	40.726	41.925	37.554	42.941	45.310	48.382	52.621
Real GDP growth rate (%)	4.434	2.946	–10.426	14.345	5.517	6.779	8.762
Real GDP per capita (Pula) [a]	23,119.91	23,527.49	20,832.42	23,547.07	24,560.65	25,924.27	27,871.92
Nominal GDP (Pula, bil.)	75.728	91.213	77.291	91.448	100.874	111.787	126.882
Nominal GDP (US$, bil.)	12.339	13.461	9.761	10.732	11.356	12.177	13.410
Nominal GDP per capita (Pula)	42,990.43	51,186.52	42,875.48	50,145.91	54,679.29	59,898.51	67,206.25
Nominal GDP per capita (US$)	7,005.10	7,554.24	5,414.97	5,884.92	6,155.76	6,524.61	7,102.71
Inflation (Average consumer prices, %)	7.077	12.623	8.115	5.247	4.457	4.105	4.049
Population (Million persons)	1.761	1.782	1.803	1.824	1.845	1.866	1.888

Source: IMF, "World Economic Outlook Database", 2009

Note a: Base year is 2000; b: Actual; c: Forecasted

[3] Source: EIU, "Country Profile 2008 Angola"

Table 2.1.12 Main Economic Indicators of Botswana (2)

	2007
Consumer price inflation (av; %)	7.1
Current-account balance (US$, bil.)	2.2
Exchange rate (av; Pula: US$)	6.14
External debt (year-end; US$ bil.)	0.4

Source: EIU, "Country Profile 2008 Botswana"

Table 2.1.13 Real Gross Domestic Product by Sector

(Unit: % of GDP)

	2002/03	2003/04	2004/05	2005/06	2006/07
Agriculture, forestry & fishing	2.2	2.2	1.8	1.8	1.7
Mining & quarrying	37.3	35.4	38.8	39.4	42.0
Manufacturing	3.9	3.9	3.6	3.3	3.5
Electricity & water	2.4	2.5	2.4	2.4	2.8
Construction	5.0	4.9	4.5	4.2	4.0
Trade, hotels & restaurants	11.2	11.4	10.2	10.6	10.5
Transport & communications	3.3	3.3	3.1	3.5	3.7
Financial and business services	10.4	10.6	10.4	10.2	9.7
Government services	16.4	17.0	16.3	16.5	15.0
Social & personal services	3.5	3.7	3.8	3.9	3.5

Source: EIU, "Country Profile 2008 Botswana"
Note: Years ending June 30th.

Significant points for the economy of Botswana include:[4]

- Botswana's economy has been built on the diamond-mining industry, and this sector still dominates: mining contributed 42% of the GDP in the 2006/07 national accounts year (July–June). Expansion in mineral production has led to an average real GDP growth of 5.7% between 2002 and 2007.
- The fledgling downstream diamond industry, including the marketing, cutting and polishing of rough diamonds, is growing and can take advantage of the large existing supply of diamonds in the country.

3) Democratic Republic of the Congo (DRC)

The main economic indicators of DRC are summarized in Tables 2.1.14, 2.1.15 and 2.1.16.

Table 2.1.14 Main Economic Indicators of DRC (1)

	2001 [b]	2002 [b]	2003 [b]	2004 [b]	2005 [b]	2006 [c]	2007 [c]
Real GDP (Francs, bil.)[a]	290.827	300.914	318.341	339.479	366.242	386.702	410.896
Real GDP growth rate (%)	–2.100	3.468	5.791	6.640	7.884	5.586	6.257
Real GDP per capita (Francs) [a]	5,668.25	5,709.32	5,870.11	6,078.09	6,364.03	6,523.83	6,730.10
Nominal GDP (Francs, bil.)	1,407.55	1,922.20	2,298.66	2,609.72	3,427.06	4,113.98	5,144.04
Nominal GDP (US$, bil.)	5.155	5.539	5.681	6.561	7.223	8.785	9.969
Nominal GDP per capita (Francs)	27,433	36,470	42,386	46,725	59,551	69,405	84,255
Nominal GDP per capita (US$)	100.473	105.091	104.747	117.462	125.517	148.212	163.284
Inflation (Average consumer prices, %)	357.280	25.316	12.817	4.001	21.394	13.211	16.713
Population (Million persons)	51.308	52.706	54.231	55.853	57.549	59.275	61.053

[4] Source: EIU, "Country Profile 2008 Botswana"

	2008 [c]	2009 [c]	2010 [c]	2011 [c]	2012 [c]	2013 [c]	2014 [c]
Real GDP (Francs, bil.) [a]	436.361	448.125	472.955	510.627	544.804	592.843	637.226
Real GDP growth rate (%)	6.197	2.696	5.541	7.965	6.693	8.817	7.486
Real GDP per capita (Francs) [a]	6,939.02	6,918.54	7,089.20	7,430.95	7,697.40	8,132.16	8,486.38
Nominal GDP (Francs, bil.)	6,526.48	8,322.05	10,923.23	13,366.41	15,752.08	18,697.21	22,897.45
Nominal GDP (US$, bil.)	11.589	11.223	12.158	13.357	14.520	16.110	18.482
Nominal GDP per capita (Francs)	103,784	128,483	163,730	194,516	222,557	256,474	304,941
Nominal GDP per capita (US$)	184.281	173.271	182.238	194.374	205.155	220.979	246.140
Inflation (Average consumer prices, %)	17.966	33.908	19.895	13.500	10.500	9.000	8.750
Population (Million persons)	62.885	64.772	66.715	68.716	70.778	72.901	75.088

Source: IMF, "World Economic Outlook Database", 2009
Note a: Base year is 2000; b: Actual; c: Forecasted

Table 2.1.15 Main Economic Indicators of DRC (2)

	2003	2004	2005	2006	2007
Consumer price inflation (av; %)	12.9	4.0	21.3	13.1	16.9
Current-account balance (US$, m)	–83	–157	–755	–653	–873
Exchange rate (av; Francs: US$)	405	396	474	468	517
External debt (year-end; US$ m)	11,254	11,434	10,600	11,201	11,760

Source: EIU, "Country Profile 2008 Democratic Republic of Congo"

Table 2.1.16 Real Gross Domestic Product by Sector in the DRC

(Unit: % of GDP)

	2002	2003	2004	2005	2006
Primary sector	58.3	57.1	55.6	54.6	53.1
Agriculture, forestry, hunting & fishing	47.0	45.1	42.5	41.0	40.3
Mining	11.2	12.1	13.1	13.5	12.8
Secondary sector	10.0	11.1	11.9	12.2	12.2
Manufacturing	4.2	4.4	4.5	4.6	4.4
Construction	5.0	5.8	6.7	6.9	7.1
Tertiary sector	29.7	29.9	30.4	31.1	32.5
Government	17.2	17.6	18.8	20.3	22.3
Financial	4.1	4.9	5.2	5.4	6.0

Source: EIU, "Country Profile 2008 Democratic Republic of Congo"

Significant points for the economy of the DRC include:[5]

- Although mining has traditionally dominated the economy, it now contributes only around 14% to the GDP. More than 40% of the GDP is contributed by agriculture and logging.
- Real GDP growth averaged 6.4% in 2003–07 and is expected to accelerate as new mining ventures enter production following heavy foreign investment.

4) South Africa

Significant economic indicators of South Africa are summarized in Tables 2.1.17, 2.1.18 and 2.1.19.

[5] Source: EIU, "Country Profile 2008 Democratic Republic of Congo"

Table 2.1.17 Main Economic Indicators of South Africa (1)

	2001 [b]	2002 [b]	2003 [b]	2004 [b]	2005 [b]	2006 [b]	2007 [b]
Real GDP (Rand, bil.)[a]	947.373	982.121	1,012.760	1,062.030	1,114.760	1,174.080	1,233.930
Real GDP growth rate (%)	2.735	3.668	3.120	4.864	4.965	5.321	5.098
Real GDP per capita (Rand) [a]	21,037.57	21,565.74	22,011.87	22,858.58	23,774.81	24,774.28	25,787.08
Nominal GDP (Rand, bil.)	1,020.01	1,168.70	1,260.69	1,395.37	1,543.98	1,745.22	1,999.09
Nominal GDP (US$, bil.)	118.563	111.130	166.655	216.340	242.676	257.894	283.381
Nominal GDP per capita (Rand)	22,650.50	25,662.68	27,400.49	30,033.28	32,928.88	36,825.91	41,777.57
Nominal GDP per capita (US$)	2,632.83	2,440.23	3,622.15	4,656.40	5,175.63	5,441.82	5,922.20
Inflation (Average consumer prices, %)	5.700	9.177	5.806	1.392	3.393	4.688	7.090
Population (Million persons)	45.032	45.541	46.010	46.461	46.888	47.391	47.851

	2008 [c]	2009 [c]	2010 [c]	2011 [c]	2012 [c]	2013 [c]	2014 [c]
Real GDP (Rand, bil.) [a]	1,271.72	1,267.67	1,291.78	1,342.26	1,400.32	1,463.25	1,527.62
Real GDP growth rate (%)	3.062	–0.318	1.902	3.908	4.325	4.494	4.400
Real GDP per capita (Rand) [a]	26,120.26	25,753.86	25,958.03	26,679.07	27,530.19	28,454.38	29,383.02
Nominal GDP (Rand, bil.)	2,283.78	2,433.15	2,654.08	2,933.58	3,243.31	3,597.69	3,999.32
Nominal GDP (US$, bil.)	277.188	243.315	249.524	261.982	277.569	295.430	313.599
Nominal GDP per capita (Rand)	46,907.33	49,431.55	53,333.25	58,308.46	63,763.38	69,960.77	76,924.83
Nominal GDP per capita (US$)	5,693.27	4,943.16	5,014.14	5,207.20	5,456.98	5,744.94	6,031.91
Inflation (Average consumer prices, %)	11.504	6.119	5.647	4.975	4.574	4.755	5.079
Population (Million persons)	48.687	49.223	49.764	50.311	50.865	51.424	51.990

Source: IMF, "World Economic Outlook Database", 2009
Note a: Base year is 2000; b: Actual; c: Forecasted

Table 2.1.18 Main Economic Indicators of South Africa (2)

	2003	2004	2005	2006	2007
Consumer price inflation (av; %)	6.8	4.3	3.9	4.6	6.5
Current-account balance (US$, m)	–1,903	–7,003	–9,722	–16,487	–20,631
Exchange rate (av; Rand: US$)	7.6	6.4	6.4	6.8	7.0
External debt (year-end; US$ m)	27,423	27,112	31,099	35,549	37,755

Source: EIU, "Country Profile 2008 South Africa"

Table 2.1.19 Real Gross Domestic Product by Sector in South Africa

(Unit: % of GDP)

	2003	2004	2005	2006	2007
Agriculture	3.6	3.2	2.7	2.8	3.2
Industry	31.6	30.8	30.8	31.2	31.3
Services	64.8	66.0	66.4	66.0	65.5

Source: EIU, "Country Profile 2008 South Africa"

Significant points for South Africa's economy include:[6]

- South Africa is well endowed with natural resources. The country's mineral wealth is significant, with gold, platinum, coal, iron and diamonds being some of its key exports.
- The distribution of income in South Africa is among the most unequal in the world, although a sizable working and black middle class is emerging.
- South Africa, best known for its precious metals, fruit and wine, has moved from an economy dominated by mining and agriculture to one in which manufacturing and financial services contribute the larger share of GDP.
- The economy has been growing in recent years, mainly with the backing of strong consumer demand and an investment boom.

[6] Source: EIU, "Country Profile 2008 South Africa"

5) Zambia

Significant economic indicators for Zambia are summarized in Tables 2.1.20, 2.1.21 and 2.1.22.

Table 2.1.20 Main Economic Indicators of Zambia (1)

	2001 [b]	**2002** [b]	**2003** [b]	**2004** [b]	**2005** [b]	**2006** [b]	**2007** [b]
Real GDP (Kwacha, bil.)[a]	10,564.63	10,913.61	11,472.30	12,091.21	12,733.34	13,529.08	14,375.91
Real GDP growth rate (%)	4.894	3.303	5.119	5.395	5.311	6.249	6.259
Real GDP per capita (Kwacha) [a]	1,001,652	1,010,497	1,037,486	1,067,829	1,098,182	1,139,464	1,182,408
Nominal GDP (Kwacha, bil.)	13,132.70	16,260.30	20,479.20	25,997.45	32,456.25	39,223.10	45,669.00
Nominal GDP (US$, bil.)	3.640	3.775	4.326	5.440	7.271	10.893	11.411
Nominal GDP per capita (Kwacha)	1,245,135	1,505,549	1,852,017	2,295,952	2,799,177	3,303,498	3,756,243
Nominal GDP per capita (US$)	345.114	349.565	391.216	480.392	627.126	917.417	938.556
Inflation (Average consumer prices, %)	21.700	22.200	21.402	17.968	18.325	9.019	10.657
	2008 [c]	**2009** [c]	**2010** [c]	**2011** [c]	**2012** [c]	**2013** [c]	**2014** [c]
Real GDP (Kwacha, bil.) [a]	15,240.90	15,856.38	16,577.48	17,410.41	18,445.21	19,547.57	20,709.02
Real GDP growth rate (%)	6.017	4.038	4.548	5.025	5.944	5.976	5.942
Real GDP per capita (Kwacha) [a]	1,224,173	1,243,759	1,269,845	1,302,391	1,347,460	1,394,521	1,442,753
Nominal GDP (Kwacha, bil.)	53,706.34	60,232.00	68,593.00	76,525.00	85,399.00	95,086.00	100,736
Nominal GDP (US$, bil.)	14.323	12.992	15.343	16.909	18.695	20.518	21.311
Nominal GDP per capita (Kwacha)	4,313,777	4,724,540	5,254,266	5,724,475	6,238,572	6,783,424	7,018,061
Nominal GDP per capita (US$)	1,150.47	1,019.07	1,175.26	1,264.85	1,365.68	1,463.73	1,484.67
Inflation (Average consumer prices, %)	12.446	12.179	8.346	5.906	5.000	5.000	5.000
Population (Million persons)	12.450	12.749	13.055	13.368	13.689	14.017	14.354
Population (Million persons)	10.547	10.800	11.058	11.323	11.595	11.873	12.158

Source: IMF, "World Economic Outlook Database", 2009
Note: a: Base year is 2000; b: Actual; c: Forecasted

Table 2.1.21 Main Economic Indicators of Zambia (2)

	2003	**2004**	**2005**	**2006**	**2007**
Consumer price inflation (av; %)	21.4	18.0	18.3	9.0	10.6
Current-account balance (US$, m)	−405	−389	−417	433	−228
Exchange rate (av; Kwacha : US$)	4,733.3	4,778.9	4,463.5	3,603.1	4,002.5
External debt (year-end; US$ m)	6,800	7,455	5,378	2,325	2,596

Source: EIU, "Country Profile 2008 Zambia"

Table 2.1.22 Real Gross Domestic Product by Sector in Zambia

(% of GDP)

	2003	**2004**	**2005**	**2006**	**2007**
Agriculture	22.8	20.8	18.5	17.9	17.4
Industry	27.1	26.8	25.1	25.9	26.1
Services	50.1	52.4	56.3	56.2	56.5

Source: EIU, "Country Profile 2008 Zambia"

Significant points for Zambia's economy include:[7]

- The combination of privatization and surging international prices has provided a dramatic boost to copper mining in Zambia over the past few years. This has also had a positive knock-on effect on the manufacturing, wholesale and retail sectors.

[7] Source: EIU, "Country Profile 2008 Zambia"

- Trends in copper prices and production have a significant influence on the merchandise trade balance. The increased levels of investment since privatization in 2000 are now yielding results in terms of higher copper production, which, combined with the boom in prices, has lifted total exports.

6) Zimbabwe

The main economic indicators of Zimbabwe are summarized in Tables 2.1.23, 2.1.24 and 2.1.25.

Table 2.1.23 Main Economic Indicators of Zimbabwe (1)

	2001 [b]	**2002** [b]	**2003** [b]	**2004** [c]	**2005** [c]	**2006** [c]	**2007** [c]
Real GDP (Z$, bil.)[a]	0.352	0.336	0.301	0.291	0.279	0.264	0.248
Real GDP growth rate (%)	−2.672	−4.370	−10.363	−3.557	−3.953	−5.422	−6.092
Real GDP per capita (Z$) [a]	30.149	28.909	25.631	24.785	23.805	22.514	21.143
Nominal GDP (Z$, bil.)	0.71	1.70	5.52	23.95	77.71	820.72	81,331.16
Nominal GDP (US$, bil.)	12.883	30.856	10.515	4.713	4.627	5.596	11.977
Nominal GDP per capita (Z$)	61	146	469	2,042	6,624	69,958	6,932,608
Nominal GDP per capita (US$)	316.494	201.128	158.059	332.788	209.560	122.526	54.616
Inflation (Average consumer prices, %)	73.39	133.22	365.05	349.99	237.82	1,016.68	10,452.56
Population (Million persons)	11.666	11.635	11.763	11.732	11.732	11.732	11.732

	2008 [c]	**2009** [c]	**2010** [c]	**2011** [c]	**2012** [c]	**2013** [c]	**2014** [c]
Real GDP (Z$, bil.) [a]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Real GDP growth rate (%)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Real GDP per capita (Z$) [a]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nominal GDP (Z$, bil.)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nominal GDP (US$, bil.)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nominal GDP per capita (Z$)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nominal GDP per capita (US$)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Inflation (Average consumer prices, %)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Population (Million persons)	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Source: IMF, “World Economic Outlook Database”, 2009
Note a: Base year is 2000; b: Actual; c: Forecasted

Table 2.1.24 Main Economic Indicators of Zimbabwe (2)

	2006
Consumer price inflation (av; %)	1,033.5
Current-account balance (US$, m)	−532.0
Exchange rate (av; Z$:US$)	162.07
External debt (year-end; US$ m)	4,677.0

Source: EIU, “Country Profile 2008 Zimbabwe”

Table 2.1.25 Real Gross Domestic Product by Sector in Zimbabwe

(Unit: % of GDP)

	2003	**2004**	**2005**	**2006**	**2007**
Agriculture & fishing	20.1	16.3	18.0	18.2	17.5
Industry	26.1	24.3	23.2	23.3	22.0
Manufacturing	18.1	16.4	15.8	14.9	13.2
Services	53.7	59.4	58.8	58.6	60.5

Source: EIU, “Country Profile 2008 Zimbabwe”

Significant points for Zimbabwe's economy include:[8]

- Although gold is probably the best known of the country's mineral exports, mineral deposits in Zimbabwe are varied, and include coal, platinum and nickel.
- Zimbabwe used to have a well-developed manufacturing sector, relatively diversified commercial farms, productive peasant agriculture, varied mineral resources and a good tourism potential. However, disastrous government policy decisions have decimated the economy.
- In the decade following independence, Zimbabwe's economic growth had generally been strong, but since the last 1990s economic contraction has accelerated rapidly.

(2) Key Social Indicators

1) Angola

The main social indicators for Angola are summarized in Table 2.1.26.

Table 2.1.26 Main Social Indicators of Angola

Item	Unit	
Population in 2007	(projected, 000)	17,024
Surface area	(sq. km.)	1,246,700
Population density	(per sq. km.)	13.7
Population growth rate 2005–2010	(% per annum)	2.8
Population aged 0–14 years	(%, 2006)	46.0
Population aged 60+ years	(women/men, % of total, 2006)	4.0/3.0
Sex ratio	(men per 100 women, 2006)	97.3
Life expectancy at birth 2005–2010	(women/men, 2006)	44/41
Urban population	(%, 2006)	53
Urban population growth rate 2000–2005	(% per annum, 2006)	4.1
Rural population growth rate 2000–2005	(% per annum, 2006)	1.5
Primary-secondary gross enrolment ratio	(women/men, per 100, 2006)	31/37

Source: United Nations Statistics Division

The main points for Angola's social indicators are as follows.[9]

- Angola has one of the highest rates of population growth in Sub-Saharan Africa, estimated at 2.9% in 2000–05.
- Angola has a low-lying coastal plain, with over 1,600 km of coastline, rising to a highland plateau in the interior. The country has large water resources but has only partially developed its agricultural and hydroelectric potential.

2) Botswana

The main social indicators for Botswana are summarized in Table 2.1.27.

[8] Source: EIU, "Country Profile 2008 Zimbabwe"
[9] Source: EIU, "Country Profile 2008 Angola"

Table 2.1.27 Main Social Indicators of Botswana

Item	Unit	
Population in 2007	(projected, 000)	1,882
Surface area	(sq. km.)	581,730
Population density	(per square km)	3.2
Population growth rate 2005–2010	(% per annum)	1.2
Population aged 0–14 years	(%, 2006)	35.0
Population aged 60+ years	(women/men, % of total, 2006)	6.0/4.0
Sex ratio	(men per 100 women, 2006)	98.9
Life Expectancy at birth 2005–2010	(women/men, 2006)	51/50
Urban population	(%, 2006)	57
Urban population growth rate 2000–2005	(% per annum, 2006)	1.6
Rural population growth rate 2000–2005	(% per annum, 2006)	−1.7
Primary-secondary gross enrolment ratio	(women/men, per 100, 2006)	92/92

Source: United Nations Statistics Division

The main points for Botswana's social indicators are as follows.[10]

- Botswana's population growth is slowing, having dropped to 1% in 2006 according to the World Bank; the population growth rate is estimated to have slowed further in 2007 owing to the impact of HIV/AIDS, which is increasing the mortality rate.
- Botswana is a landlocked country, much of which is covered by the Kalahari Desert. Drought is a recurring hazard, and only 5% of the land area is considered arable.

3) DRC

The main social indicators of the DRC are summarized in Table 2.1.28.

Table 2.1.28 Main Social Indicators of the DRC

Item	Unit	
Population in 2007	(projected, 000)	62,636
Surface area	(sq. km.)	2,344,858
Population density	(per sq. km.)	26.7
Population growth rate 2005–2010	(% per annum)	3.2
Population aged 0–14 years	(%, 2006)	47.0
Population aged 60+ years	(women/men, % of total, 2006)	5.0/4.0
Sex ratio	(men per 100 women, 2006)	98.1
Life expectancy at birth 2005–2010	(women/men, 2006)	48/45
Urban population	(%, 2006)	32
Urban population growth rate 2000–2005	(% per annum, 2006)	4.3
Rural population growth rate 2000–2005	(% per annum, 2006)	2.1
Primary-secondary gross enrolment ratio	(women/men, per 100, 2006)	37/51

Source: United Nations Statistics Division

The main points for the social indicators of the DRC are as follows.[11]

- The DRC is Sub-Saharan Africa's largest country and its third most populous. More than 60% of the population live in rural areas.
- In terms of resources, the DRC is one of the richest in Africa. It has huge potentials for mineral production, hydroelectricity and agriculture. Foreign investment in mining is starting to raise mineral output, particularly of copper and cobalt, following years of decline.

[10] Source: EIU, "Country Profile 2008 Botswana"
[11] Source: EIU, "Country Profile 2008 Democratic Republic of Congo"

4) South Africa

The main social indicators of South Africa are summarized in Table 2.1.29.

Table 2.1.29 Main Social Indicators of South Africa

Item	Unit	
Population in 2007	(projected, 000)	48,577
Surface area	(square kms)	1,221,037
Population density	(per square km)	39.8
Population growth rate 2005–2010	(% per annum)	0.6
Population aged 0–14 years	(%, 2006)	32.0
Population aged 60+ years	(women/men, % of total, 2006)	8.0/6.0
Sex ratio	(men per 100 women, 2006)	96.7
Life expectancy at birth 2005–2010	(women/men, 2006)	50/49
Urban population	(%, 2006)	59
Urban population growth rate 2000–2005	(% per annum, 2006)	1.6
Rural population growth rate 2000–2005	(% per annum, 2006)	−0.4
Primary-secondary gross enrolment ratio	(women/men, per 100, 2006)	100/99

Source: United Nations Statistics Division

The main points for South Africa's social indicators are as follows.[12]

- South Africa's population growth has slowed, to an estimated average of 0.8% per year between 2003 and 2007. This largely reflects the impact of HIV/AIDS.
- Continuous migration from rural areas and from other countries in the region to South Africa's urban areas means that more than 50% of the total population is now living in towns and cities. Rapid urbanization has put huge strains on the municipal authorities in the cities.

5) Zambia

The main social indicators of Zambia are summarized in Table 2.1.30.

Table 2.1.30 Main Social Indicators of Zambia

Item	Unit	
Population in 2007	(projected, 000)	11,922
Surface area	(square kms)	752,618
Population density	(per square km)	15.8
Population growth rate 2005–2010	(% per annum)	1.9
Population aged 0–14 years	(%, 2006)	46.0
Population aged 60+ years	(women/men, % of total, 2006)	5.0/4.0
Sex ratio	(men per 100 women, 2006)	99.3
Life expectancy at birth 2005–2010	(women/men, 2006)	42/42
Urban population	(%, 2006)	35
Urban population growth rate 2000–2005	(% per annum, 2006)	1.9
Rural population growth rate 2000–2005	(% per annum, 2006)	1.76
Primary-secondary gross enrolment ratio	(women/men, per 100, 2006)	76/82

Source: United Nations Statistics Division

[12] Source: EIU, "Country Profile 2008 South Africa"

Main points for Zambia's social indicators are as follows.[13]

- The impact of HIV/AIDS has slowed population growth. Another growing problem is urbanization: rural-to-urban migrants have put pressure on employment structures, housing needs and security.
- Income distribution is highly skewed, with the majority earning very little while a minority enjoys a comfortable living. Subsistence agriculture is the biggest single employer.

6) Zimbabwe

The main social indicators of Zimbabwe are summarized in Table 2.1.31.

Table 2.1.31 Main Social Indicators of Zimbabwe

Item	**Unit**	
Population in 2007	(projected, 000)	13,349
Surface area	(square kms)	390,757
Population density	(per square km)	34.2
Population growth rate 2005–2010	(% per annum)	1.0
Population aged 0–14 years	(%, 2006)	38.0
Population aged 60+ years	(women/men, % of total, 2006)	6.0/4.0
Sex ratio	(men per 100 women, 2006)	98.9
Life expectancy at birth 2005–2010	(women/men, 2006)	43/44
Urban population	(%, 2006)	36
Urban population growth rate 2000–2005	(% per annum, 2006)	1.9
Rural population growth rate 2000–2005	(% per annum, 2006)	-
Primary-secondary gross enrolment ratio	(women/men, per 100, 2006)	67/70

Source: United Nations Statistics Division

Main points for Zimbabwe's social indicators are as follows.[14]

- Population growth is either low, or negative. This reflects a combination of the HIV/AIDS pandemic and emigration.
- Land has always been a central and controversial issue in Zimbabwe, because of highly skewed distribution. However, in recent years the issue has been reignited for political reasons, notably the president's waning popularity since 1999.

(3) Export and Import

1) Angola

The trade of Angola and main trading partners are summarized in Tables 2.1.32 and 2.1.33. Total exports including others increased from US$ 9,508 million to US$ 45,026 million from 2003 to 2007 with a 4.7 times growth rate. The most rapid growth rate is recorded by crude oil at 5.0 times followed by refined petroleum at 2.4 times and diamonds at 1.6 times. The largest shares are occupied by crude oil at 95.4% followed by diamond at 2.8% and liquefied natural gas at 1.1% in 2007. Total imports increased from US$ 5,480 million to US$ 12,289 million, by 2.2 times, which is a slightly smaller growth rate than exports. Exports are much higher than imports (by more than three times) in 2007.

Principal export partners include the United States at 34.9% followed by China at 32.0%. These two countries occupy almost 70% of all exports. Imports are dominated by Portugal at 18.2%

[13] Source: EIU, "Country Profile 2008 Zambia"
[14] Source: EIU, "Country Profile 2008 Zimbabwe"

followed by the United States at 10.1%, South Korea at 9.6%, and China at 9.5%. It could be observed that the United States and China have a relatively high contribution to both exports and imports.

Table 2.1.32 Composition of Trade of Angola

(Unit: US$ m)

	2003	2004	2005	2006	2007[a]	Growth Rate (2003-2007)
Exports FOB						
Crude oil	8,533.00	12,441.00	22,583.00	29,928.60	42,947.90	5.0
Diamonds	788.1	789.6	1,092.00	1,155.00	1,270.00	1.6
Refined petroleum	138.5	147.6	241.8	294.6	327.6	2.4
Liquefied natural gas	15.7	30.4	29.5	259.8	480	30.6
Total exports incl. others	9,508.00	13,475.00	24,109.00	31,083.60	45,026.40	4.7
Imports CIF	5,480.10	5,831.80	8,353.20	8,777.60	12,288.60	2.2

Source: EIU, "Country Profile 2008 Angola"
Note a: Estimated

Table 2.1.33 Main Trading Partners of Angola

(Unit: % of total)

	2002	2003	2004	2005	2006
Exports FOB to					
US	48.2	37.8	39.8	38.1	34.9
China	23.6	35.7	29.6	34.2	32.0
France	7.4	6.5	7.8	4.9	6.4
Netherlands	0.2	0.0	0.5	0.3	3.3
Imports CIF from					
Portugal	18.1	13.1	13.3	14.9	18.2
US	12.1	9.3	12.4	15.1	10.1
South Korea	0.6	28.4	20.3	10.0	9.6
China	3.6	2.8	5.0	8.7	9.5

Source: EIU, "Country Profile 2008 Angola"

2) Botswana

The trade composition of Botswana and its main trading partners is summarized in Tables 2.1.34 and 2.1.35.

Total exports including others increased from US$ 2,425 million to US$ 4,587 million from 2002 to 2006 by a 1.9 times growth rate. The highest growth rate is recorded in copper and nickel at 8.5 times followed by soda ash at 1.9 times, and diamonds at 1.7 times. The largest shares in exports are occupied by diamonds as 74.5% followed by copper and nickel at 14.2% in 2006. These two commodities occupy around 80% of exports. Total imports including others increased from 1,845 million US$ to 3,043 million US$ by 1.6 times which is a slightly smaller growth rate than exports. The highest growth is recorded by fuels at 4.3 times followed by machinery and electrical goods at 1.4 times. The largest shares in imports are occupied by fuels at 17.3% followed by machinery and electrical goods at 16.8% in 2006. Exports have been slightly more than the imports.

The export partners are mostly occupied by the UK at 73.0% and most imports are occupied by SACU (South African Customs Union) at 86.5% and the shares of other countries are extremely low. It could easily be recognized that the trade of Botswana is mostly dependent on the UK and SACU.

Table 2.1.34 Composition of Trade of Botswana

(Unit: US$ m)

	2002	2003	2004	2005	2006	Gropwth Rate (2002-2006)
Exports FOB						
Diamonds	1,971.20	2,365.20	2,798.50	3,325.00	3,418.00	1.7
Copper & nickel	76.2	140.3	336.3	460.7	650.3	8.5
Meat & meat products	44.2	52.6	60.5	59.9	61	1.4
Soda ash	42.4	46.4	53.4	64.7	79.9	1.9
Total incl. others	2,425.00	3,024.40	3,695.90	4,429.10	4,587.40	1.9
Imports CIF						
Vehicles & transport equipment	319.9	298.2	461.8	404.5	290.9	0.9
Machinery & electrical goods	373.9	446.7	591.3	529.4	511.6	1.4
Food, drink & tobacco	328.2	410.3	469.1	445.2	422.8	1.3
Fuels	121.4	166.4	380	431	525.6	4.3
Total incl. others	1,845.00	2,448.10	3,363.90	3,246.60	3,042.90	1.6

Source: EIU, "Country Profile 2008 Botswana"

Table 2.1.35 Main Trading Partners of Botswana

(Unit: % of total)

	2002	2003	2004	2005	2006
Exports FOB to					
UK	79.7	77.6	74.4	75.7	73.0
SACU	7.8	8.8	9.6	9.0	6.2
Zimbabwe	2.5	2.9	3.7	4.1	5.4
US	0.7	0.4	1.6	2.2	1.8
Imports CIF from					
SACU	81.3	86.6	83.4	85.1	86.5
Zimbabwe	1.4	1.5	1.5	1.5	1.5
UK	3.1	2.5	3.1	1.3	1.1
US	1.2	0.7	1.3	1.2	0.9

Source: EIU, "Country Profile 2008 Botswana"

3) DRC

The trade composition of the DRC and its main trading partners is summarized in Tables 2.1.36 and 2.1.37.

Total exports including others increased from 1,076 million US$ to 2,319 million US$ during from 2002 to 2006 by a growth rate of 2.2 times. The highest growth rate in exports is copper at 5.8 times followed by crude oil at 2.8 times and cobalt at 2.1 times. Most shares are occupied by diamonds at 38.1% followed by crude oil at 25.0% in 2006. Total imports including others increased from US$ 1,031 million to US$ 2,740 million by 2.7 times which is a higher growth rate than exports. The highest growth is recorded by non-aid related by 3.0 times followed by aid-related at 1.9 times. The largest import shares are occupied by non-aid-related as 75.7%. It is notable that the exports are specified by the mining industry and the imports are simply categorized by the aid-related and the non-aid-related.

The partners of exports are occupied by Belgium at 19.6% followed by China at 18.2%, and Brazil at 10.4%. These three countries occupy around 50% of all exports in 2006. It is notable that the Belgium share has drastically reduced from 55.4% in 2002 but that the other two countries have increased their share. The imports are dominated by South Africa at 18.1% followed by Belgium at 11.2% while shares of the other countries are less than 10%.

Table 2.1.36 Composition of Trade of DRC

(Unit: US$ m)

	2002	2003	2004	2005	2006	Growth Rate (2002-2006)
Exports FOB						
Diamonds	653	957	1,009	1,158	884	1.4
Crude oil	205	251	360	453	580	2.8
Cobalt	175	102	407	260	373	2.1
Copper	44	19	57	113	257	5.8
Total incl. others	1,076	1,340	1,813	2,071	2,319	2.2
Imports CIF						
Aid-related	349	347	448	702	666	1.9
Non-aid-related	682	877	1,305	1,771	2,075	3.0
Total incl. others	1,031	1,223	1,753	2,473	2,740	2.7

Source: EIU, "Country Profile 2008 Democratic Republic of Congo"

Table 2.1.37 Main Trading Partners of DRC

(Unit: %of Total)

	2002	2003	2004	2005	2006
Exports FOB to					
Belgium	55.4	39.2	28.8	22.4	19.6
China	2.3	6.2	8.8	16.2	18.2
Brazil	0.0	0.1	0.0	9.4	10.4
US	15.5	9.0	13.5	3.8	8.2
Finland	4.9	17.2	5.8	5.5	6.0
France	2.5	1.0	6.1	1.4	5.7
Imports CIF from					
South Africa	17.4	18.6	16.7	16.2	18.1
Belgium	15.2	15.6	14.4	9.9	11.2
France	8.3	10.9	8.2	7.8	7.5
Kenya	7.6	8.9	7.1	6.2	7.0
Zimbabwe	0.8	1.1	0.0	0.0	8.3
Zambia	3.9	9.5	6.2	5.5	7.0
US	3.3	6.0	4.1	3.2	4.5

Source: EIU, "Country Profile 2008 Democratic Republic of Congo"
Note: Based on partners' trade returns; subject to a wide margin of error.

4) South Africa

The trade composition of South Africa and its main trading partners is summarized in Tables 2.1.38 and 2.1.39.

Total exports including others increased from US$ 29,793 million to US$ 67,699 million from 2002 to 2006, a growth rate of 2.6 times. Over the same time period, platinum is recorded to increase by 8.7 times. Total imports including others increased from US$ 26,046 million to US$ 67,699 million by 2.6 times which is higher growth rate than the exports as 2.0 times. The highest growth rate is recorded by motor cars and other components at 4.0 times followed by petrochemicals at 3.2 times. The largest shares are occupied by petrochemicals at 12.8% followed by equipment components at 7.4%. It could be observed that the imports have grown larger than exports since 2004.

The partners of exports are dominated by US at 12.1% followed by Japan at 10.0%, and China at 8.5% in 2006. Imports are dominated by Germany at 13.4% followed by China at 10.4%. It is notable that the main partners are all by developed countries.

Table 2.1.38 Composition of Trade of South Africa

(Unit: US$ m)

	2002	2003	2004	2005	2006	Growth Rate (2002-2006)
Exports FOB						
Platinum	853	1,143	4,622	5,332	7,424	8.7
Total incl. others	29,793	36,481	46,208	51,970	58,255	2.0
Imports CIF						
Petrochemicals	2,731	3,562	5,899	6,481	8,654	3.2
Equipment components for cars	2,356	3,219	4,049	4,815	4,994	2.1
Motor cars & other components	961	1,449	2,559	3,629	3,846	4.0
Total incl. others	26,046	34,212	47,501	54,826	67,699	2.6

Source: EIU, "Country Profile 2008 South Africa"

Table 2.1.39 Main Trading Partners of South Africa

(Unit: % of total)

	2002	2003	2004	2005	2006
Exports FOB to					
US	10.5	10.1	9.4	10.4	12.1
Japan	8.6	8.8	9.9	10.7	10.0
China	2.4	2.3	2.6	3.6	8.5
UK	8.7	9.1	9.6	7.9	8.3
Imports CIF from					
Germany	16.3	15.6	15.5	13.9	13.4
China	7.1	8.2	9.9	11.1	10.4
US	10.8	9.3	8.6	8.4	7.6
Japan	7.7	7.5	7.4	7.3	6.4

Source: EIU, "Country Profile 2008 South Africa"

5) Zambia

The trade composition of Zambia and main trading partners are summarized in Tables 2.1.40 and 2.1.41.

Total exports including others increased from US$ 944 million to US$ 3,819 million from 2002 to 2006, a growth rate of 4.0 times. The highest growth rate is recorded by crude minerals (excl. Fuels) at 7.4 times followed by manufactured goods at 3.9 times. The highest share is occupied by manufactured goods at 72.6% and the shares of other commodities are less than 20 % in 2006. Total imports including others increased from US$ 1,573 million to US$ 3,022 million by 1.9 times, which is a much lower growth rate than exports during 2003 to 2006. The highest growth rate is recorded by fuels at 3.5 times followed by machinery and transport equipment at 2.4 times. The highest shares are occupied by machinery and transport equipment at 39.9%. It could be observed that the exports overtaken imports in 2006.

The partners of exports are occupied by Switzerland at 33.6% followed by South Africa at 20.3% in 2006. These two countries occupy around 50% of all exports in 2006. It is noticeable that the share of Switzerland has rapidly increased its share from 8.1% in 2002. The most imports are occupied by South Africa as 47.7% followed by the United Arab Emirates at 10.0%. These two countries occupy around 60% of all exports. It could easily be recognized that South Africa and China are the main partners both of exports and imports.

Table 2.1.40 Composition of Trade of Zambia

(Unit: US$ m)

	2002	2003	2004	2005	2006	Growth Rate (2002-2006)
Exports FOB						
Manufactured goods (chiefly refined copper)	715.3	741.6	1,016.00	1,558.00	2,772.10	3.9
Crude materials (excl fuels)	72.9	91.5	237.6	258.4	536.8	7.4
Food & live animals	69.6	75	152.1	172.9	139.4	2.0
Total incl. others	944.3	1,090.40	1,846.90	2,210.40	3,819.20	4.0
Imports CIF						
Machinery & transport equipments	n/a	504.4	670.6	814.2	1,207.20	2.4
Fuels	n/a	128.8	244.1	279.1	453.2	3.5
Chemicals	n/a	291.5	345.3	457.5	446.1	1.5
Manufactured goods (chiefly refined copper)	n/a	249.7	314.2	405.8	429.1	1.7
Total incl. others		1,572.70	2,149.60	2,576.60	3,022.40	1.9

Source: EIU, "Country Profile 2008 Zambia"
Note: The growth rate of imports and total are for the period from 2003 to 2006

Table 2.1.41 Main Trading Partners of Zambia

(Unit: % of total)

	2002	2003	2004	2005	2006
Exports FOB to					
Switzerland	8.1	16.2	28.7	38.4	33.6
South Africa	21.6	24.4	18.6	21.6	20.3
China	1.7	2.2	2.1	10.3	8.5
Italy	0.2	0.2	0.4	0.1	5.8
Imports CIF from					
South Africa	48.4	46.2	47.6	47.3	47.7
UAE	4.3	6.8	3.7	10.4	10.0
China	2.7	2.1	3.3	2.7	5.8
Zimbabwe	12.8	5.8	4.3	5.7	5.7

Source: EIU, "Country Profile 2008 Zambia"

6) Zimbabwe

The trade composition of Zimbabwe and its main trading partners is summarized in Tables 2.1.42 and 2.1.43.

Total exports including others increased from US$ 2,371 million to US$ 1,886 million from 2000 to 2004 by a negative growth rate at only 0.8 times. The most rapid growth rate is recorded by nickel at 9.7 times followed by platinum at 2.7 times, minerals at 1.4 times, and gold at 1.2 times. The remainder of exports show a decrease since the growth rate is less than 1.0. The largest number of shares is occupied by minerals at 32.0% followed by agricultural exports at 20.4%, gold at 13.9%, and tobacco at 12.0% in 2004. Total imports including others increased from US$ 1,238 million to US$ 1,441 million by 1.2 times. The highest growth is recorded by food at 2.6 times followed by chemicals at 1.3 times and fuels and electricity at 1.2 times. Most shares are occupied by fuels and electricity at 32.1% followed by machinery and transport equipment at 28.9% and so on. It is notable that it is the only surrounding country with a decrease in exports and the growth rate of imports is the lowest of all surrounding countries.

The partners of exports are occupied by South Africa at 43.5% followed by three countries at less than 9%. Most imports are occupied also by South Africa at 46.1% and the shares of other countries are less than 6%. It could easily be recognized that both of the exports and the imports are mainly depending on the three countries of South Africa, China and Zambia.

Table 2.1.42 Composition of Trade of Zimbabwe

(Unit: US$ m)

	2000	2001	2002	2003	2004	Growth Rate (2000-2004)
Agricultural exports	856	833	647	516	384	0.4
Tobacco	549	594	435	321	227	0.4
Horticulture	125	119	127	119	84	0.7
Sugar	96	70	64	55	54	0.6
Mineral	440	391	298	391	604	1.4
Gold	216	226	160	152	263	1.2
Nickel	11	18	15	77	174	9.7
Platinum	78	35	32	69	96	2.7
Total exports FOB	2,371	2,286	1,778	1,700	1,886	0.8
Machinery & transport equipment	493	424	375	341	417	1.0
Fuels & electricity	372	335	352	456	462	1.2
Food	62	68	337	206	161	2.6
Chemicals	311	408	361	328	401	1.3
Total Imports CIF	1,238	1,235	1,425	1,331	1,441	1.2

Source: EIU, "Country Profile 2008 Zimbabwe"

Table 2.1.43 Main Trading Partners of Zimbabwe

(Unit: % of total)

	2002	2003	2004	2005	2006
Exports FOB to					
South Africa	23.6	41.9	33.2	33.1	43.5
China	2.1	6.2	6.4	9.8	8.5
Zambia	8.9	3.1	4.2	6.8	8.4
Japan	13.6	7.8	3.2	8.3	8.0
Imports CIF from					
South Africa	42.7	20.5	52.6	52.5	46.1
China	1.1	2.1	2.6	5.7	5.9
Botswana	2.2	0.7	4.0	4.1	4.8
Zambia	0.5	0.9	3.4	3.4	4.1

Source: EIU, "Country Profile 2008 Zimbabwe"

(4) Industrial Development Plans

1) Angola

Angola's government is pursuing its own "home-grown" economic programme, which it believes is sufficient to ensure macroeconomic stability, boost economic growth, stimulate private-sector activity, and reduce poverty.

The Government has shown strong commitment to pursuing economic and structural reforms to enable private sector development while moving from an oil to a non-oil driven economy. Direct spill-over effects from the oil sector to the rest of the economy have, however, been limited.

Prudent macroeconomic policies have yielded good results over recent years and Angola was considered in 2007 as one of the fastest growing economies in Africa. These policies are expected to be pursued by the government in order to reach the convergence indicators set by SADC countries.

2) Botswana

Two of the Botswana government's main policy objectives are economic diversification and job creation. However, these will be difficult to achieve, because as developing new industries

require improved national infrastructure, development plans are continually hampered by weak administrative capacity and limited capacity in the construction sector.

Botswana has considerable prospects for growth. Proven reserves in the mines already in production are estimated to last for some thirty years, at current rates of operation. Prospecting is also continuing at a strong pace and preliminary findings suggest substantial deposits of precious minerals that are yet to be exploited. Vast coal reserves could also be exploited to boost thermal energy for the industrial sector.

In spite of this remarkable economic performance, Botswana's economy continues to face some challenges. These include an inadequate capacity, an undiversified economy, and a small internal market.

3) DRC

The DRC's government prepared a medium-term priority programme (2007–2011) in 1997, based on the main priority areas defined by the country's president. Subsequently, the government and its development partners agreed to a Country Assistance Framework (CAF) which was presented at the Consultative Group meeting in November 2007. Both bilateral and multilateral development partners promised to provide sustained support to the country estimated at US$ 4 billion over the three years (2008–2010).

4) Republic of South Africa (RSA)

The impact of South Africa's electric power shortage on production, especially in the mines and other energy intensive industries, has led to a significant downward revision of the economic growth forecasts. Although the medium- to long-term growth outlook in South Africa remains robust, higher input costs, arising from higher domestic inflation and higher international commodity prices, coupled with higher costs of borrowing and the growing energy crisis portends fragile growth in the short- to medium-term. In spite of these challenges, foreign investors remain confident of South Africa's growth potential. Foreign investment continues to play an important role in the South African economy.

5) Zambia

Future prospects for economic growth remain positive if international commodity prices remain favourable. The new fiscal regime for the mining sector, which aims at bringing the sector in line with international benchmarks and ensuring equitable distribution of the mineral wealth between the state and mining companies, is also expected to boost government revenue for development programmes. The amendment of the Mines and Minerals Act of 1995 allows, among other changes, for the revision of the mineral royalty from base metals from 0.6% to 3.0%. However, high international oil prices remain a factor that could have an adverse impact on business as the country is a net oil importer. Zambia has also been affected by the global rise in food prices but is examining possibilities of how it could turn this situation to its advantage.

6) Zimbabwe

Zimbabwe used to have one of the largest, most diversified and well-integrated manufacturing sectors in Sub-Saharan Africa. However, the sector has since been affected by the general macroeconomic deterioration in the country, most notably from the decreased competitiveness caused by the overvalued exchange rate, the drying-up of foreign exchange for inputs and more recently, price controls. Worsening the situation, in early 2008 the government implemented its Indigenisation and Empowerment Act. The new law stipulates that black Zimbabweans must own at least 51% of the shares of every public company and all other businesses (except those

in the mining sector, which will fall under a separate indigenisation law). Currently, Zimbabwe is struggling to recover from its confused economic situation.

2.2 Transport Network in Namibia and Her Neighbouring Countries

2.2.1 Current Maritime Transport Network

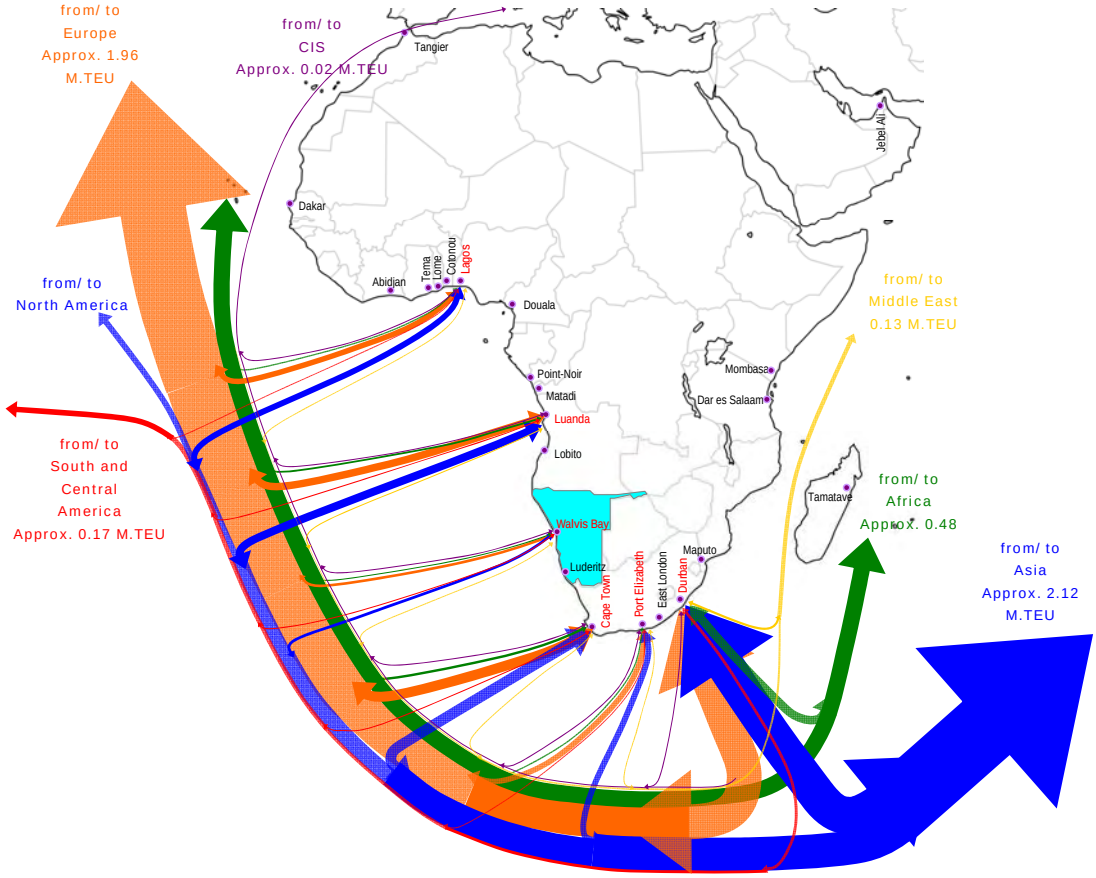
The Port of Walvis Bay is offering one of the shortest seaborne access routes and natural gateways for international trade to and from the SADC region to Europe, South America and the Asia Pacific Region. Because of the Port of Walvis Bay is situated in the central coastal region of Namibia, Namport recognises the port's important role as a hub for trade to central and southern Africa.

The port consists of two harbours, the commercial harbour and the fishing harbour. The Commercial harbour offers a range of terminal facilities that can handle solid and liquid bulk, break-bulk, containers and frozen products. In the midst of the busy ports of Durban in RSA and Luanda in Angola, Walvis Bay has been framed in as an inactive port and had market awareness next to nothing among mega-carriers until 2007. However, due to the synergy effects of the Walvis Bay Corridor Group (WBCG) and the enthusiasm of the Namibian Ports Authority (Namport), the Port of Walvis Bay has started a new era and has established a world class multi-purpose port.

(1) Maritime Transport Network

Currently, five major deep sea carriers are calling at the Port of Walvis Bay. They are MSC, MACS, Maersk-Sealand and its group of companies, CMA/CGM and its subsidiary Delmas Line and Mitsui OSK Line since June 2009.

Directly or via the Internet, JICA Study Team collected shipping routes and schedules of all the shipping lines who have scheduled calls as of August 2009 on the west, south and east coasts of Africa. This information is depicted in Figure 2.2.1 below.



Source: JICA Study Team

Figure 2.2.1 Current Existing South Africa/Asia, Europe, Americas Routings – Trunk and Feeder

There are four main maritime routes namely, Europe–Africa, South America–Africa, Asia–Africa and Middle East/South Asia–Africa.

For the Europe–Africa Route, the maritime routes servicing the ports of the West Africa like Tema, Cotonou, and Lomé, are completely separated from those servicing Walvis Bay or the ports of South Africa. Currently, there is no maritime route from Europe directly servicing the West Coast of Africa, like Angola. Walvis Bay is considered to be the best gateway for cargo from Europe to the land locked countries of Southern Africa in transporting cargo from South America.

From the South America–Africa Route, only the Port of Walvis Bay and a few ports of South Africa are currently receiving maritime services. The Port of Walvis Bay is a transhipment port for the container cargos from South America to the ports of the west coast of Africa like Luanda in Angola. It has promising potential as a transhipment port to the ports of West Africa.

There are five maritime sub-routes in connection with Asia–Africa Route. They are the routes of 1) Asia–South Africa, 2) Asia–East Coast of Africa, 3) Asia–West Africa Direct, 4) Asia–West Africa via South Africa or Namibia and 5) Asia–East Africa–South Africa–West Africa. It is notable that all the shipping lines provide services to the ports of Southern Africa before going to call at the ports of West Africa, which are very congested and have ships wait for the berthing for many days. Among the sub-routes of the Asia–Africa Route, the above 1) and 2) are not

relevant to Walvis Bay. On the sub-route 4) a mega carrier is currently calling at Walvis Bay on the way to West Africa in connection with the sub-routes 3) and 5), and when the new container terminal is built, Walvis Bay is a potential container transhipment port to the West Africa as well as the gateway port to the land-locked countries of Southern Africa in transporting cargo from Asia.

As it is located at the opposite side of the continent, there will be no big role that the Port of Walvis Bay can play in connection with the Middle East/South Asia–Africa Route.

(2) Typical Maritime Routing Networks to and from South and West Africa

Basic Routings:

- Far East to South West Africa
- Asia Pacific Region to East, West and South West Africa
- Europe to West Africa
- Europe to South Africa
- Asia to South West Africa and South America
- North America East Coast to South Africa

Source: Routing Map – Delmas

Figure 2.2.2 Asia/Africa Routing

Table 2.2.1 Current South Africa Routings by Carriers

Carrier/Group	T/S Port	Rotation	Frequency	Ships Deployed
Cosco/EMC	HKG/KHH	Shanghai/Ningbo/KHH/HKG/PTP/Durban – Cape Town	Weekly	3,400TEU x 8
CMA/CSCL	Shanghai	Pusan/Shanghai/Xiamen/Chiwan/PKL Durban – Santos	Weekly	2,000 – 4,000 x 10
CMA/CGM Delmas	Port Kelang	Port Kelang/**Walvis Bay**/Tema/Abidjan/ Lagos/Port Kelang	Weekly	1,997-2,002 x 4
CSAV	Shanghai	Pusan/Shanghai/HKG/Spore/PTP/	Weekly	3,000 TEU x 8
Hamburg Sued/Maersk (Safmarine)	Pusan/PTP	Durban – Santos-Rio de Janeiro	Weekly	6,500 TEU x 10
K Line/MISC/PIL	Singapore	Shanghai/Ningbo/KHH/Shekou/HKG/Spore – Durban – Santos	Weekly	3,500 TEU x 7
	Feeder (KL)	Cape Town/Abidjan/Tema/Lome/Lagos/ Luanda	Weekly	
MOL	Singapore	1. HKG/Singapore – Durban – Santos	Weekly	3,700 TEU x 11
		2. Singapore/Reunion/Tamatave/Maputo/ **Walvis Bay**/Lagos/Tema/Abidjan/Santos Rio de Janeiro/Luanda/Singapore	Weekly	1,991-2,003 x 7
		3. Singapore/Durban/Singapore		
		4. Singapore/Cape Town/Douala/Singapore		
		5. Singapore/Jieprouge/Lagos/Singapore		
		6. Singapore/Tanjeer/Dakar/Abidjan/ Tema/ Lome/Cotonou/Singapore		
		7. Mare/Maher/Mombasa/Tanga/Dar es Salaam		
Evergreen (EMC)		Kaohsiung/ Hong Kong/ PTP/ Singapore/ Durban/ Cape Town/ Kaohsiung	Weekly	2,758-3,400 x 6
MSC	HKG	1.HKG/Spore-Port Louis-Durban-P. des Galets	Weekly	4,000 TEU x 7
		2. Chiwan/Hong Kong/Durban/**Walvis Bay**/Lome/Lagos/Chiwan	Weekly	2,686-4250 x 7
Maersk/Safmarine	T.Pelepas	1. PTP/**Walvis Bay**/Abidjan/Tema/Lagos	Weekly	4,400 TEU x 7
	Hong Kong	2. Hong Kong/Shanghai/Ningbo/Yatian PTP/Durban/Port Elizabeth/Cape Town	Weekly	2,200 TEU x 6
	Shanghai	3.Shanghai/ Ningbo /Hong Kong/ Nansha PTP/ Lome/ Cotonou/ Lagos		
	T.Pelepas Feeder Loop	4. PTP/Port Louis/Tamatave/Maputo/PTP/ Abidjan/Bata/Calabar/Port Gentil/Abidjan Pointe Noire/Matadi/Pointe Noire		
PIL	Singapore	1. Singapore/Santos/Buenos Aires/Rio De Janeiro/Cape Town/Singapore	Weekly	2,800-3,250 x 11
		2. Singapore/Cape Town/Cotonou/Lagos Tema/Lome/Douala/Pasir Gugang	Weekly	1,250-1,400 x 9
		3. Singapore/Durban/Tema/Lagos/Lome Abidjan/Singapore	Weekly	330 x 6
		4. Nhava Sheva/Jebel Ali/Durban/Cotonou Cape Town/Durban/Singapore	12 days	850 x 5
		5. Singapore/Durban/Luanda/Singapore	21 days	1,000-1,200 x 3

Carrier/Group	T/S Port	Rotation	Frequency	Ships Deployed
		6. Shanghai/Ningbo/Kaohsiung/ Hong Kong Port Kelang/Durban/Cape Town/ Singapore	Weekly	1,250 x 7
		7. Shanghai/ Ningbo/ HKG/ Huangpu/ Kuantan/ Singapore/ Port Louis/ Reunion / Tamatave Mombasa/ Singapore	Weekly	1,250 x 7
		8. Singapore/Dar es Salaam/Pasir Gudang	18 days	950 x 3
		9. Nhava Sheva/Jebel Ali/Mombasa/Dar es Salaam/Karachi/Nhava Sheva	Weekly	850 x 4
MACS	Immingham	Immingham/**Walvis Bay**/ Cape Town/Port Elizabeth East London/ Durban/ Maputo/ Richards Bay	Weekly	
AMEX SERVICE (Maersk/ Safmarine/MSC New York/ Baltimore/ Norfolk/ Charleston Consortium)		New York/ Baltimore/ Norfolk/ Charleston Freeport/Cape Town/Port Elizabeth/ Durban/New York	Weekly	4,600 x 8

Source: Routing Map – MACS

Figure 2.2.3 Europe/Mediterranean–Africa Routing

Table 2.2.2 Carriers Currently Calling at the Port of Walvis Bay

1	Maersk Line/Safmarine & P&O NEDLLOYD
2	MSC – Cheetah Loop
3	CMA/CGM Delmas
4	MOL - from Asia only
5	MACS from Europe only
6	OACL - Regional Feeder service

(3) Important Carriers – Namport Focus

- Pacific International Lines (PIL) / Singapore: Showing interest in Namport
- K Line / Japan: Having hectic problems around Luanda/showing interest in Namport's
- MOL / Japan: Busiest Loop of Europe/Africa service
- Evergreen Line (EMC) / Taiwan: Calling Durban and Cape Town for South America Service
- Hyundai Line / Korea: Korea's biggest conglomerate calling Durban only for South
- (HMM) America service
- Hanjin Line (HJCL)/ Korea: Korea's leading shipping line not calling Africa
- COSCO / China: Calling Cape Town and Durban for South America Service

2.2.2 Cargoes Currently Handled at the Port of Walvis Bay

(1) Cargoes by Main Commodity

Table 2.2.1, Figure 2.2.1 and 2.2 show the historical behaviour of the cargo volume handled by the Port of Walvis Bay. The total cargo volume of the Port of Walvis Bay has increased from 2,310.3 thousand FT (freight tonnes) in 2000 to 4,795.6 thousand FT in 2008 by an average annual growth rate of 9.6%.[15]

For imports, they grew from 1,523 thousand FT to 2,725.5 thousand FT in 2008 by a growth rate of 7.5%. The highest growth is shown by vehicles at 44.7% followed by cement as 31.6%, coal at 27.9% and others at 20.2%.

The main reasons for the increase of main cargoes are as follows:

- Cement: 2010 world cup to be held in South Africa
- Vehicle : Increase of transit to Angola demand + congestion in Luanda
- Other : Increase of transit to Angola + uranium mines

The highest decrease is recorded by lubricant oil at -43.1% followed by manganese ore at 16.5%, fish products at -7.5%, and wheat at 3.5%. The decrease of lubricant is mainly caused by the decline of fishing industry. Other cargoes have not changed drastically.

For exports, they grew from 745.3 thousand FT to 1,300.9 thousand FT by a growth rate of 7.2%. The highest growth rate is shown by charcoal at 214.7% followed by marble and granite at 32.8% and Manganese ore at 32.6%. The most severe decrease is shown by flat cartons at −11.6% followed by fertilizer at −8.7% while skins and hides were at −5.9%. The main reasons for high growth of these cargoes are as follows:

[15] Definitions regarding on container transport are as follows; (i) cargo volume : transported quantity of cargo in freight ton ; (ii) container cargoes: transported volume of container in TEU; (iii) reefer container: refrigerated shipping container for transporting perishables, having its own stand-alone (self-powered) cooling system

- Manganese ore : Development of new mines
- Marble and granite : Increase of demand + raise in market price
- Charcoal : New factory was opened

Transhipment has increased from 41,921 FT in 2000 to 769,157 FT in 2008 by the drastically high growth rate of 43.8% averaged per annum. Especially, general cargo has increased by a growth rate of 81.7% followed by foodstuffs at 57.8% but fish products show a fall of −7.5%. Highly efficient handling machines for container cargoes such as the reach-stackers and the ship-to-shore mobile cranes were introduced to cope with the extreme growth in 2006.

On the other hand, total cargo volume during five months (January to May) from 2008 to 2009 has experienced a decline of −6.5%. Imports and the exports decreased by −13.2% and −26.4% respectively. However transhipment recorded an increase of 104.4%. There are commodities which showed high growth such as copper/lead and concentrate at 148.1%, vehicles at 80.9%, manganese ore at 70.0%, sugar at 58.9% and malt at 51.9%. This contrasts with drastic decreases in coal at −85.7% and sulphuric acid at −65.4%. The table below details these statistics.

Table 2.2.3 Historical Performance of Cargo Volume by Main Commodities at the Port of Walvis Bay

(Unit : Freight Ton)

Category of Handling	Category of Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009.5	Average Annual Growth (%)	
												2000/2008	2008.5/ 2009.5
Imports	Petroleum	802,547	935,111	712,438	606,467	672,699	761,893	782,161	624,679	883,014	259,791	1.2	-31.8
	Fish Products	172,362	150,322	134,945	111,582	120,825	131,608	119,405	94,197	92,554	42,675	-7.5	3.0
	Coal	21,674	18,970	30,146	34,523	63,587	11,227	104,402	86,142	154,875	9,606	27.9	-85.7
	Sugar	54,566	52,060	71,781	42,353	33,475	41,888	53,975	54,893	59,501	29,762	1.1	58.9
	Wheat	40,728	34,108	34,700	52,056	40,418	30,169	52,005	38,704	30,171	9,600	-3.7	-36.3
	Copper / Lead and Conc.	0	11,497	20,587	11,962	5,548	0	0	9,184	53,244	48,893	-	148.1
	Mangnese Ore	63,414	0	22,307	19,751	21,554	3,000	23,017	25,712	15,023	8,515	-16.5	70.0
	Sulphuric acid	182,706	151,822	174,324	177,821	211,472	195,908	185,991	237,824	447,449	87,448	11.8	-65.4
	Cement	15,328	16,534	12,325	3,834	65	54,153	36,438	103,055	138,294	68,855	31.6	-37.3
	Malt	19,842	22,177	22,505	20,465	21,683	25,273	22,259	28,405	27,874	17,644	4.3	51.9
	Wine	3,391	2,789	18,389	29,704	40,699	43,944	24,655	14,050	8,888	3,410	12.8	13.9
	Vehicles	13,740	19,803	18,479	27,608	35,140	48,642	86,043	145,107	263,483	149,564	44.7	80.9
	Lubricatting Oil	5,972	5,701	4,309	3,254	643	330	370	38	66	154	-43.1	-
	Other	126,757	218,778	215,516	210,980	228,758	251,348	446,248	591,744	551,096	418,732	20.2	30.0
	Total	1,523,026	1,639,671	1,492,749	1,352,361	1,496,566	1,599,383	1,936,969	2,053,733	2,725,532	1,154,649	7.5	-13.2
Exports	Salt Bulk and Bagged	433,865	499,402	513,642	544,065	769,149	595,014	504,264	641,082	699,064	183,405	6.1	-32.4
	Fish Products	85,216	92,381	122,652	113,284	116,758	129,066	105,833	137,648	132,281	64,214	5.7	4.7
	Copper / Lead and Conc.	41,393	31,287	72,116	43,383	51,974	60,280	42,434	73,392	52,469	26,884	3.0	24.0
	Fluorspar	67,325	67,071	82,543	82,846	100,637	112,824	107,563	113,495	118,317	40,468	7.3	-22.7
	Mangenese Ore	9,200	0	0	0	0	26,011	0	36,099	88,130	31,015	32.6	21.9
	Marble and Granite	3,876	5,584	14,205	9,284	22,421	24,308	29,165	39,752	37,435	4,669	32.8	-76.7
	Skins and Hides	5,267	4,610	3,165	5,191	5,336	5,851	4,297	3,264	3,234	2,222	-5.9	236.7
	Flat Cartons	24,099	23,112	26,649	23,016	13,699	11,359	4,971	4,681	9,123	8,052	-11.4	1,280.0
	Charcoal	4	4,456	6,498	7,111	9,071	11,486	18,368	21,682	38,500	16,720	214.7	1.6
	Fertilizer (Guano)	1,554	1,229	1,258	1,129	2,028	1,463	665	948	748	682	-8.7	72.2
	Other	73,585	82,008	69,785	69,039	80,915	80,465	62,800	96,212	121,640	25,057	6.5	-67.7
	Total	745,385	811,141	912,514	898,348	1,171,988	1,058,127	880,361	1,168,257	1,300,941	403,387	7.2	-26.4
Transhipment	Fish Products	35,604	50,595	33,101	53,061	39,622	19,826	19,178	13,252	19,136	18,373	-7.5	633.0
	Foodstuffs	40	1,821	14,010	166	727	44	708	3	1,524	0	57.8	-
	General Cargo	6,307	8,759	2,898	19,193	258,847	334,786	729,958	698,402	748,497	346,775	81.7	96.8
	Total	41,951	61,175	60,395	72,420	299,197	354,656	749,844	711,657	769,157	365,148	43.8	104.4
Grand Total		2,310,362	2,511,986	2,465,658	2,323,129	2,967,751	3,012,166	3,567,174	3,933,647	4,795,630	1,923,183	9.6	-6.5

Source: Statistic Section of Business Intelligence Division of NAMPORT.

Note: 1. The all data in the Year of 2009 and sub total of the exports, imports and transhipment from2003 to 2008 were revised by the JICA Study Team on the basis of understanding of the staffs of Statistics Section.

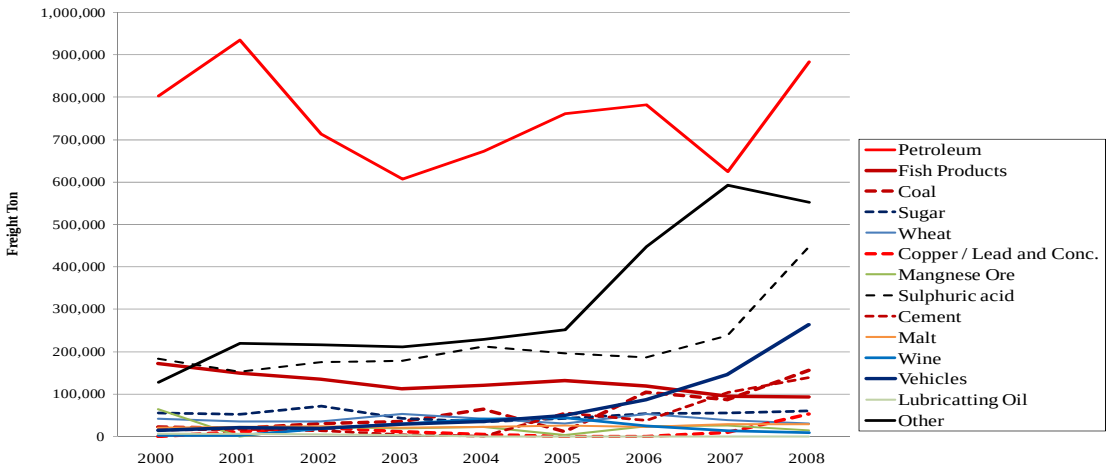


Figure 2.2.4 Historical Performance of Cargo Volume of Imports by Main Commodity at the Port of Walvis Bay

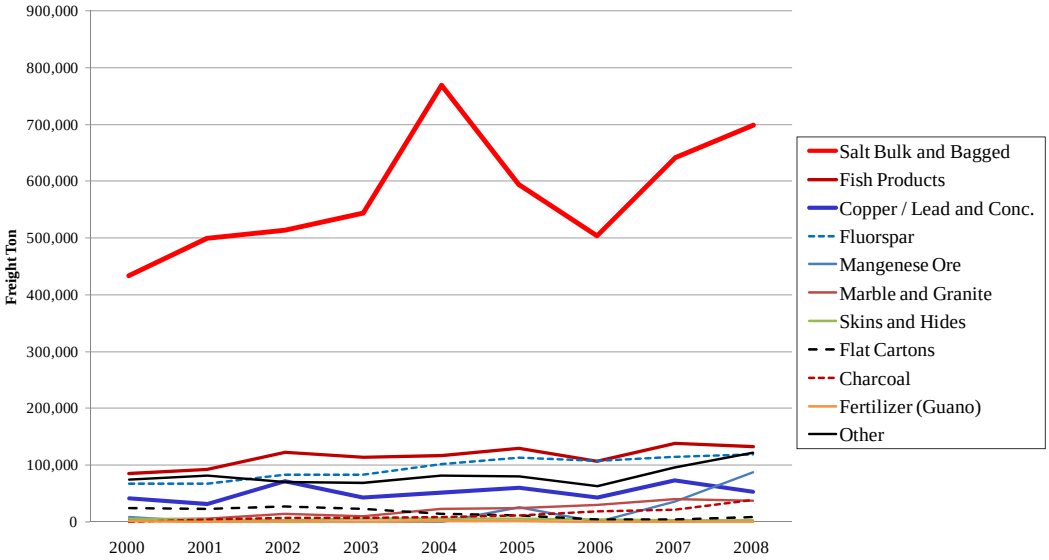


Figure 2.2.5 Historical Performance of Cargo Volume of Exports by Main Commodity at the Port of Walvis Bay

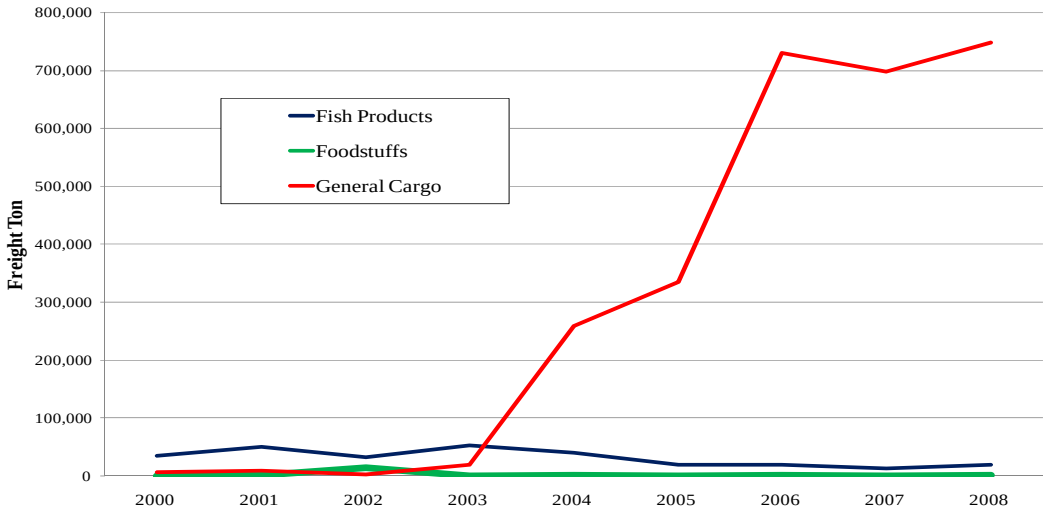


Figure 2.2.6 Historical Performance of Cargo Volume of Transhipment by Main Commodity at the Port of Walvis Bay

Table 2.2.3 shows the historical performance of share of cargo volume by main commodity at the Port of Walvis Bay. The share of imports and the exports decreased from 65.9% to 56.8% and from 32.3% to 27.1% during the period from 2000 to 2008 while transhipment drastically increased its share from 1.8% to 16.0% during the same period. The highest increase by share of imports is recorded by others from 5.5% to 11.5% followed by vehicles from 0.6% to 5.5%, coal from 0.9% to 3.2% and sulphuric acid from 7.9% to 9.3%. The most drastic decrease of share was recorded by petroleum from 34.7% to 18.4% followed by fish products from 7.5% to 1.9%. These trends seem to have accelerated during the first five months of 2009 (from January to May).

There is no cargo which has drastically increased its share by an outstanding margin. Manganese ore increased its share from 0.4% to 1.8%, marble and granite from 0.2% to 0.8% and charcoal from 0.0% to 0.8%. The majority of cargo recorded a decrease in the overall share shares. The largest decrease by share is shown by salt bulk and bagged from 18.8% to 14.4% followed by fish products from 3.7% to 2.8%. These characteristics were also intensified during the first five months in 2009.

On the contrary, the share of transhipment increased its share by a considerable margin from 1.8% to 16.0%. In particular, general cargo recorded a drastically high growth rate from 0.3% to 16.0% and 19.0% in 2009 and occupies around one fifth of all commodities at present. It means that the Port of Walvis Bay has strengthened its roles as a hub port in the Southwest region of Africa.

Table 2.2.4 Historical Performance of Share of Cargo Throughput by Main Commodity of the Port of Walvis Bay

(Unit : %)

Category of Handling	Category of Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009.5
Imports	Petroleum	34.7	37.2	28.9	26.1	22.7	25.3	21.9	15.9	18.4	13.5
	Fish Products	7.5	6.0	5.5	4.8	4.1	4.4	3.3	2.4	1.9	2.2
	Coal	0.9	0.8	1.2	1.5	2.1	0.4	2.9	2.2	3.2	0.5
	Sugar	2.4	2.1	2.9	1.8	1.1	1.4	1.5	1.4	1.2	1.5
	Wheat	1.8	1.4	1.4	2.2	1.4	1.0	1.5	1.0	0.6	0.5
	Copper / Lead and Conc.	0.0	0.5	0.8	0.5	0.2	0.0	0.0	0.2	1.1	2.5
	Mangnese Ore	2.7	0.0	0.9	0.9	0.7	0.1	0.6	0.7	0.3	0.4
	Sulphuric acid	7.9	6.0	7.1	7.7	7.1	6.5	5.2	6.0	9.3	4.5
	Cement	0.7	0.7	0.5	0.2	0.0	1.8	1.0	2.6	2.9	3.6
	Malt	0.9	0.9	0.9	0.9	0.7	0.8	0.6	0.7	0.6	0.9
	Wine	0.1	0.1	0.7	1.3	1.4	1.5	0.7	0.4	0.2	0.2
	Vehicles	0.6	0.8	0.7	1.2	1.2	1.6	2.4	3.7	5.5	7.8
	Lubricatting Oil	0.3	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Other	5.5	8.7	8.7	9.1	7.7	8.3	12.5	15.0	11.5	21.8
	Total	65.9	65.3	60.5	58.2	50.4	53.1	54.3	52.2	56.8	60.0
Exports	Salt Bulk and Bagged	18.8	19.9	20.8	23.4	25.9	19.8	14.1	16.3	14.6	9.5
	Fish Products	3.7	3.7	5.0	4.9	3.9	4.3	3.0	3.5	2.8	3.3
	Copper / Lead and Conc.	1.8	1.2	2.9	1.9	1.8	2.0	1.2	1.9	1.1	1.4
	Fluorspar	2.9	2.7	3.3	3.6	3.4	3.7	3.0	2.9	2.5	2.1
	Mangenese Ore	0.4	0.0	0.0	0.0	0.0	0.9	0.0	0.9	1.8	1.6
	Marble and Granite	0.2	0.2	0.6	0.4	0.8	0.8	0.8	1.0	0.8	0.2
	Skins and Hides	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1
	Flat Cartons	1.0	0.9	1.1	1.0	0.5	0.4	0.1	0.1	0.2	0.4
	Charcoal	0.0	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.9
	Fertilizer (Guano)	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	Other	3.2	3.3	2.8	3.0	2.7	2.7	1.8	2.4	2.5	1.3
	Total	32.3	32.3	37.0	38.7	39.5	35.1	24.7	29.7	27.1	21.0
Transhipment	Fish Products	1.5	2.0	1.3	2.3	1.3	0.7	0.5	0.3	0.4	1.0
	Foodstuffs	0.0	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	General Cargo	0.3	0.3	0.1	0.8	8.7	11.1	20.5	17.8	15.6	18.0
	Total	1.8	2.4	2.4	3.1	10.1	11.8	21.0	18.1	16.0	19.0
Grand Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Statistic Section of Business Intelligence Division of NAMPORT.

(2) Container Cargo

Total container cargo increased from 25,817 in TEU and 20,925 in box to 194,102 in TEU and 128,851 in box during the eight years from 2000 to 2008 by 4.2 times and by 5.0 times or by 30.2% and 27.3% on an average annual basis. Over the same period, the 6m and 12m container throughputs have grown by 21.3% and 39.5%, respectively. The growth of 12m container shows a higher rate of growth than the 6m container. Similarly, empty container cargo is recorded the same trend as the total container cargo indicates an increase from 8,505 TEU and 6,309 boxes to 49,952 TEU and 31,135 box by 5.9 times and by 5.5 times or by around 31.6% and 28.9% of annual average growth rate, respectively. The sizes of 6m and 12m container are indicated in the growth rates of 41.8% and 24.8%, respectively. The growth of 12 m containers shows higher growth than 6 m containers (Table 2.2.5).

Compared by transport type of container cargo, the most dramatic increase was attributed to transhipment. Particularly landed transhipment indicates the average growth rate of TEU was 191.6% (around a 306 times increase), boxes rose 186.8% (around a 289 times increase), 6m containers rose 185.1% (around 247 times), and 12 m containers rose 218.7% (around 347 times increase) during the same period. On the contrary, the imports and the exports showed a distinctively lower growth rate than transhipment. The growth rates of TEU, boxes and 12 m containers in exports are higher than that of the imports (Please refer to Table 2.2.5 and Figure 2.2.4).

The shares landed and shipped of all containers were almost the same at 50% and had no big change during the eight years from 2000 to 2008. But compared with the transport type of

container cargo, the imports and exports decreased in share from about 50% to 20%. On the contrary, the transhipment drastically increased its share from less than 1% to 30%. On the other hand, the share of empty containers decreased slightly during from 2004 to 2007 but recovered its share to around 20% for shipped and 13% for landed (Table 2.2.6). The share of 6m containers for all container boxes decreased from 77% to 49% while that of 12 m container increase 23% to 51%. Meanwhile, an increase of 40 ft containers was observed. The scale up of container size is also observed for both imports and exports. But the shares of both sizes for transhipment have not been drastically changed and have kept almost the same share at about 50%, except in 2001 and 2003. On the other hand, the scale up of the empty container can be observed in the total and also in shipped containers, but the landed containers do not show a rise and stay around 50% share of one another (Table 2.2.7).

Table 2.2.5 Historical Performance of Container Cargoes of the Port of Walvis Bay

Items \ Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009.6	Average Annual Growth Rate (%)	
													2000 /2008	2008.6 /2009.6
All Container (Full + Empty)	Imports	6m	8,263	7,206	10,244	8,008	9,076	10,939	10,184	10,846	12,083	7,027	6.6	32.5
		12m	2,363	2,858	2,916	4,980	5,099	5,153	6,829	8,893	11,685	9,228	23.9	64.7
		Box	10,626	10,064	13,160	12,988	14,175	16,092	17,013	19,739	23,768	16,255	11.1	49.0
		TEU	12,989	12,922	16,076	17,968	19,274	21,245	23,842	28,632	35,453	25,483	13.7	54.3
	Exports	6m	7,591	6,770	9,743	8,267	8,787	10,643	10,113	10,109	10,718	7,997	5.8	76.0
		12m	2,400	3,100	3,938	4,942	5,795	5,591	7,037	9,693	13,778	8,170	25.1	59.3
		Box	9,991	9,870	13,681	13,209	14,582	16,234	17,150	19,802	24,496	16,167	12.6	67.2
		TEU	12,391	12,970	17,619	18,151	20,377	21,825	24,187	29,495	38,274	24,337	15.7	64.5
	Transshipment (Landed)	6m	88	151	89	545	4,275	5,026	14,648	16,704	21,804	11,736	185.1	13.6
		12m	64	49	72	224	3,005	4,788	10,784	13,698	22,201	15,144	218.7	70.3
		Box	152	200	161	769	7,280	9,814	25,432	30,402	44,005	26,880	186.8	39.8
		TEU	216	249	233	993	10,285	14,602	36,216	44,100	66,206	42,024	191.6	49.5
	Transshipment (Shipped)	6m	91	153	88	550	4,110	4,765	13,531	15,899	18,995	10,881	179.3	20.9
		12m	65	34	77	238	2,940	4,571	9,885	12,840	17,587	14,971	207.7	96.3
		Box	156	187	165	788	7,050	9,336	23,416	28,739	36,582	25,852	176.7	55.5
		TEU	221	221	242	1,026	9,990	13,907	33,301	41,579	54,169	40,823	180.1	68.3
	Total (Landed)	6m	8,351	7,357	10,333	8,553	13,351	15,965	24,832	27,550	33,887	18,763	22.1	20.0
		12m	2,427	2,907	2,988	5,204	8,104	9,941	17,613	22,591	33,886	24,372	41.3	68.1
		Box	10,778	10,264	13,321	13,757	21,455	25,906	42,445	50,141	67,773	43,135	27.8	43.2
		TEU	13,205	13,171	16,309	18,961	29,559	35,847	60,058	72,732	101,659	67,507	30.7	51.3
	Total (Shipped)	6m	7,682	6,923	9,831	8,817	12,897	15,408	23,644	26,008	29,713	18,878	20.7	39.4
		12m	2,465	3,134	4,015	5,180	8,735	10,162	16,922	22,533	31,365	23,141	38.5	81.4
		Box	10,147	10,057	13,846	13,997	21,632	25,570	40,566	48,541	61,078	42,019	26.8	59.8
		TEU	12,612	13,191	17,861	19,177	30,367	35,732	57,488	71,074	92,443	65,160	29.7	66.9
	Total (Landed+Shipped)	6m	16,033	14,280	20,164	17,370	26,248	31,373	48,476	53,558	63,600	37,641	21.3	29.0
		12m	4,892	6,041	7,003	10,384	16,839	20,103	34,535	45,124	65,251	47,513	39.5	74.3
		Box	20,925	20,321	27,167	27,754	43,087	51,476	83,011	98,682	128,851	85,154	27.3	50.9
		TEU	25,817	26,362	34,170	38,138	59,926	71,579	117,546	143,806	194,102	132,667	30.2	58.5
Empty Conatiner	Landed	6m	886	1,656	2,553	1,342	1,910	2,324	3,156	4,733	9,148	5,012	42.1	-12.9
		12m	1,203	1,690	1,298	1,615	2,094	1,977	2,130	5,403	7,918	6,536	34.2	48.3
		Box	2,089	3,346	3,851	2,957	4,004	4,301	5,286	10,136	17,066	11,548	34.7	13.6
		TEU	3,292	5,036	5,149	4,572	6,098	6,278	7,416	15,539	24,984	18,084	33.6	24.1
	Shipped	6m	3,407	3,058	4,006	4,015	3,929	4,748	4,489	6,367	11,312	7,302	19.2	18.8
		12m	903	1,239	1,101	3,211	2,519	2,256	4,062	8,771	13,306	12,283	54.2	86.6
		Box	4,310	4,297	5,107	7,226	6,448	7,004	8,551	15,138	24,618	19,585	27.5	53.8
		TEU	5,213	5,536	6,208	10,437	8,967	9,260	12,613	23,909	37,924	31,868	32.5	65.0
	Total (Landed+Shipped)	6m	4,293	4,714	6,559	5,357	5,839	7,072	7,645	11,100	20,460	12,314	24.8	3.4
		12m	2,106	2,929	2,399	4,826	4,613	4,233	6,192	14,174	21,224	18,819	41.8	71.3
		Box	6,399	7,643	8,958	10,183	10,452	11,305	13,837	25,274	41,684	31,133	28.9	36.0
		TEU	8,505	10,572	11,357	15,009	15,065	15,538	20,029	39,448	62,908	49,952	31.6	47.4

Source : Statistics Section of Business Division Intelligence Division, NAMPORT

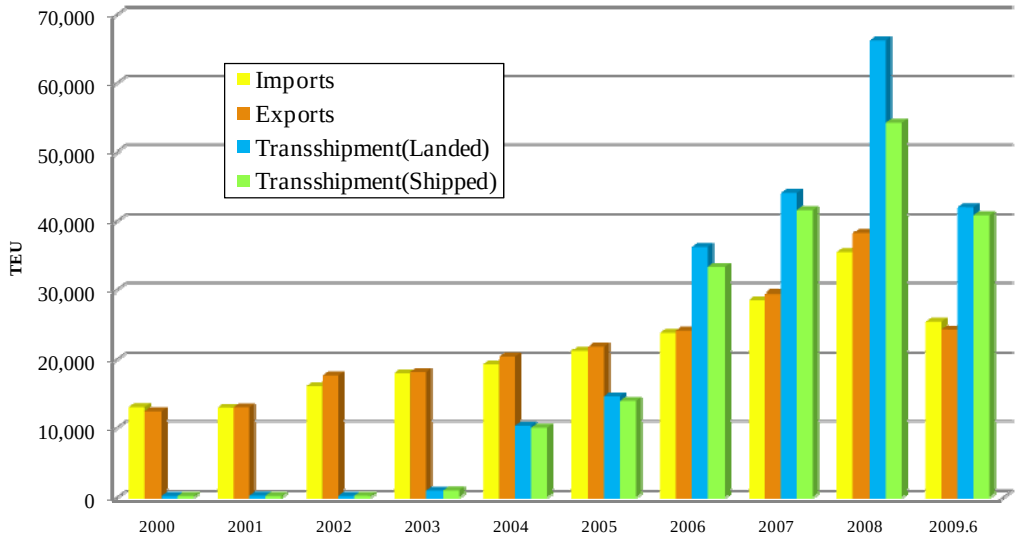


Figure 2.2.7 Historical Performance of Container Cargoes at the Port of Walvis Bay

Table 2.2.6 Historical Performance of Share by Type of Container Cargoes in TEU of the Port of Walvis Bay

(Unit : %)

Items \ Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009.6
All Conainer	Imports	50.3	49.0	47.0	47.1	32.2	29.7	20.3	19.9	18.3	19.2
	Exports	48.0	49.2	51.6	47.6	34.0	30.5	20.6	20.5	19.7	18.3
	Transshipmen (Landed)	0.8	0.9	0.7	2.6	17.2	20.4	30.8	30.7	34.1	31.7
	Transshipment (Shipped)	0.9	0.8	0.7	2.7	16.7	19.4	28.3	28.9	27.9	30.8
	Total (Landed)	51.1	50.0	47.7	49.7	49.3	50.1	51.1	50.6	52.4	50.9
	Total (Shipped)	48.9	50.0	52.3	50.3	50.7	49.9	48.9	49.4	47.6	49.1
	Total (Landed+Shipped)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Empty Container	Landed	12.8	19.1	15.1	12.0	10.2	8.8	6.3	10.8	12.9	13.6
	Shipped	20.2	21.0	18.2	27.4	15.0	12.9	10.7	16.6	19.5	24.0
	Total (Landed + Shipped)	32.9	40.1	33.2	39.4	25.1	21.7	17.0	27.4	32.4	37.7

Source : Statistics Section of Business Division Intelligence Division, NAMPORT

Table 2.2.7 Historical Performance of Share by Size of Container Cargoes of the Port of Walvis Bay

(Unit : %)

Items \ Year			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009.6
All Container (Full + Empty)	Imports	6m	78	72	78	62	64	68	60	55	51	43
		12m	22	28	22	38	36	32	40	45	49	57
		Box	100	100	100	100	100	100	100	100	100	100
	Exports	6m	76	69	71	63	60	66	59	51	44	49
		12m	24	31	29	37	40	34	41	49	56	51
		Box	100	100	100	100	100	100	100	100	100	100
	Transshipment (Landed)	6m	58	76	55	71	59	51	58	55	50	44
		12m	42	25	45	29	41	49	42	45	50	56
		Box	100	100	100	100	100	100	100	100	100	100
	Transshipment (Shipped)	6m	58	82	53	70	58	51	58	55	52	42
		12m	42	18	47	30	42	49	42	45	48	58
		Box	100	100	100	100	100	100	100	100	100	100
	Total (Landed)	6m	77	72	78	62	62	62	59	55	50	43
		12m	23	28	22	38	38	38	41	45	50	57
		Box	100	100	100	100	100	100	100	100	100	100
	Total (Shipped)	6m	76	69	71	63	60	60	58	54	49	45
		12m	24	31	29	37	40	40	42	46	51	55
		Box	100	100	100	100	100	100	100	100	100	100
	Total (Landed + Shipped)	6m	77	70	74	63	61	61	58	54	49	44
		12m	23	30	26	37	39	39	42	46	51	56
		Box	100	100	100	100	100	100	100	100	100	100
Empty Conatiner	Landed	6m	42	49	66	45	48	54	60	47	54	43
		12m	58	51	34	55	52	46	40	53	46	57
		Box	100	100	100	100	100	100	100	100	100	100
	Shipped	6m	79	71	78	56	61	68	52	42	46	37
		12m	21	29	22	44	39	32	48	58	54	63
		Box	100	100	100	100	100	100	100	100	100	100
	Total (Landed+Shipped)	6m	67	62	73	53	56	63	55	44	49	40
		12m	33	38	27	47	44	37	45	56	51	60
		Box	100	100	100	100	100	100	100	100	100	100

Source : Statistics Section of Business Division Intelligence Division, NAMPORT

The reefer containers in total increased from 2,148 by box and 3,554 by TEU to 20,190 by box and by 39,247 TEU over the period from 2000 to 2008 at a high annual average growth rate of 39.0 % by box and 41.8% by TEU. However, the growth rate of one year from 2008 (Jan. to Jun.) to 2009 (Jan. to Jun.) recorded only a slight increase both in boxes and TEU, which may reflect the worldwide financial crisis.

The sizes of 6m and 12 m reefer containers in total have grown by 11.2% and 45.5%, respectively. The growth of 12m reefer containers also shows a much higher growth rate than 6m reefer containers. It is recognized that the landed reefer containers contributed to the drastic increase of total reefer containers. The landed reefer containers indicated a high growth rate of 87.9% by TEU and 85.2% by box. Particularly, 12 m reefer containers recorded an extreme increase from 169 boxes to 4,638 boxes, a 27 time increase. On the contrary, the number of boxes for both sizes for the shipped reefer containers was almost equal to those of the landed reefer containers in 2008, but the growth rate of the shipped reefer containers were lower than those of the landed reefer containers. Particularly, 6m containers showed a decrease of 0.2% (Table 2.2.8).

A rise in reefer containers can be observed. The share of 12m reefer containers in total increased from 65% to 96% during the period from 2000 to June 2009. Accordingly, the share of 6m

reefer containers decreased from 35% to 4%. This trend is expected to continue in the future. The rise in 12 m reefer containers has progressed much faster than 6 m reefer containers although the share of each size are almost equal to each other according to data points from 2008 and June 2009 showing that the share of 6m reefer containers is 3%–6% and that of 12 m reefer containers is 94%–97% (Table 2.2.9).

Table 2.2.8 Historical Performance of Reefer Containers by Size at the Port of Walvis Bay

(Unit : TEU)

Items \ Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009.6	Average Annual Growth Rate (%)	
												2000 /2008	2008.6 /2009.6
Landed	6m	60	32	27	29	77	107	340	253	591	220	59.4	-3.9
	12m	169	91	108	268	976	2,035	3,965	3,717	9,226	4,638	91.3	12.4
	Box	229	123	135	297	1,053	2,142	4,305	3,970	9,817	4,858	85.2	11.5
	TEU	398	214	243	565	2,029	4,177	8,270	7,687	19,043	9,496	87.9	12.0
Shipped	6m	682	479	602	410	388	370	494	462	542	149	-0.2	-65.3
	12m	1,237	1,317	1,305	1,660	2,557	3,463	4,702	4,290	9,831	4,360	34.8	-4.6
	Box	1,919	1,796	1,907	2,070	2,945	3,833	5,196	4,752	10,373	4,509	28.3	-9.8
	TEU	3,156	3,113	3,212	3,730	5,502	7,296	9,898	9,042	20,204	8,869	31.1	-7.3
Total	6m	742	511	629	439	465	477	834	715	1,133	369	11.2	-44.0
	12m	1,406	1,408	1,413	1,928	3,533	5,498	8,667	8,007	19,057	8,998	45.5	3.5
	Box	2,148	1,919	2,042	2,367	3,998	5,975	9,501	8,722	20,190	9,367	39.0	0.1
	TEU	3,554	3,327	3,455	4,295	7,531	11,473	18,168	16,729	39,247	18,365	41.8	1.7

Source : JICA Study Team

Table 2.2.9 Historical Performance of Share of Reefer Container by Size at the Port of Walvis Bay

(Unit : %)

Items \ Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009.6
Landed	6m	26	26	20	10	7	5	8	6	6	5
	12m	74	74	80	90	93	95	92	94	94	95
	Box	100	100	100	100	100	100	100	100	100	100
Shipped	6m	36	27	32	20	13	10	10	10	5	3
	12m	64	73	68	80	87	90	90	90	95	97
	Box	100	100	100	100	100	100	100	100	100	100
Total	6m	35	27	31	19	12	8	9	8	6	4
	12m	65	73	69	81	88	92	91	92	94	96
	Box	100	100	100	100	100	100	100	100	100	100

Source : JICA Study Team

2.2.3 Current Cross-Border Transport

There are four major cross-border corridors linking the Port of Walvis Bay to her neighbouring countries, namely: (i) the Trans-Kalahari Corridor; (ii) the Trans-Caprivi Corridor; (iii) the Trans-Cunene Corridor; and (iv) the Trans-Oranje Corridor. WBCG was established in 2000 in order to promote the use of those four corridors, so-called the Walvis Bay Corridors. These corridors are the focal point for regional development initiatives. Initially based on transport routes, the corridors are critical to the achievement of the region's economic and political objectives. Almost half of the SADC Member States are landlocked and require efficient regional transport links for access to the sea. Due to its location and efficiency, the port of

Walvis Bay offers substantial reliability advantages for time-sensitive cargo. Initiatives within the corridor have focused on strategies to strengthen efficiency of the corridor transport systems along its four arms. The current situation of the Walvis Bay Corridors is as follows.

(1) Trans-Kalahari Corridor

The Trans-Kalahari Highway: The Corridor stretches over 1,900 km along Walvis Bay–Windhoek–Gaborone–Johannesburg/Pretoria. It is supported by a railway line from the Port of Walvis Bay to Gobabis (via Windhoek), where transload facilities are available, and continues from Lobatse in Botswana. The Trans-Kalahari Highway was completed and commissioned in 1998. This highway links the Port of Walvis Bay to Botswana and further to Gauteng Province, the industrial hub of South Africa estimated to produce about 37% of South Africa's GDP and 28% of GDP for the SADC region. The highway is a potential artery between this industrial heartland and European and American markets. The potential traffic development is considerable, but the development has been slow to materialize. Nevertheless local traffic has grown considerably leading to greater connectedness of small Botswana and Namibian communities with positive economic impact. Realization of the transcontinental potential will foster greater development along the route as well. Several service areas have already developed to meet the needs of both the freight and tourist traffic. Gobabis, in eastern Namibia, is also realizing development to serve this traffic. Local leaders hope to promote Gobabis as a tourist destination in addition to performing a service and accommodation role along the route.

Railway: The Trans-Kalahari Corridor is also a rail corridor. The railway connects the Port to the capital city, Windhoek, in a daily freight and passenger service. The railway continues east to Gobabis on the outskirts of the Kalahari in eastern Namibia. The length of railway from Walvis Bay and Gobabis is 640 km and the distance from Gobabis to the border of Botswana is 100 km. It was originally intended to connect to the Botswana Railway in eastern Botswana and to Spoornet through Mafeking and Gauteng Province but link is not yet built. There was considerable interest in this service from the automotive industry in Rosslyn and some mineral exporting companies. The Namibian and Botswana governments are planning to have coal transportation by railway along this corridor. The feasibility study starts in July 2009, and is expected to take 12 months to complete.

There are many trains between Walvis Bay and Windhoek, but the frequency of freight trains is only 3 times a week between Windhoek and Gobabis. The passenger train in this section was discontinued in 2009 because of the small number of passengers.

WBCG has established a branch office in Gauteng, South Africa last year to develop business for this market. The Gauteng economy is the second biggest economy in Africa and has major potential for development since cargo can be delivered 5 days earlier. WBCG believes that this market can become the biggest market for transit traffic via the Port of Walvis Bay. In the following pages, Figure 2.2.8 shows the routes and positions of the Walvis Bay Corridors in Southern Africa.

(2) Trans-Caprivi Corridor (TCC)

Trans-Caprivi Highway: The Trans-Caprivi Highway links the Port of Walvis Bay to the inland areas of Zambia (Livingstone, Lusaka, Ndola and Kitwe) and the South Eastern Democratic Republic of Congo (Lubumbashi area) via the bridge across the Zambezi at Katima Mulilo, which was completed in 2008. The Corridor stretches over 2,500 km and is supported by a railway line between Walvis Bay and Grootfontein, where transroad facilities are available. The TCC covers the markets of Zambia, DRC and Zimbabwe. When the bridge at Katima Mulilo was completed between Zambia and Namibia over the Zambezi River in 2004, the WBCG started to develop its marketing campaign for the Zambia market. In 2005 the WBCG

then developed its first branch office in Lusaka, Zambia to develop this market for imports and exports via the Port of Walvis Bay. This branch office mainly focuses on how can they increase transit traffic for the Zambia market via the Port of Walvis Bay. Cargo volumes for the Zambian and DRC (Lubumbashi) markets has since then grown significantly over the past 5 years. Namibia has also joined hands with the Zambian and DRC governments to establish joint forums to address issues along the corridor such as border transit times. As soon as the economy of Zimbabwe improves, the WBCG will also start an aggressive marketing campaign to transport goods to this market. The WBCG provides an alternative route to overseas markets for these land-locked areas, as opposed to their current reliance on the North South Corridor to Durban, which is now highly congested, and the Dar es Salaam Corridor. With the current investment in increased copper production, the demand for the route is likely to grow dramatically in the next few years. This route also provides an important outlet to regional and international markets for secondary hubs along the Trans-Caprivi Highway, such as Katima Mulilo, Rundu, Tsumeb and Grootfontein. Since much of the Namibian population is centred in the North, expansion of these secondary hubs provides important opportunities for new economic activity.

Railway: The railway line along this corridor runs up to Grootfontein, a distance of 600 km from the Port of Walvis Bay. The frequency of freight trains is 1 a day up to Grootfontein. The passenger train does not run because of poor track conditions. The major commodity from Walvis Bay to Grootfontein is petrol. However, there are almost no commodities transported to Walvis Bay.

(3) Trans-Cunene Corridor

Trans-Cunene Corridor Highway: The Trans-Cunene Corridor Highway links the Port of Walvis Bay with southern Angola up to Lubango, over a distance of 1,600 km. The Angolan Government is currently planning road rehabilitations nationwide, which include the Lubango–Santa Clara leg, extending the Trans-Cunene Corridor. Since the cessation of hostilities in Angola, import traffic through the Port of Walvis Bay has been the fastest growing Corridor traffic, currently representing around 80% of the corridor traffic through the Port of Walvis Bay. Currently this corridor carries the largest volumes of transit volumes via the Port of Walvis Bay. This Corridor traverses one of the most densely populated parts of the country and also has potential for major economic development. It leads to Ondangwa and Oshakati which serve as distribution centres for the North. On the border between Namibia and Angola, Oshikango is becoming a major wholesale and retail centre for trade with Angola. It currently has 28 actively bonded warehouses and an EPZ serving this market. This is still growing rapidly since the demand for various commodities are still increasing. With the reconstruction and development of this economy still in high growth, it is believed that this corridor will continue to grow for the next 5–10 years until the ports in Angola have sufficient capacity to handle all Angolan imports and exports.

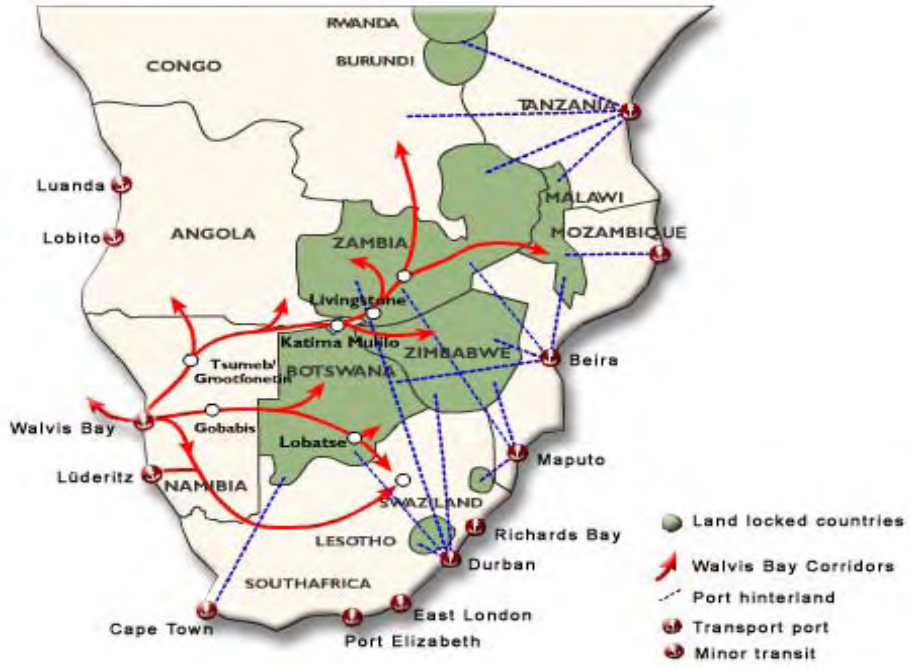
Railway: The railway line of the Trans-Cunene Corridor diverges from the line of the Trans-Caprivi Corridor at Otavi. It runs up until Ondangwa, a distance of 850 km from the Port of Walvis Bay. The railway extension along this corridor is the first priority among the three corridors. The construction of the sections between Tsumeb and Oshikango and between Ondangwa and Oshakati were started in 2001, and reached Ondangwa in 2006. The section between Ondangwa and Oshikango will be completed around 2011. A new railway line is being designed for a maximum speed of 120 km/hour, and a dedicated train for containers from Walvis Bay is also being planned. The frequency of freight trains is 2 to 3 a day up to Tsumeb, and 1 a day up to Ondangwa via Otavi station. The passenger train does not run because of bad track conditions. The major commodities are petrol, copper concentrate and coal from Walvis Bay to Tsumeb, and copper ingots from Tsumeb to Walvis Bay. Besides petrol, cement for

railway extensions are also carried to Ondangwa. There are very little commodities for the south compared to the north.

(4) Trans-Oranje Corridor

Trans-Oranje Corridor Highway: The Trans-Oranje Corridor Highway is a tarred road linking the Port of Lüderitz as well as Port of Walvis Bay to Johannesburg in South Africa, through Keetmanshoop, Windhoek and Upington. The total length from the Port of Lüderitz to Johannesburg is 1,678 km and that from the Port of Walvis Bay is even longer. It connects Lüderitz with the Northern Cape Province of South Africa and is thus ever expanding as a leader of trade route in southern Africa.

Railway: This corridor is complemented by a railway line from the Port of Lüderitz extending southwards to the Northern Cape Province via Upington. Re-construction on the 40 km railway between Aus and Lüderitz is currently under way and is scheduled to be completed in 2010.



Source: Corridor Development Consultants (Pty) Ltd., Economic Benefits of Port and Corridor Development.

Figure 2.2.8 Walvis Bay Corridors for the Development of Southern Africa

(5) Relationship of Container Cargo Demand with the Corridors

1) Modal Split of Container Cargoes

The modes of inland transport of container cargoes are mostly occupied by truck at around 90%. The main reasons are: (i) the track conditions of the railways are not in good conditions because of aging of the 30kg/m rails and their deformations, (ii) around 60 locomotives are not fully operative, and (iii) the train is not operated regularly based on a time table. These reasons result in less capacity of the train and the lack of reliability of railway services.

2) Incomplete Railway Network

The Walvis Corridors, except for the Trans-Oranje Corridor, have not yet completely linked the national borders by rail although the section between Ondangwa and Oshikango of the

Trans-Cunene Corridor will be completed around 2011. After this, all of the transit container cargoes have been transported by truck on the roads to and from the land locked countries.

3) Relative Superiority of Road Transportation of the Walvis Bay Corridors than Railway

It has been reported by the SADC Transport Ministers that roads in the northern and central corridors need to be fixed as their condition makes it impossible for the easy flow of transport and movement of goods and services and there must be a master plan for the modernization of the railways for the region, adding a modern high speed railway line for the region will ease the burden from the roads and increase the speed of movement of bulk cargo into and out of the region. According to the field survey by the JICA Study Team, the road conditions of the Walvis Bay Corridors are assumed to be in better condition. They are mostly two lanes and have enough width and will be rehabilitated. The container truck can run at an average speed of 60 km/hour to 80 km/hour. In addition, the routes of the Walvis Bay Corridor have superior railways.

4) Time Savings of Border Crossings

The largest bottleneck to inland transport is at the border crossings which are closely related to the transport network. The border crossings are *sine qua non* to enable the acceleration of transporting export and import through the transport network to land-locked countries. In this context, if the least number of border crossings would be utilized, least cost transport could be realized. A good example is demonstrated by the new route to export markets of copper of Zambia and the DRC. The Port of Walvis Bay has since 2004 established a direct linkage to the Copperbelt and the DRC market providing shorter transit times for these exporters. The transport of goods from the Port of Walvis Bay to the Copperbelt is on average 4-5 days by road with only a single border crossing at Katima Mulilo in Namibia. The traditional routes for the copper exports have been the Port of Dar es Salaam and the Port of Durban that have more than two border crossings.

2.3 Current Port Situation in Namibia and Her Neighbouring Countries

2.3.1 Ports in Namibia

(1) Port of Walvis Bay

1) Port Operation

The Port of Walvis Bay possesses 8 berths handling container, bulk cargo, and the other cargo. A summary of the berth information is shown in the following table:

Table 2.3.1 Type of Berthing Facilities at the Port of Walvis Bay

Berth	Draught (m)	Cargo Handled
Berth 1	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	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	10.0	Tankers, Liquid bulk petroleum products

Source: Namport

Berths 1–3 are working berths for container and bulk commodities having a depth of 12.8 m, and two rail-mounted wharf cranes on the rail track 2. Containerised cargo being handled on a

24-hour basis, 7 days a week, is carried out by quayside mobile tower cranes. Reach stackers and forklifts as appropriate are the primary equipment being used for the handling and moving of containers within the container yard for berths 1, 2 and 3. Ro-Ro vessels are being accommodated at Berths 3 and 6. Berths 6 and 7 are used when there is excess cargo.

The Port of Walvis Bay is equipped with reach stackers, forklifts, tractors, haulers, trailers, harbour tower cranes, and additional equipment including mobile cranes. Haulage transport is available from Namport.

The Port of Walvis Bay has no delay in ship schedule and throughput unlike other ports in South and West Africa due to smooth berthing when loading and unloading cargo from the vessels. The competence of Namport operations at the container terminal was well recognised by the Port Captain from a certain shipping line during his recent supervision of their first container vessel due in Walvis Bay in early June.

2) Actual Container Throughput /2008

There had been an obvious and remarkable increase in container throughput in the year of 2008 as follows: Total Container throughput in 2008 shows 194,102 TEU compared to 83,263 TEU for the year 2005/6.

Table 2.3.2 Container Throughput (2008)

(Unit: TEU)

Imports and Exports	Transhipment (Landed+Shipped	Total (Landed+Shipped)
73,727	120,375	194,102

Source: Namport

The number of vessels is expected to further increase in 2009 with a couple of new arrivals from MOL and CMA/CGM in addition to their weekly and 10 day interval service. The total number of vessels called at the Port of Walvis Bay in 2008 reached 1,381 passenger boats, oil tankers, etc.

3) Port of Walvis Bay Container Throughput during the First Quarter of 2009

During the recent few months from January to March 2009, Namport has been experiencing a "Jump Up" trend in handling containers when compared with the same period in the previous year. The throughput of this period is shown in the following table.

Table 2.3.3 Container Throughput—the First Quarter of 2009

(Unit: TEU)

	Shipped	Landed	Transhipped	Handled
January	1,301	4,650	17,761	23,712
February	6,169	4,154	11,161	21,484
March	4,545	3,506	11,922	19,973
Total	12,015	12,310	40,844	65,169

Source: Namport

Note: 1. "Shipped" is the total of exports and shipped transit.
2. "Landed" is the total of imports and landed transit

4) Efficiency of the Port

The rising trend in containerized cargo throughput in the Port of Walvis Bay coupled with the robust economic growth in the south and mid-African Rim has set forth an unprecedented plan under "Vision 2030", one of the government priority projects for the Port of Walvis Bay to be

developed into a world class Hub-port/Gateway in South-Western Africa to cater to transhipment and transit cargo to and from its hinterland and neighbouring countries.

Key benefits of using the Port of Walvis Bay are considered as follows:

1. Competitive turnaround time due to world class port efficiency
2. Minimum delays due to congestion-free port
3. Maximum security procedures
4. Deep water anchorage inside the harbour
5. World-class infrastructure and equipment, ensuring reliable and safe cargo handling

The prime purpose of upgrading the Port of Walvis Bay is clearly written in the ***Third National Development Plan (NDP3)***. The contents indicate that:

> *…key activities include expansion of the Walvis Bay Port, upgrading the national and regional corridor routes, expanding and upgrading the ship and rig repair industry, providing adequate Maritime rules, providing a rail link to Lüderitz Port and investigating other ports' developments in Namibia.*

5) Port Development Plan

An attempt to bring in numerous carriers, multi-national freight forwarders from Europe, the Mediterranean and from the East Coast of South America namely Santos and Rio de Janeiro etc along with Asia Pacific, is the minimal requirement.

(2) Port of Lüderitz

The Port of Lüderitz was used mainly by the fishing industry, but has seen increasing activity from the mining sector since 2004. The main strategic focus for this port is to cater to the needs of the fishing industries, offshore oil exploration, and the mining sector, together with its supporting industries and services. The Skorpion Zinc has played a great impact, the business of the port over recent years, causing mining exports to surpass those of fishing. This port has also become increasingly important for the agricultural sector with the potential of grapes being exported from Aussenkehr in the southern Namibia and the Northern Cape Province in RSA.

This export and import potential in SADC is supported by the Trans Oranje Corridor, which, by way of a road-and-rail network, links the Port of Lüderitz with the rest of Namibia as well as with the Northern Cape Province in RSA.

Key benefits of using the Port of Lüderitz are considered as follows:

- The port's strategic location makes it an important base for the fishing, mining and offshore diamond mining industries
- The port is also an essential shore base for oil and gas drilling operations off the southern coast
- Excellent logistical services and links to other towns in Namibia and South Africa are offered
- The port develops its infrastructure to suit its clients' needs.
- A 500 m quay provides cargo handling and container facilities for imports and exports, while a mobile harbour crane can handle containers and break-bulk cargo of up to 64 tonnes
- Two additional 25-tonne grab mobile cranes deal with smaller volumes of break-bulk cargo at the 500 m quay.

2.3.2 Ports in Neighbouring Countries

(1) Port of Lagos/Apapa, Nigeria

Port of Lagos/Apapa is located at the southern part of Lagos City which has a population of 14 million. Social issues this city is facing are security, poverty, poor infrastructure and deterioration of living standards. Even though the port is one of the largest ports in the region of South and West African ports, these issues have caused difficulties in port operation, particularly in transporting cargos around its vicinity.

Tin Can Container Terminal was recently built to relieve the chronic congestion of Port of Apapa but is still not quite functioning to resolve the delay of cargo handlings of Port of Apapa. Carriers calling at this terminal are Zim Israeli Lines, CMA/CGM, Happag Lloyd, Messina Lines and Cosco and K Line.

The Total container throughput[16] in the year 2008 at the respective ports are:

- Port of Apapa: 260,000 TEU
- Port of Tin Can: 158,000 TEU

The pile-up of containers in Nigerian ports have significantly increased in recent months, with the result that the port and its logistic system that have posted massive productivity improvements over the past two years have once again become strained. The government is to take action over the rising number of containers of which up to 30,000 units (TEU) is being left uncollected at the country's ports.

The strained system has resulted in some vessels having to wait longer than 14 days to secure berths, particularly at Lagos. The longer waiting of the vessels worsens the country's economy, which is already harmed by the current financial crisis. Further worsening the situation, importers need to wait another 30 days for compulsory customs inspection before taking delivery.

1) Two Burdens of Port of Lagos

i) Over 80% of incoming import containers and cargo are subject to customs inspections that take over 30 days on average to clear through, which serves as a "beach defence" against the smuggling of cargo. This has been the prime reason for the vessels' and cargo's delay in the port areas.

ii) The transhipment via Ports in Lagos to any other foreign ports is prohibited and it is unlawful to use the port as a transhipment point. There are no transhipment containers from any ports of Nigeria for the same reason. This prohibition is meant to keep an eye on the smuggling of cargo.

(2) Dar es Salaam Port, Tanzania

Likewise in East Africa at Dar es Salaam Port, the Port Authority had implemented US$ 40 per 20 footer and US$ 80 per 40 footer charges per day on all inbound containers left in the terminal for more than 21 days after they have been off-loaded from the vessel. There is a tendency for shippers and importers to use the containers and port as a storage facility. (Source: Dar es Salaam Port, 2009)

[16] The expression of "Throughput" is used for the Ports of Nigeria and of Tanzania and that of "Container Handling" is used for the Ports of Cape Town and others of South Africa. The unit of these expressions is TEU which means the number of container box converted by twenty-foot equivalent units to pass through quay wall of container terminal. Then these expressions are unified as "Throughput" in this report.

- Berth: 1 container berth, length 549 m, depth 11.5 m.
- Calling ship owners: Maersk/Safmarine Line, MOL, MSC, PIL
- Container Throughput: 170,658 TEU (2007)
  181,775 TEU (2008)

(3) Port of Cape Town, South Africa

Port of Cape Town in Cape Town City has 34 berths with 5 deep-draught berths and two costal berths for container-throughput handling operations. It is strategically located in one of the world's busiest shipping routes and for this reason the port is one of the busiest ports in the entire African Rim, handling the largest volume of agricultural products, particularly fresh fruits. The port ranks second to Durban with respect to the container throughput and is provided with significant support facilities for the repair and maintenance of shipping vessels. Shipping lines have been shifting their transhipment port from Durban to the Port of Cape Town.

The following table represents container throughput in 2008 in the Port of Cape Town.

Table 2.3.4 Container Throughput of Port of Cape Town (2008)

(Unit: TEU)

Landed	**Full**	**Empty**	**Total Landed**
Deep-sea	187,380	105,445	292,825
Coastwise	8,472	19,901	28,373
Transhipped	41,592	15,044	56,636
Total Landed	237,444	140,390	377,834
Shipped	**Full**	**Empty**	**Total Landed**
Deep-sea	252,432	75,990	327,422
Coastwise	4,885	1,119	6,004
Transhipped	42,565	13,676	56,241
Total Shipped	298,882	90,785	389,667
GRAND TOTAL 2008	536,326	231,175	767,501

Source: Transnet Port Terminal (TPT)

(4) Port Elizabeth, South Africa

Port Elizabeth is located between Durban and Cape Town and is well known in the southern hemisphere as a major sea port for ore loading. As part of the ongoing development, a new industrial zone is being developed to cater to the anticipated rise in cargo traffic. The facility is scheduled for completion by the 4th quarter of 2010. The port has been servicing automobile giants including General Motors, Volkswagen, Ford and Continental Tires with assembly plants at the back of the port. The port is also being used as backup terminal for Durban as well in catering for excess overflow cargo.

The following table represents the actual container throughput of Port Elizabeth in the year 2008.

Table 2.3.5 Container Throughput of Port Elizabeth (2008)

(Unit: TEU)

Landed	**Full**	**Empty**	**Total Landed**
Deep-sea	175,776	25,380	201,507
Coastwise	1,440	509	1,949
Transhipped	20,955	1,436	22,391
Total Landed	198,171	27,676	225,847

Shipped	**Full**	**Empty**	**Total Shipped**
Deep-sea	74,618	97,241	171,859
Coastwise	188	2,038	2,226
Transhipped	20,900	3,053	23,953
Total Shipped	95,706	102,332	198,038

GRAND TOTAL 2008	**293,877**	**130,008**	**423,885**

Source: Transnet Port Terminal (TPT)

(5) Port of Durban, South Africa

Among all the African ports, Port of Durban has been enjoying the largest share of containerised cargo. The total number of containerised cargo handled at the port has been predominant at 1.86 million TEU annually of which some 370,000 TEU on average were via feeder services from Cape Town and 43,000 TEU on average from Port of East London. Port of Durban had continuously been experiencing consistent delays in container/cargo handling operations due to ever increasing cargo volume and heavy container traffic. Recently, however, the port congestions have been dissolved by deploying rail-mounted gantry cranes to smooth the railway terminal operation.

The two rail-mounted gantry cranes purchased by TPT were commissioned at the end of May 2009. They are among the final investments which form part of phase one of the Pier 1 container terminal expansion project. The phase has seen the Port of Durban provide an additional capacity of 720,000 TEU. The cranes will be used to transfer containers between internal road vehicles and rail wagons more quickly and easily, as they approximately double the handling rates of reach stackers, which were in use until recently.

The majority of the cargo, however, is inbound laden containers destined for the consumer and industrial centres of Gauteng and Johannesburg.

During the years 2008 and 2009, the Port Authority and the labour unions jointly stood up to eliminate the port congestion and took immediate remedies to clear the quay side congestions and by adding two new terminal rail-mounted gantry cranes. By March 2009, the delays had been cleared completely and there are no longer any waiting times or congestions, to the benefit of all port users and carriers.

Container throughput covering the period of 2006 to 2007 is tabulated below.

Table 2.3.6 Container Throughput (2006/2007)

(Unit: TEU)

Landed	865,087
Shipped	899,454
Transhipped	519,609
Coastwise	50,849
TOTAL	2,334,999

Source: Port of Durban Authority NPA

The following table shows the actual container throughput figures for Port of Durban for 2008.

Table 2.3.7 Container Throughput of Port of Durban (2008)

(Unit: TEU)

Landed	**Full**	**Empty**	**Total Landed**
Deep-sea	839,755	140,686	980,441
Coastwise	5,998	6,443	12,441
Transhipped	223,533	70,135	293,668
TOTAL LANDED	1,069,286	217,264	1,286,550
Shipped	**Full**	**Empty**	**Total Shipped**
Deep-sea	668,669	358,524	1,027,213
Coastwise	13,345	18,074	31,419
Transhipped	225,600	71,383	296,983
TOTAL SHIPPED	907,634	447,981	1,355,615
GRAND TOTAL 2008:	**1,976,920**	**665,246**	**2,642,165**

Source: TPT, Ports Authority of the Republic of South Africa
(9 percent increase in 2008 cf. 2007)

Container throughput at Port of Durban represents some 65% of the total volume of containers handled in the South African ports.

(6) Port of Coega, South Africa

The port of Coega (or Ngqura) will have a capacity for accommodating larger container vessels than any of South Africa's seven other commercial ports and is the biggest infrastructure project in South Africa since 1994. The Port of Coega launched at the beginning of October 2009 as scheduled.

It is a multi-billion African rand industrial development complex and deepwater port located 20 kilometres east of the city of Port Elizabeth in the Eastern Cape. Located on the south-eastern coast of the country, the project is part of the first and one of the largest, industrial development zones (IDZ), a new initiative that aims to boost the regional economy of the Eastern Cape.

It has an advantage over other ports in Africa in that it is a deep-water port with a depth of between 16 and 18 meters. It could serve as a "feeder" or "loading centre" for other destinations, functioning as a hub where large freight ships could unload their cargo for further distribution by road, sea or rail to other destinations in Africa.

The improved infrastructure will relieve container congestion in the South Africa port system, while attracting additional transhipment cargo. Transnet (Port Authority) says that the new port is a solution to South Africa's lack of container capacity that has been strained by a considerable growth in container traffic.

The terminal will have the capacity to accommodate "Ultra-Mega" ships carrying 6,000 to 10,000 TEU and the port will be able to handle more than 100 container moves per ship working hour, with sufficient stack and berth capacity to cater for future growth up to 2 million TEU.

The JICA Study Team has yet to determine the details of the current carriers listed, however the port of Walvis Bay may be affected when Coega becomes fully operational within the last few months of 2009, especially those transhipment containers from the port of Cape Town that are uncertain to obtain.

Mega-Carriers may study the use of Coega port for their transhipment containers to the eastern coastline. The inauguration of Coega may cause the port of Walvis Bay concern and thus Namport should prepare for further pragmatic and practical promotional activities.

(7) Port of Luanda, Angola

Angola's ports are virtually non-operational having suffered lasting effects from the long-gone civil war, leaving Walvis Bay to service the SADC countries of Botswana, Zimbabwe, Zambia and Malawi even though the rehabilitation and renewal construction works are said to be underway for the Luanda and Lobito ports.

Currently, vessels' waiting time is reported to be 4 to 6 weeks and the terminal operator is imposing a congestion surcharge of US$300 per TEU, but this is in vain as the traffic is still very slow.

It has been learned that the Luanda, Lobito and Namib ports in Angola are strictly for Angolan domestic consumption only and the Port Authority has been aiming for no transhipment/transit cargo across any of the nation's borders.

The following table shows the container throughput at Port of Luanda in 2008.

Table 2.3.8 Container Throughput of Port of Luanda (2008)

	(Unit: TEU)
Landed	267,956
Shipped	296,497
TOTAL	566,463

Source: Angola Ports Authority

(8) Port of East London, South Africa

In view of its niche status, container throughput at this port is predominantly aimed at the local market. Indeed, container throughput in 2008 was only 57,000 TEU[17].

(9) Port of Lobito, Angola

It is reported that rehabilitation and renewal works have been taking place with greater urgency around the premises of the Port of Lobito and beyond, with financial assistance provided by Chinese firms. Namport has been paying careful attention to the progress and has mild concern over the completion of the port's rehabilitation in 5 years' time, which will render it a major competitor to Namport.

The port handles roughly 600,000 tons a year including 68,446 TEU[18] of building materials, flour, sugar, rice, grain, and general cargo in 2007. Destinations are mainly to the cities of Lobito, Benguels, and for local industrial plants in the Catumbela industrial zone[19].

2.3.3 Ports JICA Study Team Surveyed

JICA Study Team obtained various and precious information covering the current situation around three leading ports in the western and southern regional Africa namely Lagos/Apapa of Nigeria, Durban, RSA and Luanda, Angola as follows;-

[17] NPA, 2009.
[18] Port of Lobito, 2007
[19] OREY Angola, 2009.

(1) Nigeria – Lagos Ports (Apapa and Tincan Terminal)

JICA Study Team visited Lagos with the aim to survey the current status of the Ports of Lagos Apapa/Tincan Terminals between 18th and 23rd April and conducted interviews with major shipping lines and the Nigeria Port Authority (NPA).

The Port of Lagos/Apapa is located at the southern part of Lagos City which has a population of 14 million. Social issues this city is facing include security, poverty, poor infrastructure and deterioration of living standards. Even though the port is one of the largest ports in the region of South and West Africa ports, these issues have reportedly caused difficulties in port operation, particularly in transporting cargoes around its vicinity.

The actual performance of AMPT (AP Moller Terminal) represents 55 percent from Maersk Line while Maersk Line, PIL, MOL and CMA/CGM have been calling Apapa Terminal (Refer attachment). Zim Israeli Line, CMA/CGM, Messina Lines, Happag Lloyd, COSCO and K Line are making calls to Tincan Terminal (TCIT).

Although a plan to build a new container terminal at the place called LEKKI, northwest of the current port, to cope with ever increasing container throughput at those ports is in progress between NPA and TORERIN, an India-Singapore firm, there is no specific and concrete progress at this time.

Total container throughput of the respective ports in 2008 shows 418,000 TEU (260,000 TEU/Apapa and 158,000 TEU at Tincan Terminal). Lagos port has a total of five cargo terminals to cater conventional vessels and break-bulk cargo and the growth rate of these ports show 20 percent on average every year with a continuing upward trend. On the contrary, the export from entire Lagos ports is merely 25,000 TEU per year as is shown in the attached reference.

Under the influence of the global economic downturn, anchoring time for carriers in Nigeria has been falling off, for instance Maersk Line with Priority Berthing so called “WINDOW” cut down to three days, CMA/CGM dropped to 6 days, PIL for 16 days but MOL still suffering 25 days as of April 2009.

NPA predicts that container throughput by the year 2010 would reach 600,000 TEU, far beyond its physical capability and feared to lose international credit towards the Ports. All import goods and items are used 100 percent domestically and transhipment and transit containers are confirmed to be nil.

Without exception, importers are confronted with tedious government procedures and compulsory cargo inspections by officers, among other documentation checks by Customs House, that normally take as long as 50 days before taking delivery of the cargo.

According to NPA, to decrease the chance of contraband Custom House conducts physical inspections of almost all cargo coming into the country at a rate of over 80% due to the lack of credibility of importers. This results in nonfunctionality, coupled with a limited access of only one road to and from the port area. That importers must write their signature over 70 times before cargo release is a stark example of the inefficiency experienced here.

There is a unanimous opinion in the market place that the government direction and the general economy status including the oil industry around the Port Harcourt area are said to have poor transparency that leads to irresponsiveness towards social and economic issues.

While the port situation and the delay of berthing has been improving for carriers but the government procedures and physical inspections of the cargoes for importation remain unchanged.

Source: JICA Study Team

Figure 2.3.1 Port of Lagos

(2) Durban Port –RSA

JICA Study Team paid a visit to the Durban area from 31st May to 5th June to catch up with the current status of the port situation and gain knowledge about current improvements.

Durban Port, the most active and the largest port in the entire Africa region handled 2.6 million TEU in 2008. It is located in the centre of Durban city with 2 million people. Being the most active container terminal, all mega-carriers who serve between Indian and Atlantic Ocean such as Maersk Line, MSC, OOCL, COSCO, EMC, PIL, MOL and K Line have been calling at the port.

The Study Team learnt that on-going and unfavourable delays around the port had almost cleared away since the beginning of 2009, through various efforts by people and groups. It was also understood that the Port of Cape Town is now playing an important role to serve as a Transhipment Hub over-taking its status from Durban port.

Transnet Port Terminal (TPT) Authority told the JICA Team that they were adding 3 new berths within Pier 1, coupled with a Rail-Mounted Gantry Crane worth 36 million African Rand (equivalent to 3 million US Dollars) to clear chronic delays (this is according to TPT Press Release/Transnet Port Terminal).

Inland transportation system to and from the Durban Port has been quite efficient and has 5 – 6 trains daily including an overland transportation (OLT) scheme, running between the Johannesburg/Gauteng area and the port leaving cargo owners to have the convenient choice to clear customs at the rail terminal as well. This also benefits the transit time between Cape Town and Durban that usually takes 2.5 days.

Container throughput in 2008 showed a remarkable record of 2.6 million TEU. The port has conventional, B/B, Passenger Terminals and fishery terminals for domestic and foreign trawlers.

As a consequence of the sluggish global economy, the growth of the respective ports experienced a roughly six percent downturn in comparison of January–March 2008 and January–March 2009. This has affected Durban Port as well. As mentioned earlier, waiting time for berthing used to be 3–7 days and this has almost disappeared since January 2009 even for

those carriers without "window" priority rights. A similar situation was confirmed in all other ports and terminals in South Africa, according to a TPT officer.

International Ports/Terminal in RSA as at April 2009 (by TPT)

Richards Bay:	6,295,313 tonnes – world largest in terms of volume
Durban Port:	2,741,431 tonnes
East London:	158,028 tonnes
Ngqura Port:	to be operational on October 2009
Port Elizabeth:	302,127 tonnes
Mosel Bay Port:	98,789 tonnes
Cape Town:	300,897 tonnes
Saldanha Port:	5,749,898 tonnes

Maputo Port of Mozambique located next to Durban is acting as a feeder hub due to a comparatively short distance to cater transit cargo to Johannesburg and Gauteng, generating majority of its income from this business. The distance between Maputo and Johannesburg is approximately 500 kilometres while Duran to Johannesburg is about 650 kilometres.

Chances of getting transit cargo at the port of Walvis Bay to Johannesburg are slim due to the distance of over 1,000 kilometres from the port, except for some possibility of getting some eastbound cargoes from Europe to Johannesburg to cut the long transit time from Walvis Bay to Durban or Maputo. It is reported that the handling of Agricultural products at Durban port has been declining because majority of the items being loaded for export at Maputo.

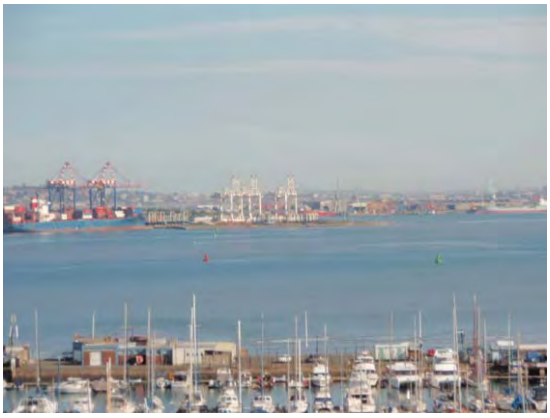
TPT is expecting to handle 350 million TEU by the year 2010 and the figures seem to be reasonable and realistic when taking the current improvement of the port into considerations. If the combined efforts between Port Authority in collaboration with the sustainable groups continue to be there, it will further heighten competitiveness after deepening the draught from 12.8 meter to 15 meters in the near future (by TPT)

Postscript – Ports in South Africa

The positioning of Durban Port as the most reputable top runner will most likely continue to be stable for years to come as they continue to strengthen its efficiency, facility, rehabilitation and improvement works for users.

Taking the facilities of Pier 1/Durban Port alone into considerations, there are 6 Gantry Cranes, 18 RTG and two Rail Transfer Gantry Cranes and also 120 Straddle Carriers to cater to 720,000 TEU a year. Based on this, Namport could attempt to capture demand from some transhipment containers around Cape Town and Luanda where the majority of cargo in Durban port is for local consumptions.

Strong leadership and timely judgment of TPT is well recognized by various media and JICA Study Team can confirm the high aspirations expressed by TPT during the interview.



Source: JICA Study Team

Figure 2.3.2 Port of Durban

(3) Luanda Port – Republic of Angola

The quay line of the port of Luanda, the largest port in Angola, is along the west coast of the cape in Luanda Bay.

Due to the extreme lack of berths and facilities for cargo handling here, about 70 to 80 vessels are constantly at anchorage awaiting berths; for general cargo vessels and container vessels the waiting time amounts to 15–20 days minimum.

The small container barges with a single boom derrick carry containers from the small container vessels in anchorage to the narrow opening area of the berth between the berthing vessels through mid-stream operation.

Since the civil war ended in 2002 the cargo quantity has significantly increased. The container boxes in 2003 reached 210,000 and in 2008 reached 410,000, an almost doubling in Luanda. The numbers of vessels rose from 2,850 to 4,100 in 2008, an 44% increase. The capacity of the facilities has never expanded since the civil war age.

There are four berths for container vessels: two in the multipurpose berths and two berths dedicated for container vessels. The container vessels not less than 140m LOA are allotted to berths 10.45m in depth, and ones up to 200m LOA to 12.5m in depth.

Generally the handling equipment on the ships is to be used, but two Liebherr mobile crane units sometimes assist handling operation. Containers are carried by the yard chassis between vessels side and the yard by lifting up/down with reach stackers at both sides.

The berths and the back lot area have become significantly uneven due to lack of maintenance for decades, and construction materials are piled in a haphazard manner. This combines to interfere with smooth trailer traffic.

Yard trailers and reach-stackers cannot move straight due to the hatch covers of the berthing vessel put on the narrow apron 15–20 m in width. The back container yard is small and there is no other space for expansion. Containers are stacked at random in the yard and it seems that it would be difficult to trace them according to the yard stowage plan.

The container operating companies are joint ventures of Angolan and foreign companies, and the Angolan government is little involved.

There is a new berth of 200–300 m length with 12.5 m depth under planning for construction now towards the north of the existing berth.

New port construction is planned at Cacuaco, 30 km north of Barra do Dande and 50 km north of Luanda, but it has been suspended due to ecological issues.

Most cargo discharged at Luanda is transported north of Luanda and into the suburbs and is carried by trucks. The infrastructure in Angola is in disrepair due to the war for independence and the civil war for over 40 years ending in 2002. There are a great many land mines, so railways and roads are banned in various places. Some areas are allegedly undergoing rehabilitation through Chinese official assistance, but the progress seems to be delayed.

The Angolan government focuses on carrying their own products to the ports by rail and does not consider carrying the products of land-locked countries. They presently export and import their cargo through ports on the East Coast of Africa. The grains from Malanje, the biggest agriculture area in Angola, are carried to Luanda, and iron ore produced in Cuanza and Casinga is carried to Lobito and Namibe. The railway, therefore, is designed with rolling stock and rail for these cargos, not for containers.

In consideration of the above, it is a very good opportunity to concentrate the transportation routes to Walvis Bay to secure the cargo of Angolan interior zones and the southern area—especially the border zone with Namibia—and the land-locked countries such as Congo and Zambia. Quick completion of the railway and the road net is desirable in association with smooth and simple customs systems at the border.

Presently it is reported that the railway which runs south to north along the coast line is under planning between the Namibian and Angolan government. The completion of the railway will help to contribute in establishing Walvis Bay as a gate port of South Western Africa.

Source: JICA Study Team

Figure 2.3.3 Port of Luanda

2.3.4 Financial Situation of Namport

(1) Activities of Namport

Namport, the Namibian Ports Authority, is a state-owned cooperation, which owns and is responsible for the operation of both the Port of Walvis Bay and the Port of Lüderitz. The Government Act 1994 provided for the establishment of a national port authority. Namport was set up in 1994, following the integration of Walvis Bay into an independent of Namibia.

Key roles of Namport are as follows.[20]

- Manage the port facilities to cater for current trade needs
- Develop the ports for future demand
- Contribute to the competitiveness of the SADC region's trade through the efficient, reliable and cost effective supply of port service
- Facilitate economic growth in Namibia by enabling regional development and cross-border trade
- Promote the Ports of Walvis Bay and Lüderitz as preferred routes for sea-borne trade between SADC, Europe and the Americas
- As the founding architects of the Walvis Bay Corridor Group, assist with developing cross-border trade
- Minimize the impact of port operation on the natural environment by applying ISO 14001
- Uplift and support the communities with which Namport operates

(2) Financial Statements of Namport

Namport has established an auditing committee, made up of external auditors, to independently perform the auditing process. An annual report is prepared every year at the end of this auditing process.

Financial statements (balance sheet, income statement, and cash flow) of Namport from 2004 to 2008 are summarized in the following tables.

Table 2.3.9 Balance Sheet of Namport (2004–2008)

(Unit: N$ 000)

	2004	2005	2006	2007	2008
Assets					
Non-current assets					
Property, plant and equipment	779,911	742,578	730,722	727,721	725,375
Investments	151,775	170,673	261,170	320,025	447,455
Channel levy fund investment	965	1,348	3,340	5,361	7,519
Investment in subsidiary	-	-	1	3,150	3,150
Loans to subsidiary	-	-	3,790	1,337	1,693
Deferred tax asset	-	-	-	-	-
Total non-current assets	932,651	914,599	999,023	1,057,594	1,185,192
Current Assets					
Inventories	666	656	674	883	1,605
Receivables and prepayments	31,576	34,045	42,011	45,012	82,439
Cash and cash equivalents	44,886	107,913	93,286	191,522	233,746
Current tax assets	-	3,282	517	1,714	-
Total current assets	77,128	145,896	136,488	239,131	317,790
Total Assets	1,009,779	1,060,495	1,135,511	1,296,725	1,502,982
Equity and Liabilities					
Capital and reserves					
Capital account	50,344	50,344	50,344	50,344	50,344
Retained earnings	332,340	705,234	732,222	815,658	913,184
Shareholders interest	186,746	755,578	782,566	866,002	963,528
Minority interest	-	-	-	-	-
Total equity	569,430	755,578	782,566	866,002	963,528

[20] Source: Namibia Ports Authority Handbook

	2004	2005	2006	2007	2008
Non-current liabilities					
Interest bearing borrowings	141,239	154,119	184,808	231,478	220,549
Shareholder loans	-	-	-	-	-
Deferred tax liabilities	236,348	83,402	98,552	120,178	154,345
Navigational aids fund	-	-	-	1,040	-
Operating lease liability	-	-	-	-	-
Channel levy fund	965	1,348	3,340	5,361	7,519
Total non-current liabilities	378,552	238,869	286,700	358,057	382,413
Current liabilities					
Trade and other payables	28,516	36,793	35,540	30,456	77,903
Current portion of long-term liabilities	25,657	19,411	20,044	27,671	36,084
Namport social investment fund	-	-	-	649	2,199
Namport solidarity fund	-	-	-	9	58
Provisions	6,590	9,844	10,661	13,881	22,081
Navigational aids fund	-	-	-	-	3,145
Current tax liabilities	1,034	-	-	-	15,571
Bank overdraft	-	-	-	-	-
Total current liabilities	61,797	66,048	66,245	72,666	157,041
Total liabilities	440,349	304,917	352,945	430,723	539,454
Total equity and liabilities	1,009,779	1,060,495	1,135,511	1,296,725	1,502,982

Source: Annual Report, Namibian Ports Authority, 2005–2008
Note: As of 31 August of each year

Table 2.3.10 Income Statement of Namport (2004–2008)

(Unit: N$ 000)

	2004	2005	2006	2007	2008
Revenue	211,270	220,858	252,671	324,237	434,213
Other income	395	1,900	96	7,365	4,467
Staff costs	-	(87,846)	(97,061)	(116,160)	(130,075)
Variable operational costs	-	(10,354)	(13,581)	(19,565)	(25,026)
Direct overhead costs	-	(5,235)	(5,517)	(4,143)	(4,324)
Indirect overhead costs	-	(15,339)	(32,033)	(34,281)	(67,128)
Depreciation	-	(54,378)	(55,232)	(53,409)	(56,102)
Maintenance	-	(12,968)	(11,925)	(12,052)	(15,860)
Direct costs	(81,952)	-	-	-	-
Indirect costs	(29,499)	-	-	-	-
Administrative expenses	(87,857)	-	-	-	-
Operating profit	12,357	36,638	37,418	91,992	140,165
Finance income/(cost)					
Interest paid on long-term loans	−20,076	−29,110	−37,010	−34,466	−43,120
Money market vested returns accrued on endowment policies	4,468	9,521	16,489	20,823	16,313
Received from other sources	10,706	16,471	28,741	34,713	51,300
Total finance income / (cost)	(4,902)	(3,118)	8,220	21,070	24,493
Profit before tax	7,455	33,520	45,638	113,062	164,658
Taxation	(11,258)	(19,513)	(15,150)	(21,626)	(52,132)
Profit / (loss) for the period	(3,803)	14,007	30,488	91,436	112,526

Source: Annual Report, Namibian Ports Authority, 2005–2008
Note: For the year ending on 31 August of each year

Table 2.3.11 Cash Flow of Namport (2004–2008)

(Unit: N$ 000)

	2004	2005	2006	2007	2008
Cash flow from operating activities					
Cash receipts from customers	211,041	221,072	253,988	296,639	437,950
Cash paid to suppliers and employees	(146,362)	(120,935)	(189,594)	(187,616)	(251,048)
Cash flow from operating activities	64,679	100,137	64,394	109,023	186,902
Cash generated from operations					
Interest received	15,174	17,240	45,230	55,536	67,613
Interest paid	(12,373)	(19,280)	(30,255)	(22,418)	(31,446)
Dividend paid	(2,200)	-	(3,500)	(8,000)	(15,000)
Tax refund/paid	-	(4,633)	2,765	(1,197)	(680)
Net cash flow operating activities	65,280	93,464	78,634	132,944	207,389
Cash flow from investing activities					
Investments to expand operating capacity	(22,346)	(7,128)	(680)	(1,471)	(2,327)
Investments to maintain operating capacity	(1,219)	(10,010)	(44,628)	(48,969)	(51,562)
Purchase of non-current investments	(20,187)	(46,044)	(77,509)	(69,167)	(116,300)
Transfer to cash on call	-	22,530	-	40,277	-
Proceeds from disposal of property, plant and equipment	45	43	64	9	10
Proceeds from disposal of property	-	13,368	8,716	-	19,561
Investment in subsidiary	-	-	(1)	-	-
Loan extended to subsidiary	-	-	(3,790)	(697)	(355)
Net cash outflow from investing activities	(43,707)	(27,241)	(117,828)	(80,018)	(150,974)
Cash flows from financing activities					
Proceeds from long-term borrowings	24,000	45,893	45,912	31,390	2,681
Payment of capital element of long-term borrowings	(40,529)	(48,900)	(30,567)	(12,589)	(25,149)
Proceeds from finance lease liabilities	-	-	9,222	26,509	8,277
Proceeds from operating leases	(229)	(189)	-	-	-
Net cash (outflow)/ inflow from financing activities	(16,758)	(3,196)	24,567	45,310	(14,191)
Net increase in cash and cash equivalent	4,815	63,027	(14,627)	98,236	42,224
Cash and cash equivalents at the beginning of year	40,071	44,886	107,913	93,286	191,522
Cash and cash equivalent at the end of year	44,886	107,913	93,286	191,522	233,746

Source: Annual Report, Namibian Ports Authority, 2005–2008
Note: For the year ending on 31 August of each year

(3) Results of Financial Statement Analysis

Based on the financial statements shown above, results of the financial statement analysis are summarized in the following table.

Table 2.3.12 Results of Financial Statement Analysis of Namport (2005–2008)

Indicators	**2005**	**2006**	**2007**	**2008**
Rate of Return on Assets	2.53%	5.03%	9.81%	10.14%
Fixed Asset Turnover Ratio	29.01%	34.30%	44.46%	59.76%
Rate of Return on Equity	2.11%	3.96%	11.09%	12.30%
Current Ratio	2.21	2.06	3.29	2.02
Quick Ratio	2.15	2.04	3.26	2.01
Cash Flow from Operations to Current Liability Ratio	57.32%	56.57%	132.45%	122.04%
Long-term Debt Ratio	16.94%	19.10%	21.09%	18.63%
Cash Flow from Operations to Total Liabilities Ratio	9.83%	11.38%	23.48%	28.89%
Interest Coverage Ratio	2.15	2.23	4.28	4.82

Source: The Study Team

The calculation methods and notes of each indicator are as follows.

- Rate of Return on Assets

= ((Profit for the period) – (Interest paid net of income tax savings))/(Average total assets during the period)

Rate of return on assets measures the performance in using assets to generate profits independent of the financing of those assets.

- Fixed Asset Turnover Ratio

= (Revenue) / (Average fixed assets during period)

Fixed asset turnover ratio measures the relation between sales and the investment in fixed assets, such as property, plant, and equipment.

- Rate of Return on Equity

= (Revenue) / (Average equity during period)

Rate of return on equity measures the performance in using and financing assets to generate profits.

- Current Ratio

=(Current assets) / (Current liability)

Current ratio indicates the ability of Namport to meet its short-term obligations.

- Quick Ratio

= ((Receivables and prepayments) + (Cash and cash equivalents)) / (Current liabilities)

Quick ratio indicates the ability of Namport to meet its short-term obligations by utilizing assets that Namport can convert quickly into cash.

- Cash flow from operations to current liability ratio

= (Operating profit) / (Average current liabilities during period)

Cash flow from operations to current liabilities ratio indicates the ability of Namport to meet its short-term obligations from the view of operations.

- Long-term debt ratio

= (Total long-term debt) / ((Total long-term debt) + (Equity))

Long-term debt ratio reports the portion of Namport's long-term capital that debt-holders furnish.

- Cash flow from operations to total liabilities ratio

= (Operating profit) / (Average total liabilities)

Cash flow from operations to total liabilities ratio indicates the ability of Namport to meet its total obligations from the view of operations.

- Interest cover ratio

= (Profit before interest and taxes) / (Interest paid on long-term loans)

Interest cover ratio indicates the relative protection that operating profitability provides bondholders, permitting them to assess the probability that Namport will fail to meet required interest payments.

Findings from the results are summarized as follows.

- The rate of return on assets, fixed turnover ratio and rate of return on equity analyze the profitability of Namport. The values of these ratios consistently increase from 2005 to 2008. Therefore, it can be said that, as Namport increases its revenue, Namport improves its profitability. In other words, during the period, Namport earns profits more effectively from its assets and equity, as the years go by.
- The current ratio, quick ratio and cash flow from operations to current liability ratio analyze the short-term liquidity of Namport. As the values of current ratio and quick ratio are more than 1.0 during 2005 to 2008, it can be said that Namport sufficiently maintains its capability to make payments in the interest of its short-term liabilities from its current assets. As the number of cash flow from operations to current liability ratio increases, its operation bears enough profit to meet the increase in short-term debt.
- Long-term debt ratio, cash flow from operations to total liabilities ratio and interest coverage ratio analyze the long-term liquidity of Namport. It is commonly said that a financially healthy company normally has a cash flow from operations to total liabilities ratio of 20% or more[21]. In addition, analysts typically view an interest coverage ratio below 3.0 as risky[22]. From these standards, in 2005 and 2006 Namport was a "risky company" in terms of its capability to pay the interests of its long-term debt. But, as those numbers have overcome the standard values since 2007, it is assumed that Namport has gained enough revenue and profit to pay the interest of long-term debt after 2007. In addition, most borrowings of Namport are set on fixed rates. Fluctuation in variable rates does not impact on the operating profit of Namport very much and Namport faces little risk of fluctuation of interest rates. Therefore, the current financial situation of Namport sees no problem in covering its current long-term debt.

These results indicate that Namport does not have any financial problems in covering its liabilities after 2007. The increase of revenue and profit provides Namport with sufficient capability to render its financial performance healthy.

2.4 Current Railway Situation

2.4.1 Organization and Route of Railway in Namibia

(1) Organization of Railway in Namibia

The railway of Namibia was managed and operated by the Republic of South Africa until 1985. Organization reforms took place after independence and now, TransNamib Holdings Limited, a wholly owned parastatal of the government of the Republic of Namibia, manages and operates the railway.

[21] Source: Clyde P. Stickney and Roman L. Weil, "Financial Accounting 10th edition," Thomson Learning 2003, p274
[22] Source: Clyde P. Stickney and Roman L. Weil, "Financial Accounting 10th edition," Thomson Learning 2003, p275

Specializing in the transportation of bulk and containerized freight, TransNamib utilizes a combination of rail and road transportation, and is the national logistic provider in Namibia.

(2) Route of Railway in Namibia

The total length of Namibian railway is 2,442 km. The main line of Namrail is as follows:

- Walvis Bay–Swakopmund–Usakos–Kranzberg–Omaruru–Otjiwanrongo–Otavi–Tsumeb (594 km)
- Windhoek–Okahandja–Karibib–Kranzberg (210 km)
- Lüderitz–Aus[23]–Seeheim (318 km)
- Windhoek–Kalkrand–Mariental–Keetemanshoop–Seeheim–Kransburg–Ariamsvlei (849 km)
- Otjiwanrongo–Outjo[24] (69 km)
- Windhoek–Gobabis (228 km)
- Otavi–Grootfontein (91 km)
- Tsumeb–Ondangwa (248 km)

Source: TransNamib

Figure 2.4.1 Railway Route Map in Namibia

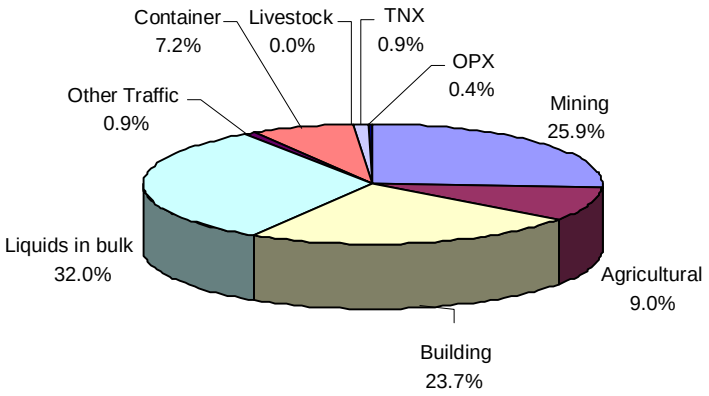
2.4.2 Current State of Railway Transportation

(3) Freight

The freight trains have no operation timetables. A train departs when the freight gathers and is ready to depart. Although trains with connected passenger cars have operation timetables, they rarely run as scheduled.

[23] Under reconstruction between Aus and Lüderitz (140km)
[24] Under suspension

The volume of freight transportation by railway is approximately 2 million tonnes and 1,100–1,200 million tonne-kilometres. The main commodities are building materials, liquids in bulk, mining and agricultural raw materials, and containers. The distribution of these commodities in 2006/2007 is as shown below:



Note
TNX: TransNamib Express
OPX: TransNamib Overnight Parcel Express

Source: TransNamib Annual Report 2006

Figure 2.4.2 Distribution of Railway Tonnage in 2006/2007

(4) Passengers

The long-distance trains run from Windhoek in every direction but have low frequencies.

The annual passenger volume is 90,000 and decreases every year. The main reasons for this are the very small populations along the railways and the inaccurate train schedules.

Although, as measures against the decrease in passengers, TransNamib has reduced prices and improved accommodation to include air-conditioning and reclining seats, the negative trend has not declined. As of July 2009, trains only run:

- Windhoek–Walvis Bay: every day except Saturday
- Windhoek–Keetmanshop: every day except Saturday
- Keetmanshop–Karasburug: twice a week

Every train is connected to a regular freight train.

Although the Diesel Multiple Unit (DMU) train began to run between Windhoek and Oshivelo in 2004, the operation was discontinued in November 2008 due to bad track conditions.

Table 2.4.1 Overview of the Railway System and Traffic Volume

Item	**2004/05**	**2005/06**	**2006/07**
Route Length (km)	2,290	2,290	2,442
Number of Locomotive	51	51	51
Locomotive kilometre	4,758,618	4,482762	4,244,034
Freight volume			
(‘000 net ton)	2,070	2,154	2,005
(‘000 net ton-km)	1,262,190	1,212,795	1,118,911
(net ton-km/loco)	265	270	264
Passenger Volume			
(person)	96,485	94,149	92,458

Source: TransNamib Annual Report 2005, 2006

2.4.3 Current State of Railway Facilities

(1) Major Specifications

The major specifications of the railway system are shown in the following table:

Table 2.4.2 Major Specifications of the Railway System

Item	Specifications
Track	
Gauge	1,065 mm (3'6'')
Rail	30 kg/m (Existing section) 48 kg/m (New or Upgrading section)
Fastening	Bolt, Elastic
Sleeper	Steel, Pre-stressed Concrete
Axle Load	12.5 t (Existing section) 18.0 t (New and Upgrading section)
Max. Speed	65 km/h (Existing section) 120 km/h (New and Upgrading section)
Max. Grade	1:66 (1.5%)

Source: JICA Study Team

(2) Track and Civil Structure

1) Track Structure

The tracks are ballast tracks with 30 kg/m rail and steel sleepers. 48 kg/m rail and Pre-stressed Concrete sleepers are used in the new line and in upgraded sections.

The 30 kg/m rails are progressively ageing, and surface deformations are visible. Results of ultrasound tests on the rails reveal much internal damage, even reaching a dangerous state in the section between Kranzberg and Tsumeb. Therefore, the passenger trains have discontinued in this section because of the risk of derailment, while freight trains run at approximately 10 km/h to ensure safety. However, the tracks in this section are undergoing an upgrade to 48 kg/m rails and PC sleepers.

In the section between Tsumeb and Oshikango, which started construction in 2002, 48 kg/m rail and Pre-stressed Concrete sleepers were used from the start. The minimum horizontal curve radius is 800 m and the maximum speed is 120 km/h.

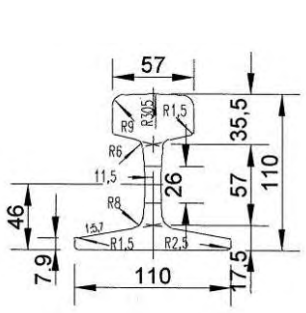
It seems that the maintenance of a track can be carried out very briskly using a track inspection vehicle and a tapering machine. Although the rail is progressively ageing, other track defects such as track irregularities, shortages of ballast volume, and mud pumping are not seen.

(a) 30 kg/m Rail with Steel Sleeper

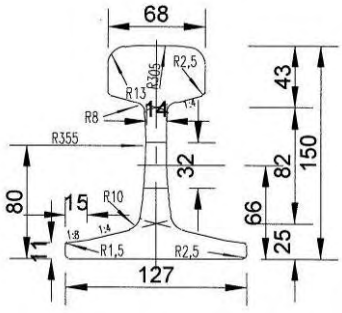
(b) 48 kg/m Rail with PC Sleeper

Source: JICA Study Team

Figure 2.4.3 Photo of Track



(a) 30 kg/m Rail



(b) 48 kg/m Rail

Source: JICA Study Team

Figure 2.4.4 Rail Section

The railway line between Walvis Bay and Swakopmund runs close to the dune, and the track is covered with sand. However, it appears that tracks are not completely buried in sand and do not make train operation impossible for many hours because winds are constantly blowing the sand away.

Source: JICA Study Team

Figure 2.4.5 Track Buried in Sand (between Walvis Bay and Swakopmund)

2) Earthwork

Most of the rail sections, including the new line, are built by earthwork. Although the details of the banking materials are unknown, heterogeneous materials, including small stones, are used for nearly 89 km of the Kranzberg starting points in the Kranzberg–Tsumeb line.

In the section between Ondangwa and Oshikango, there are trenches along the track. It appears that topsoil has been used as a baking material.

In the cutting section, there are exposed rocks on the face of the slope, with no safeguards.

3) Bridge

Steel trusses or plate girders are used in the main bridges. There are many bridges that consist of simple beams with small spans because most rivers crossing the railway are dry rivers, which flow only during the rainy season. Some girders are also directly connected with piers or abutments without shoes.

Although it appears that many of these were constructed early in the 20th century, the investigation was not able to determine if this was also the case for the bridge on dangerous status.

Box-culverts are used in parts where the water flows only during times of flooding.

4) Tunnel

There are no tunnels along any of the corridors.

(3) Station

Most TransNamib stations handle both passengers and freight. Typically, they have a few loop tracks and platforms for passengers and freight. Loop tracks are usually filled with fine material such as ballast when a train rides in into a track, which also enables the direct handling of freight alongside a freight car.
Some stations have siding tracks to factories and oil terminals.

There are large shunting yards in Windhoek and Walvis Bay. The freight trains are rearranged and composed there. There is also an Inland Container Depot (ICD) in Windhoek.

In addition, there are small stations with passing loops every 10–15 km. There are no station staffs in these stations, and the assistant driver switches the turnouts.

The locomotive maintenance depots are located in Windhoek, Walvis Bay, Otjiwarongo etc., while the workshop is located in Windhoek.

(4) Signalling, Telecommunication and Level Crossing

Mechanical signals that indicate when a turnout is set correctly are used in some stations, but in most stations, there are no signals for indicating that the line ahead is clear (free from any obstruction) or blocked, for example, or that the driver has permission to proceed. Therefore, the departure of a train is directed by radio or orally by the station staff. Line clearance between stations has to be confirmed via radio or mobile phone at every other station, which makes for substandard safety.

The turnouts are switched manually, by an assistant driver who operates them.

Most level railway crossings with roads have only crossbucks, and do not have alarms or crossing gates. The crossings with the main road are either overpasses or underpasses.

(5) Rolling Stock

1) Locomotive

Each locomotive is of diesel-electric type and is typically either of the 33-400 Class, manufactured by General Electric of USA (1968–1970), or the SDD6 Class, manufactured by CSR of China. All locomotives including other types are used both for the main line and for shunting. But the CKD8C Class introduced as aid from China in 2004 is not used at present because it is not suitable for Namibian climate.

The locomotives use an air braking system, but the trains use vacuum brakes instead.

TransNamib has been carrying out refurbishment of the ageing 33-400 Class with a South African manufacturer since 2008. The cost of refurbishment is N$3–5 million per locomotive and will take 24 months.

(a) 33-400 Class

(b) SSD6 Class

Source: JICA Study Team

Figure 2.4.6 Photo of Locomotives

2) Freight Car

The types of freight cars used by TransNamib are flat wagons with side doors, flat wagons without side doors, tankers, and box wagons. Freight cars with two fixed axles are not usually used.

Flat wagons with side doors are used to carry coal, sugar, brick and packed cement etc., while flat wagons without side doors are used for containers. Tankers are used to carry fuel, sulphuric acid and chemical materials while box wagons are used for packed wheat. Flat wagons with side doors are also used for container transpiration because those flat wagons are short.

Most freight cars have been used since the South Africa government era. The cars made in China are also increasing in number recently.

(a) Flat Wagon for Container

(b) Flat Wagon with side door

Source: JICA Study Team

Figure 2.4.7 Photo of Freight Cars for Container

3) Passenger Cars, DMUs and the Desert Express

Passenger car: Most passenger cars have also been used from the South Africa government era. TransNamib improved these old cars in order to attract more passengers. These cars have aircraft-like seats, air conditioning, vending machines and audio-visual entertainment. There are also sleeping cars.

DMU: The DMU for passenger was manufactured in China in 2004. This train is composed of 4 cars: a motor car with a driver's cab, a trail car with the driver's cab at one end, and two other trail cars in the middle. The trail car with the driver's cab is a first-class car and the middle two trail cars are second-class cars.

Although this train, named "Omugulu Gwombashe Star", began to run between Windhoek and Oshivelo in 2004, the operation has been discontinued since November 2008 because of bad track conditions.

Desert Express: This luxurious train for tourists runs over weekends between Windhoek and Swakopmund.

2.4.4 Rehabilitation Project

The Government of the Republic of Namibia and TransNamib have started the rehabilitation project for the Walvis Bay – Tsumeb line, procuring financing through Public Private Partnerships (PPP's), in October 2009. The main scope of the project is the following:

1. Ballasted track to meet 18.5 ton axle load continuously welded rail track at 100 km/h maximum speed in accordance with requirements set by TransNamib Holdings for rails, sleeper type and spacing, track fastenings and ballast.
2. Trackside signage repairs where required.
3. Level Crossing pavement in accordance with standards set by TransNamib.
4. Special concrete sleepers for the Swakopmund – Walvis Bay sub-section to withstand environmental factors (corrosion, sand).
5. Railtrack horizontal alignment improvement where economically justified.
6. Drainage and embankment improvements.
7. Strengthening of weight carrying structures (drainage, grade separation) to accommodate 18.5 ton axle loads.
8. Upgrading of station yard rail tracks where economically justified.

As a first step, consultants carrying out consultancy services for this project were invited in October 2009.

2.5 Previous Expansion Plans of Port of Walvis Bay

Previously the following expansion plans were studied for the Port of Walvis Bay:

- "Feasibility of Port Expansions at Walvis Bay" in 1994 (F/S in 1994)
- "Feasibility Study for Deepening the Port of Walvis Bay" in 1999 (Deepening Study)
- "Study on the Long-term Development of Port of Walvis Bay" in 2007 (Long-Term Development Study)
- "Design, Feasibility and Tender Berth 0/1 Concepts and Feasibility for Ship Repair Hub & Dedicated Fish Terminal" in 2008 (Berth Zero Study)
- "Technical Pre-Feasibility Study for New Container Terminal" in 2008 (Pre-F/S in 2008)

2.5.1 "Feasibility of Port Expansions at Walvis Bay" in 1994 (F/S in 1994)

"F/S in 1994" was conducted under the "Proposed Future Extensions to the Port of Walvis Bay" as shown in Figure 2.5.1. The study was conducted by CSIR of South Africa.

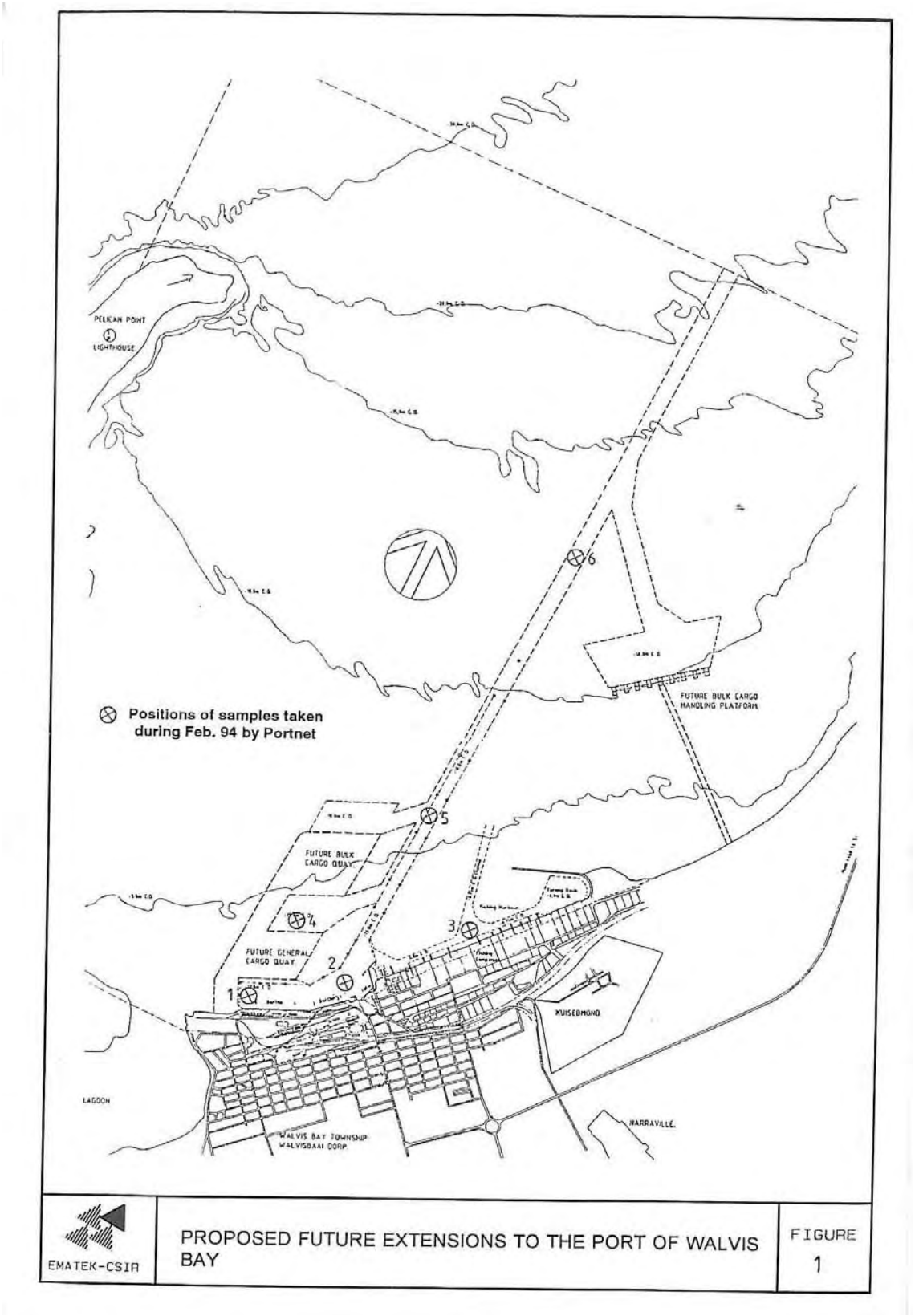
The aim of the study was to assess the effect of the proposed development on:

- the movement of the sediment in the bay
- the associated future maintenance dredging
- the port capacity
- navigational aspects of the proposed berth and channel layout, and
- possible ecological effects that the extended harbour may have on especially the Walvis Bay lagoon and other ecologically sensitive areas in the southern part of the bay.

Even now, the abovementioned assessments remain the key issues in conducting studies on the development of the Port of Walvis Bay.

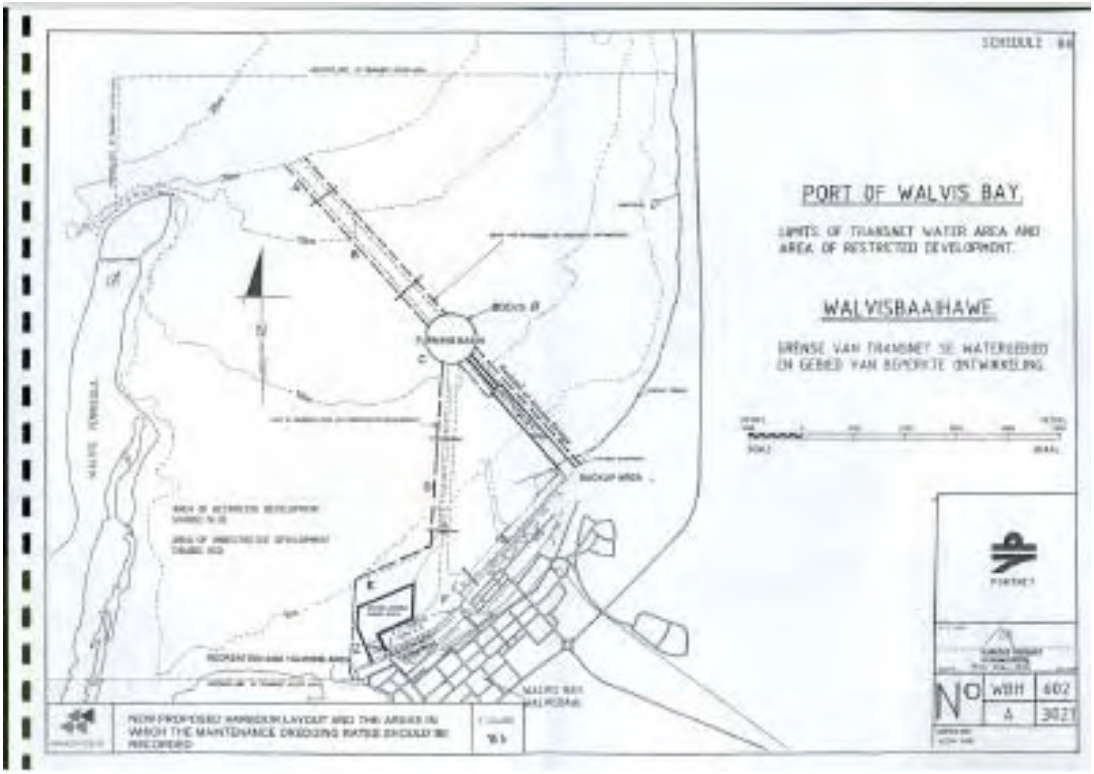
Among others, "F/S in 1994" concluded that the expansion of the harbour to the north-east is preferable because the lagoon and the yacht club, along with their associated recreational usage, exist at the south-west of the port. Recommended also was the limited expansion (shallow water general cargo quays of chart datum (CD) −13 m) to the south-west. "F/S in 1994" proposed that all future bulk cargo quays be located north-east of the existing port, the orientation of the main channel be north-west instead of north, and the turning basin and access channel to the bulk cargo handling platform be merged with the main entrance channel.

As a result of "F/S in 1994," an alternative future expansion was proposed as shown in Figure 2.5.2.



Source: Namport, Feasibility of Port Expansions at Walvis Bay, 1994

Figure 2.5.1 Proposed Future Expansion (1994)



Source: Namport, Feasibility of Port Expansions at Walvis Bay, 1994

Figure 2.5.2 Proposed Alternative Future Expansion (1994)

2.5.2 "Feasibility Study for Deepening the Port of Walvis Bay" in 1999 (Deepening Study)

"Deepening Study" was conducted by a consulting group consisting of Sogreah, Windhoek Consulting Engineers, BKS Engineering and Project Management, and the Centre for Marine Studies from the University of Cape Town, in order to evaluate the economic and financial feasibilities in deepening the navigation channel and Berths 1 to 3 from CD −10.0 m to CD −12.8 m. The result of the analysis predicted that the Port of Walvis Bay would be able to attract, in addition to the throughput in 1996/1997, approximately 35,000 TEU and 618,000 tons of cargo annually during the first few years of operation of the deeper port. The report was submitted in March 1999 and concluded that deepening was feasible with FIRR from 20.3 % to 25.8 % in the realistic case.

The deepening of the channel and harbour was carried out in 2000. The deepening to CD −12.8 m of the Port of Walvis Bay was very rational from a technical and scientific point of view and was proved a timely decision due to the increase of cargo thereafter.

2.5.3 "Study on the Long-term Development of the Port of Walvis Bay" in 2007 (Long-Term Development Study)

"Long-Term Development Study" was conducted on both the Port of Walvis Bay and the Port of Lüderitz. The study covered all the aspects of port development for both ports. For the Port of Walvis Bay, discussed were development of the container terminal, storage of foodstuffs, fluorspar storage and handling, relocation of VTS / Port Control, common user fish terminal, synchrolift development and refurbishment, and potential relocation of tanker discharge facilities and LPG terminal. The study was conducted by HPC Hamburg Port Consultants

GmbH in cooperation with Africon Namibia (Pty) Ltd, and Hamburg Port Training Institute GmbH.

To cope with the increasing demand, a wide-ranging and in-depth study was conducted. From a broad point of view, however, the study was too concerned about the renovations of the existing port facilities and consequently no conceptual development plan was presented. Accordingly, it was proposed that the quay length be extended by 320 m by constructing a new berth called Berth 0 so that larger container vessels could be effectively accommodated. Proposed also was that the container stacking yard behind Berth 1 to 3 be renovated for use by Ship-to-Shore Gantry (SSG) cranes for efficient cargo handling. Among others, the study concluded with the demand forecast of the container cargo as 135,874 TEU, 169,239 TEU and 229,862 TEU in 2008, 2010 and 2015 respectively in comparison with the actual throughput of 200,719 TEU in 2008.

Based on the development plan recommended by "Long-Term Development Study," the following detailed engineering study called "Design, Feasibility and Tender Berth 0/1" was conducted.

2.5.4 "Design, Feasibility and Tender Berth 0/1 Concepts and Feasibility for Ship Repair Hub & Dedicated Fish Terminal" in 2008 (Berth Zero Study)

"Berth Zero Study" is the detailed engineering study for tendering the berth extension to Berth 1, called Berth 0 (zero), and the area renovations behind Berths 1 to 3. In addition, the study examined the feasibilities of facility development for ship repair and a fish terminal. The study was conducted by WNL Consulting Engineers Coast (Pty) Ltd and INROS LACKNER AG. During the course of the engineering study, however, it was found that the demolition of the existing facilities and economic compensation for them were costly. Found also was that the renovation of Berths 1 to 3 attached to Berth 0 as their expansion into a modern container terminal would take a longer time and construction work would hamper the port operation, particularly container cargo handling which had begun to increase remarkably.

Therefore, it was concluded that the renovation of Berths 1 to 3 and the construction of Berth 0 should be implemented after Berths 1 to 3 had been relieved of the burden of handling the increased number of containers. To this end, it was recognized as a necessity to construct a separate container terminal whose construction would not interfere with cargo handling. Thus, taking these economical and operational points of view into consideration, an offshore container terminal development similar to the one suggested in "F/S in 1994" was revived in 2008.

2.5.5 "Technical Pre-Feasibility Study for New Container Terminal" in 2008 (Pre-F/S in 2008)

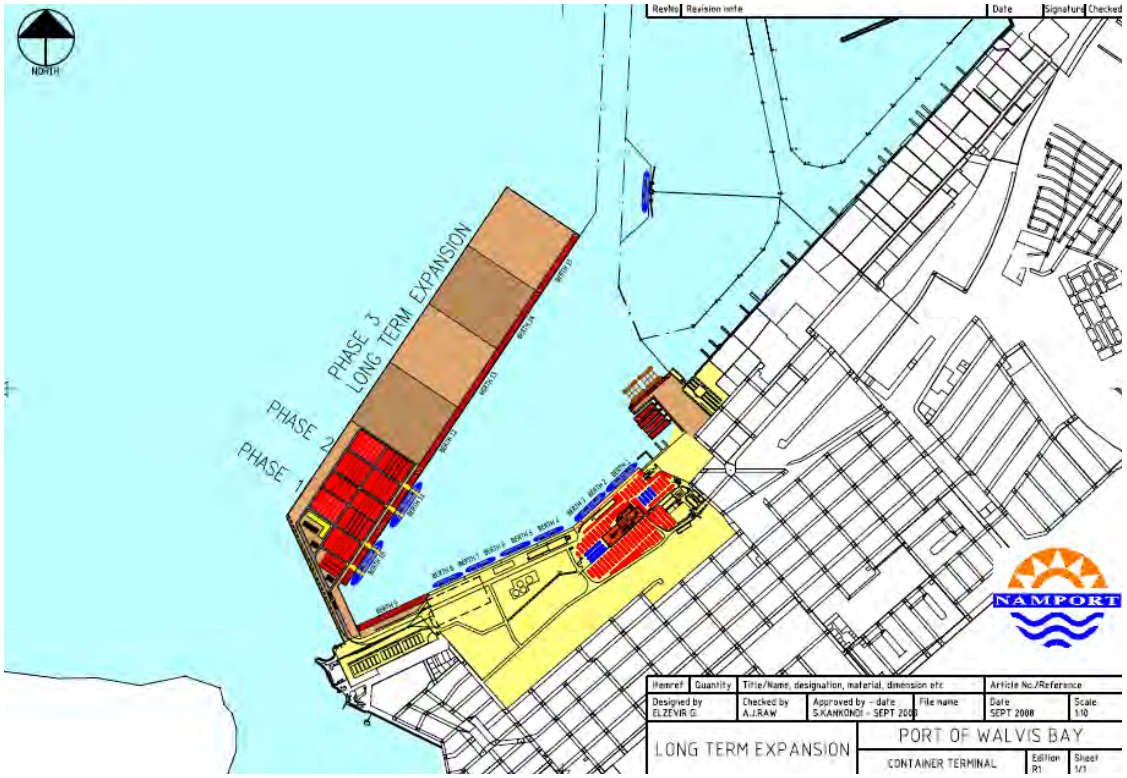
Facing difficulties in renovating Berths 1 to 3 and in constructing Berth 0, Namport employed INROS LACKNER AG to conduct a pre-feasibility study on the expansion of port facilities offshore. The conceptual expansion plan suggested in the "Pre-R/S in 2008" is shown in Figure 2.5.3. Container terminals and bulk terminals are laid out across the approaching channel from each other, with the container terminal is on the west side and the bulk terminal on the east side. This concept will allow for further development of the Port of Walvis Bay. Based on the conceptual plan for the expansion, the container terminal's development is suggested to be gradually implemented, first in two phases, Phase 1 and Phase 2 before future phases. In line with the conceptual expansion, two alternatives of more detailed container terminal development are presented in the tender documents to procure the EIA study on the offshore container terminal project from a consulting firm. They are shown in Figures 2.5.4. and 2.5.5.

Source: Namport, Technical Pre-Feasibility Study for New Container Terminal, 2008

Figure 2.5.3 Proposed Conceptual Expansion Plan (2008)

Source: Namport, Technical Pre-Feasibility Study for New Container Terminal, 2008

Figure 2.5.4 Proposed Alternative Expansion Plan 1 (2008)



Source: Namport, Technical Pre-Feasibility Study for New Container Terminal, 2008

Figure 2.5.5 Proposed Alternative Expansion Plan 2 (2008)

2.6 Natural Conditions at Walvis Bay and Its Vicinity

2.6.1 Topography, Bathymetry and Subsoil

(1) Topography and Bathymetry

Walvis Bay is located on the northern edge of the Kuiseb river delta. The delta had been developing until sufficient river flow ceased. After then, sand dunes have intruded and covered the delta with patches of swamp remaining. The littoral drift generated by southerly waves along the coast is creating a sand bar growing to the north at about 17 m a year observed at Pelican Point, which is located north-west of the Port of Walvis Bay across the bay. The port, therefore, is well sheltered by the sand bar from the intruding southerly waves generated in the Atlantic Ocean. Gradually growing, the sand bar has been enclosing the coastal sea and forming a huge lagoon, which is partly used by a salt firm and mostly protected by the Ramsar Convention as a sanctuary of birds, both migratory and resident.

The Port of Walvis Bay was built on the south-east end of the bay near the mouth of the lagoon. East of its vicinity is a residential area and further east is the hinterland of the Namib Desert. The land is flat and gradually gains altitude eastwards.

The seabed of the bay is gradually getting deeper from about CD −2 m at the mouth of the lagoon to CD −20 m at the opening of the bay. The seabed slope is almost 1 in 200. At the Phase 1 area of the container terminal development, the seabed elevation surveyed by use of a 200 kHz echo-sounder is CD −3 m to CD −5 m, deeper toward the bay opening. Because the echo-sounder picks up fluid diatoms accumulated on the seabed surface, the soil surface is considered slightly lower than the survey readings.

(2) Subsoil

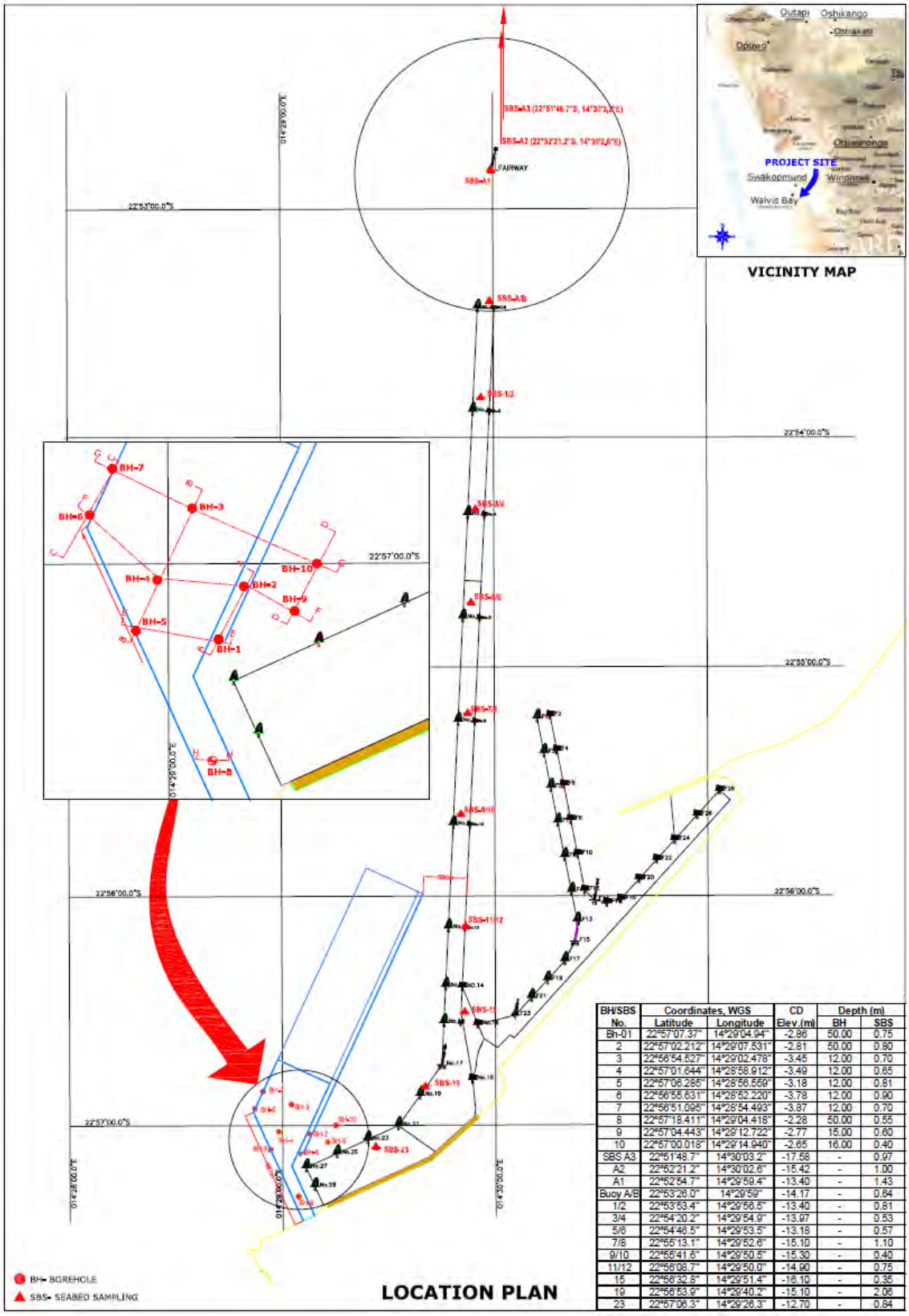
Borehole Exploration: Unexpected was that a thick layer of diatom-origin silt exists deeper than 24 m from the seabed at the Phase 1 area. Three boreholes drilled 50 m below the seabed could not confirm the thickness of this diatom-origin silt layer. At a shallower depth, a relatively thin diatom-origin silt layer of 1 to 2 m thickness was found at several boreholes.

The diatomaceous silt behaves like sand due to its porous micro structures absorbing water inside and has neither plasticity nor liquid limits. Its wet unit weight is mostly ranging from 1.06 to 1.20 gm/cc with 1.14 gm/cc on average, considered too light to support the heavy gravity structures like concrete caisson quay wall.

The diatomaceous silt is also compressive with the compressive coefficient (Cc) of about 0.4. This is extremely small when compared with clayey soil which Cc is normally 0.8 to 1.2. In planning the reclamation works having Cc of this value, no harmful settlement but very fast settlement would practically take place. Therefore, the reclamation needs some extra elevation to compensate the settlement.

Also unexpected was that the diatomaceous ooze at the seabed surface at the reclamation and dredging areas of Phase 1 development is not as thick as previously anticipated. Generally speaking, the subsoil to be dredged is mostly sandy and suitable for use as reclamation material.

The following borehole stratifications are briefed as follows: For location of the borehole, refer to Figure 2.6.1.



BH/SBS No.	Coordinates, WGS Latitude	Coordinates, WGS Longitude	CD Elev.(m)	Depth (m) BH	Depth (m) SBS
Bh-01	22°57'07.37"	14°29'04.94"	-2.86	50.00	0.75
2	22°57'02.212"	14°29'07.531"	-2.81	50.00	0.80
3	22°56'54.527"	14°29'02.478"	-3.45	12.00	0.70
4	22°57'01.644"	14°28'58.912"	-3.49	12.00	0.65
5	22°57'06.285"	14°28'56.559"	-3.18	12.00	0.61
6	22°56'55.631"	14°28'52.220"	-3.78	12.00	0.90
7	22°56'51.095"	14°28'54.493"	-3.87	12.00	0.70
8	22°57'18.411"	14°29'04.418"	-2.28	50.00	0.55
9	22°57'04.443"	14°29'12.722"	-2.77	15.00	0.60
10	22°57'00.018"	14°29'14.940"	-2.65	16.00	0.40
SBS A3	22°51'48.7"	14°30'03.2"	-17.58	-	0.97
A2	22°52'21.2"	14°30'02.6"	-15.42	-	1.00
A1	22°52'54.7"	14°29'59.4"	-13.40	-	1.43
Buoy A/B	22°53'26.0"	14°29'59"	-14.17	-	0.64
1/2	22°53'53.4"	14°29'56.5"	-13.40	-	0.81
3/4	22°54'20.2"	14°29'54.9"	-13.97	-	0.53
5/6	22°54'46.5"	14°29'53.5"	-13.18	-	0.57
7/8	22°55'13.1"	14°29'52.6"	-15.10	-	1.10
9/10	22°55'41.6"	14°29'50.5"	-15.30	-	0.40
11/12	22°56'08.7"	14°29'50.0"	-14.90	-	0.75
15	22°56'32.8"	14°29'51.4"	-16.10	-	0.35
19	22°56'53.9"	14°29'40.2"	-15.10	-	2.06
23	22°57'06.3"	14°29'26.3"	-12.70	-	0.84

Source: Subsoil and Seabed Materials Investigation, JICA Study Team

Figure 2.6.1 Location Plan

1) BH-01

Borehole No. 01 is located on the quay wall alignment. Seabed elevation is CD −2.86 m. Based on the results from the Standard Penetration Test (SPT), five (5) alternating SOIL formations were observed until borehole completion at 50m, namely (in order from top to bottom): sandy/clayey SILT (or Diatomaceous Ooze) on top of seabed portion; silty to well graded SAND; sandy SILT (or Diatomaceous SILT); thin layer of silty/clayey SAND; and followed by a thick layer of sandy SILT (or Diatomaceous SILT). Soil stratifications for this borehole are detailed as follows:

Table 2.6.1 Soil Stratifications for BH-01

Depth (m)	Consistency	Visual Soil Description
0.00– 0.75	Very soft	Clayey, sandy SILT (Diatomaceous Ooze)
0.75 – 3.00	Loose to Med. Dense	SAND with a thin layer of silt between 2 to 2.70m
3.00– 10.5	Dense to Very Dense	SAND containing traces of silts/clay and highly compacted between 6.0 to 8.91m.
10.5 –15.0	Very loose to M-Dense	Silty SAND
15.0 – 21.0	Firm to Very Stiff	Sandy SILT, (Diatomaceous SILT)
21.0 – 24.0	M. Dense – Dense	Silty SAND
24.0 – 50.0	Stiff – Hard	Sandy SILT, (Diatomaceous SILT)

Source: JICA Study Team

2) BH-02

Borehole No. 02 is located on the quay alignment, north-eastern side of Borehole-01, approximately 177m away. Seabed elevation is CD −2.81 m. On top of the seabed layer was a Sandy/Clayey SILT (or Diatomaceous SILT), followed by a thick silty to poorly graded SAND of varying consistency. Sand deposits between these layers were highly compacted as indicated by the SPT N-value which was considered as “refuse”. Then, this was followed by a layer of sandy SILT (or Diatomaceous SILT) with alternating thin layers of silty SAND and followed again by a thick layer of sandy SILT (or Diatomaceous SILT) with generally heavy consistencies. And lastly, silty fine to medium SAND were observed at the bottom of this hole. In the following are the details for each soil formation:

Table 2.6.2 Soil Stratifications for BH-02

Depth (m)	Consistency	Visual Soil Description
00.0 – 2.00	Loose	Silty SAND with a layer of SILT between 1.70 to 1.90m.
2.00 – 18.0	Very Dense	Compacted SAND, slightly silty to poorly graded.
18.0 – 21.0	Stiff	Sandy/clayey SILT (Diatomaceous SILT)
21.0 – 24.0	Medium Dense	Silty SAND
24.0 – 45.0	Stiff to Very Stiff	Sandy/clayey SILT (Diatomaceous SILT)
45.0 – 50.0	Very Dense	Silty SAND

Source: JICA Study Team

3) BH-03

Borehole No. 03 is located on the northernmost portion of the reclamation area with Bh-02 on its south-eastern side and Bh-07 at north-western side. Seabed elevation is CD −3.45 m. Samples taken from SPT are described as follows:

Table 2.6.3 Soil Stratifications for BH-03

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.80	Very Soft	Sandy, clayey SILT (Diatomaceous Ooze) with many shell particles.
0.80 – 10.00	Medium dense	Silty SAND, poorly graded with silt
10.0 – 12.0	Dense	Silty SAND poorly graded

Source: JICA Study Team

4) BH-04

Borehole No. 04 is situated at the central portion of the reclamation area. Drilling was done to a total depth of 12 m from the seabed. Seabed elevation is CD −3.49 m. Soil samples recovered from SPT were logged and described as follows:

Table 2.6.4 Soil Stratifications for BH-04

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.65	Very Soft	Sandy, clayey SILT (Diatomaceous Ooze) with much shell particles.
0.65 – 2.00	Loose	Silty SAND with shell fragments
2.00 – 3.80	Soft to Very Stiff	Slightly sandy SILT (Diatomaceous SILT)
3.80 – 6.00	Medium Dense	Silty SAND poorly graded.
6.00 – 12.0	Very Dense	Silty SAND poorly graded.

Source: JICA Study Team

5) BH-05

Borehole No. 05 was located on the western side of the reclamation area between Bh-06 and Bh-08. A total depth of 12 m was reached, calculated from the seabed. Seabed elevation is CD −3.18 m. Soil stratifications are as follows:

Table 2.6.5 Soil Stratifications for BH-05

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.81	Very Soft	Sandy, clayey SILT (Diatomaceous Ooze) with much shell particles.
0.81 – 0.95	Very Loose	Silty SAND with shell fragments
0.95 – 4.00	Soft to Very Stiff	Slightly sandy SILT (Diatomaceous SILT)
4.00 – 12.0	Dense to Very Dense	SAND with traces of silt

Source: JICA Study Team

6) BH-06

Borehole No. 06 was located at the outer western side of the reclamation area. Drilling was done to a total depth of 12 m. Seabed elevation is CD −3.78 m. Below follows its soil layering description.

Table 2.6.6 Soil Stratifications for BH-06

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.90	Very Soft	Sandy, clayey SILT (Diatomaceous Ooze) with much shell particles
0.90 – 3.00	Loose to M. Dense	Silty SAND with some shell fragments
3.00 – 4.90	Stiff to Very Stiff	Slightly sandy SILT (Diatomaceous SILT)
4.90 – 12.0	Dense to Very Dense	SAND with traces of silt

Source: JICA Study Team

7) BH-07

Borehole No. 07 was located at outer north-western side of the reclamation area. Drilling was done to a total depth of 12.0 m. Seabed elevation is CD −3.87 m. Based from the samples recovered, the following soil types were encountered as follows:

Table 2.6.7 Soil Stratifications for BH-07

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.70	Very Soft	Sandy, clayey SILT (Diatomaceous Ooze) with shell fragments
0.70 – 3.00	Loose to Med. Dense	Silty SAND, fine to medium grained
3.00 – 5.00	Firm	Slightly sandy SILT (Diatomaceous SILT)
5.00 – 12.0	Dense to Very Dense	SAND, with traces of silt

Source: JICA Study Team

8) BH-08

Borehole No. 08 is located on the alignment of the causeway. Seabed elevation is −2.70m. SPT tests were conducted at every 1m interval down to 6m and at every 1.50m thereafter until 40.50m. Beyond this depth, SPT were done at 45m and at the final depth of 50.0m. Seabed elevation is CD −2.28 m. Below is the soil description:

Table 2.6.8 Soil Stratifications for BH-08

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.55	Very Soft	Clayey, sandy SILT (Diatomaceous Ooze)
0.55 – 3.00	Very Loose	Silty, clayey SAND w/ shell fragments
3.00 – 4.00	Firm	SILT, slightly sandy
4.00 – 10.5	M. dense to V. Dense	SAND, highly compacted between 4 to 6m
10.5 – 18.0	Firm to Stiff	Sandy/clayey SILT (Diatomaceous SILT)
18.0 – 24.0	Dense to V. dense	Silty SAND
24.0 – 50.0	Stiff to Hard	Sandy/clayey SILT (Diatomaceous SILT)

Source: JICA Study Team

9) BH-09

Borehole No. 9 is situated at the turning basin for the future dredging work. Drilling was done to a total depth of 15 m reckoned from the seabed. SPT testing was undertaken every 1m interval. Samples recovered were divided into two in an alternating depth sequence; one will be used for geotechnical laboratory tests and the other for EIA Consultants for chemical tests. Generally, samples recovered from this hole revealed a thick layer of SAND with a top layer of around 0.60m-thick Diatomaceous Ooze material and an intermediate thin layer of sandy SILT (known to be a Diatomaceous SILT) between 9 to 10m depth. Seabed elevation is CD −2.77 m. Shown below are its soil stratification:

Table 2.6.9 Soil Stratifications for BH-09

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.60	Very soft	Sandy/clayey SILT (Diatomaceous Ooze)
0.60 – 4.00	Loose to Dense	Silty SAND with some shell fragments
4.00 – 9.00	Very Dense	SAND compacted
9.00 – 10.0	Stiff	Sandy/clayey SILT (Diatomaceous SILT)
10.0 – 15.0	Very Dense	Silty SAND

Source: JICA Study Team

10) BH-10

Borehole No. 10 is located on the future dredging site near Bh-09. Seabed elevation is −3.50m. Samples recovered from this hole were divided alternately based on sampling depths. One half of the samples were given to EIA Consultants for chemical testing and the remaining half were sent to the site laboratory for physical testing. Seabed elevation is CD −2.65 m. Samples recovered were logged and described as follows:

Table 2.6.10 Soil Stratifications for BH-10

Depth (m)	Consistency	Visual Soil Description
0.00 – 0.40	Very Soft	Sandy, clayey SILT (Diatomaceous Ooze) with much shell particles
0.40 – 4.00	Loose to M. Dense	Silty SAND with shell fragments
4.00 – 6.00	Very Dense	SAND, poorly graded with silt
6.00 – 10.0	Dense to M. Dense	Silty SAND
10.0 – 11.0	Soft	Slightly sandy SILT (Diatomaceous SILT)
11.0 – 15.0	M. Dense to Dense	Slightly silty SAND
15.0 – 16.0	Very Dense	SAND poorly graded with silt

Source: JICA Study Team

Resistivity Survey: In addition to the borehole exploration conducted by JICA Study Team, Namport has conducted "Marine Geophysical Surveying in the Port of Walvis Bay" in September 2009 to determine the engineering characteristics of the sediments in the reclamation area and the dredging areas. To map the sub-bottom geology, resistivity methods were used. An acoustic sub-bottom profiling (pinger) system was utilised at the same time. Any shortcomings identified in the resistivity would be supplemented with data 3 from the acoustic pinger data. The bathymetry of the survey area was recorded with an acoustic dual frequency echo sounder. The survey area and the results are shown in Figure 2.6.2, Figure 2.6.3 and Figure 2.6.4.

As conclusions, the resistivity results show 2 different geophysical areas separated by a SW to NE running boundary of the survey area. The first geophysical area, situated SE of the boundary, shows a resistivity sequence with very high resistivity values overlying low resistivity values underneath it and intermediate resistivity 15 values at deeper levels. The low resistivity values seem to correlate with the occurrence of diatomaceous silt intercalations described in some of the boreholes. The very high resistivity top structure is associated with a high concentration of diffractions on seismic records. The second geophysical area, situated NW of the boundary as well as in the port and main channel areas, shows very low resistivity values with a thin intercalation of slightly higher resistivity values close to the seabed surface.

Interpreted by comparing the results of the borehole exploration, the resistivity values of different geological structures are strongly influenced by geological processes and features involving organic content of diatomaceous origin.

From the above findings, it can be concluded that the original project site including its extension to the northeast lies on the sandy layer (low resisitivity) exiting from the seabed up to at least CD – 17 m. It is very probable also from the findings that the alternative project sites to be discussed in Chapter 6 lie on the sandy layer. However, the future extension of the alternative project sites may lie on the silt layer, as they will extend offshore.

Special attention is invited to the deepening of the approach channel, as the diatomaceous-origin silt is confirmed to exist from the seabed up to CD – 17 m. Dredging operations will have to cope with high gas concentrations in the sediments and as well as with a highly corrosive environment.

(3) Seabed Materials

Those conducted at the borehole location for sub-soil investigation inclusive, twenty-three (23) seabed sampling in total were carried out as shown in Figure 2.6.1 to analyze the natural moisture content, Atterberg limit, soil classification, gradation, and specific gravity. Seabed sampling was carried-out using a string of rods with automatic seal off sampler.

All the seabed materials, except for those taken from the dredged part of the approach channel which surface is of silty fine sand, are diatomaceous ooze, geotechnically called “sandy clayey silt.” Generally speaking, the diatomaceous ooze at the natural seabed becomes thicker toward the bay mouth. The thickness is from 0.4 m at BH10 to 1.43 m at Point A1. The thickest diatomaceous ooze is found 2.08 m at Buoy 19, about 500 m offshore from Berth 2. The results of the seabed materials survey are summarized in Table 2.6.11.

Table 2.6.11 Summary of Seabed Materials

SAMPLE NUMBER	DEPTH (m)	NMC (%)	ATTERBERG LIMIT, (%)			USCS Class.	SIEVE ANALYSIS (% FINER) PASSING SIEVE NO.										SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)	Unit Weight of Cohesive Soils		REMARKS
			LL	PL	PI		1	3/4	3/8	4	10	20	40	60	140	200		Wet Unit Weight (g/cc)	Dry Unit Weight (g/cc)	
SEABED SAMPLING																				
BH-1	0.00 - 0.75	69	-	NP	-	SM				100	98	97	93	85	19	14	-	-	-	-
BH-2	0.00 - 0.80	31	-	NP	-	SP			100	98	95	93	62	36	7	5	-	-	-	-
BH-3	0.00 - 0.70	125	-	NP	-	SM				100	99	91	70	51	36	30	2.35	-	-	-
BH-4	0.00 - 0.65	123	-	NP	-	SM				100	99	91	73	54	32	30	2.36	-	-	-
BH-5	0.00 - 0.81	261	-	NP	-	SM					100	91	82	76	51	45	2.33	-	-	-
BH-6	0.00 - 0.90	127	-	NP	-	SM					100	99	85	70	41	36	2.36	-	-	-
BH-7	0.00 - 0.70	126	-	NP	-	SM					100	93	72	60	42	39	2.35	-	-	-
BH-8	0.00 - 0.55	147	-	NP	-	SM					100	96	78	59	30	25	2.40	-	-	-
BH-9	0.00 - 0.60	57	-	NP	-	SP-SM			100	95	92	90	85	74	12	8	2.62	-	-	-
BH-10	0.00 - 0.40	68	-	NP	-	SM			100	97	95	92	70	53	18	15	2.60	-	-	-
A1	0.00 - 1.43	719	201	115	86	ML							100	99	93	92	2.09	-	-	-
A2	0.00 - 1.00	642	290	108	182	ML							100	98	96	94	2.07	-	-	-
A3	0.00 - 0.97	796	323	99	224	ML							100	99	96	93	2.04	-	-	-
Bouy A/B	0.00 - 0.64	377	201	77	124	ML								100	97	97	2.06	-	-	-
Bouy 1/2	0.00 - 0.81	290	200	94	106	ML						100	99	95	88	87	2.10	-	-	-
Bouy 3/4	0.00 - 0.53	414	277	144	133	ML							100	99	96	91	2.05	-	-	-
Bouy 5/6	0.00 - 0.57	559	292	123	169	ML							100	99	93	92	2.05	-	-	-
Bouy 7/8	0.00 - 1.10	305	150	66	84	ML						100	89	85	76	72	2.16	-	-	-
Bouy 9/10	0.00 - 0.40	141	-	NP	-	SP				100	99	99	94	82	9	6	2.63	-	-	-
Bouy 11/12	0.00 - 0.75	41	-	NP	-	SP-SM					100	99	96	87	14	11	2.65	-	-	-
Bouy 15	0.00 - 0.35	24	-	NP	-	SP					100	99	95	76	9	7	2.68	-	-	-
Bouy 19	0.00 - 2.06	177	-	NP	-	SM						100	96	90	44	36	2.52	-	-	-
Bouy 23	0.00 - 0.84	288	160	58	102	ML						100	99	92	70	66	2.42	-	-	-

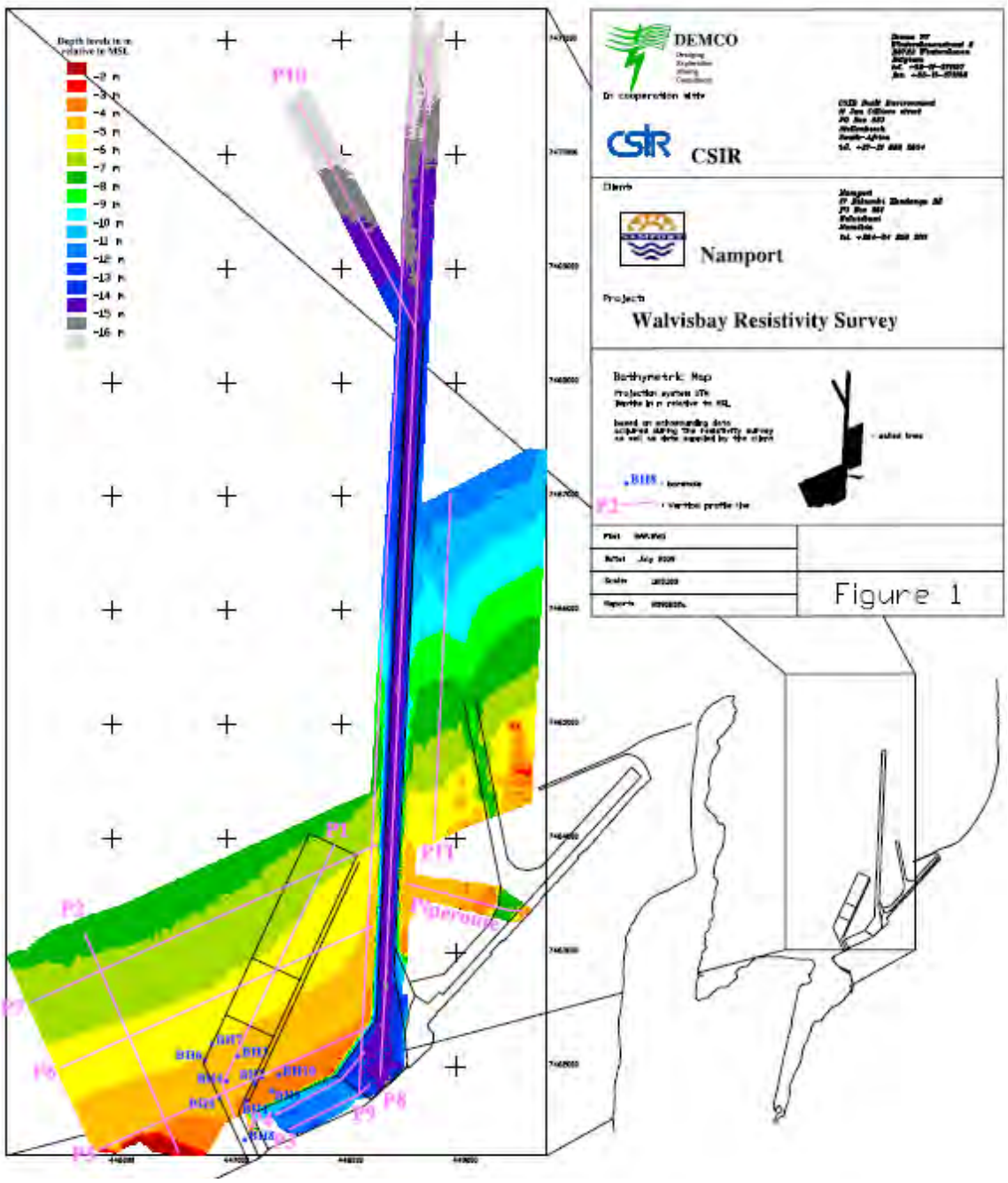


Figure 2.6.2 Resistivity Survey Area (1)

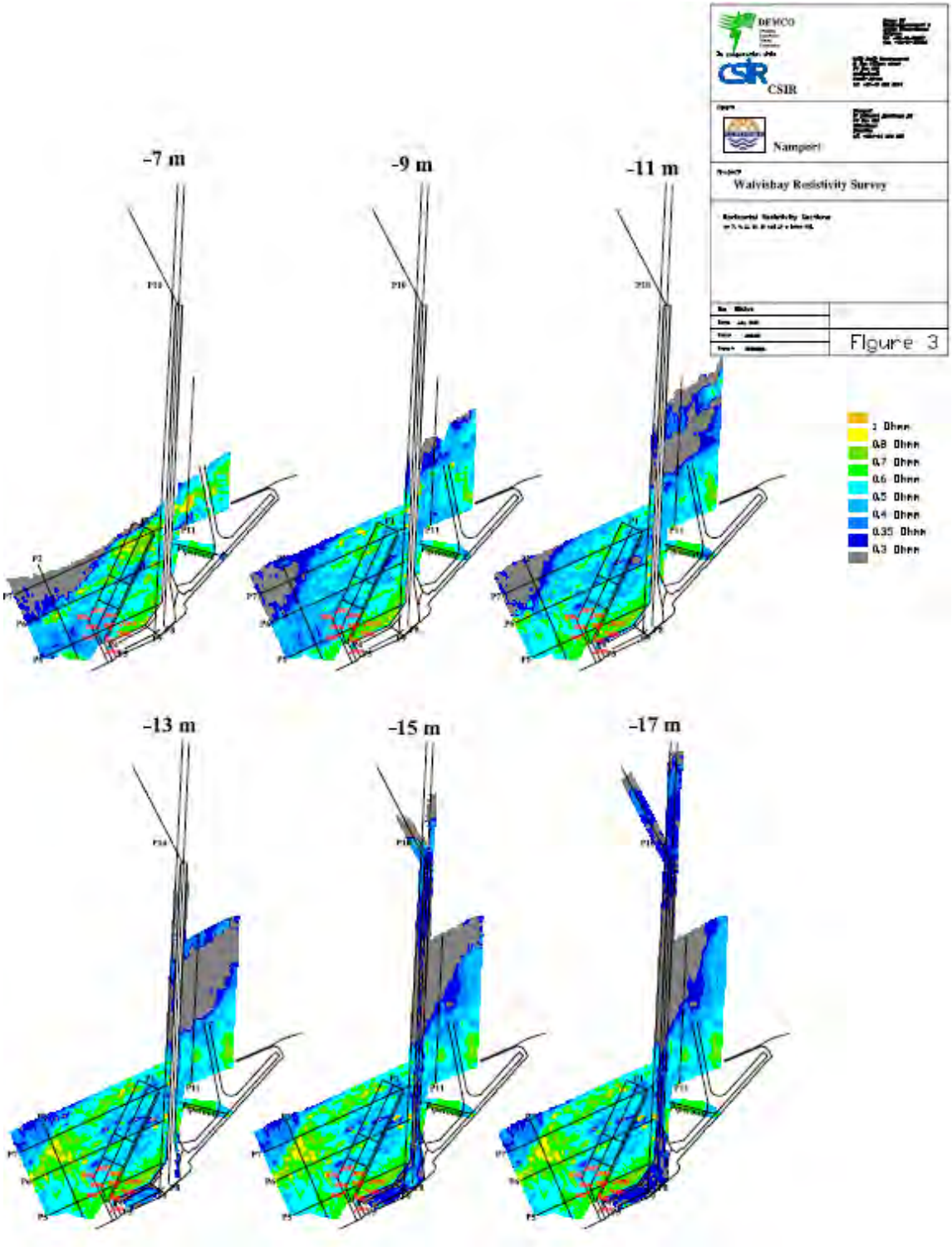


Figure 2.6.3 Resistivity Survey Area (2)

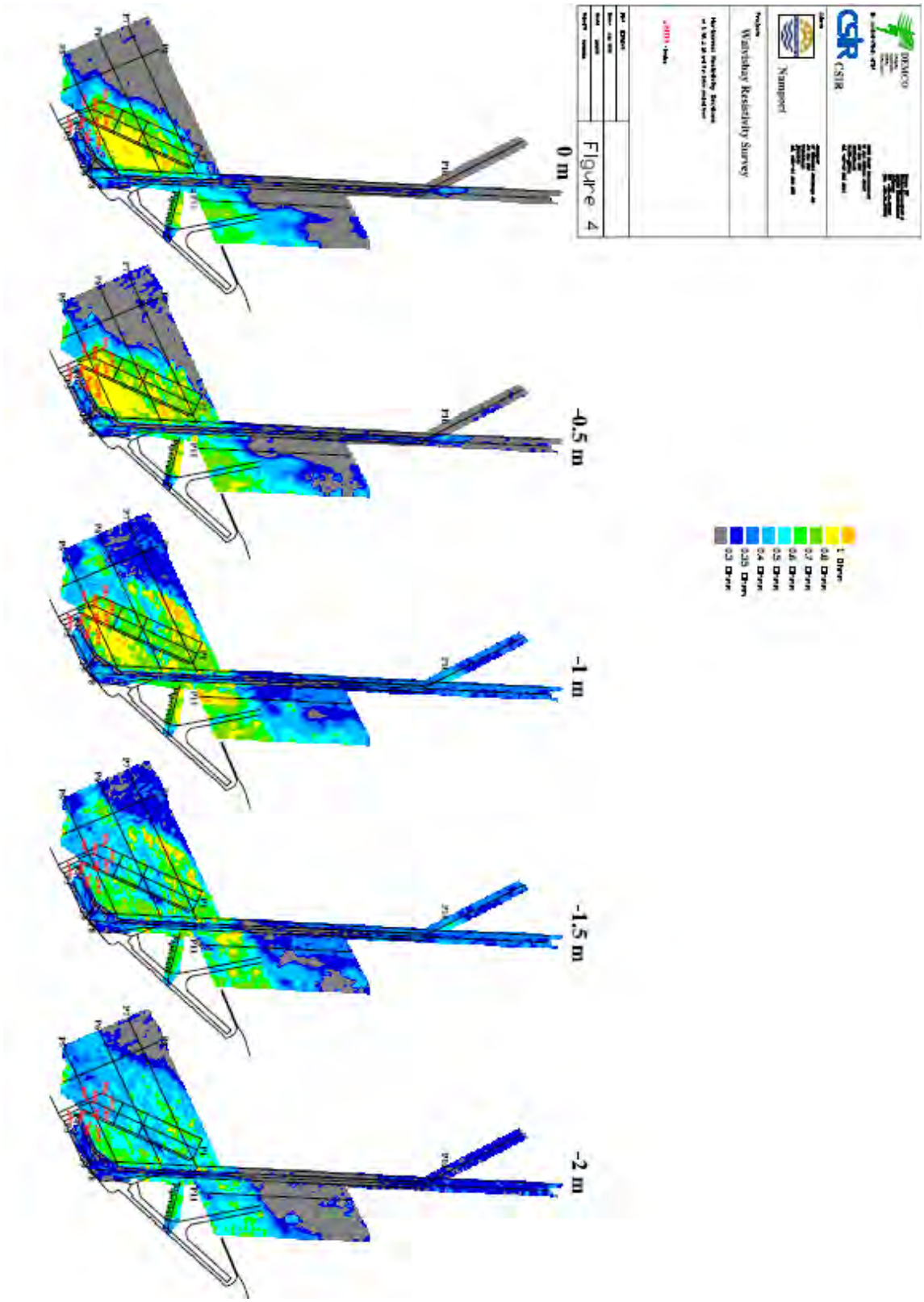


Figure 2.6.4 Resistivity Survey Area (3)

2.6.2 Meteorology and Oceanography

(1) Meteorology

Port of Walvis Bay is located in the western coast of Southern Africa in the middle of Namibia. The Benguela current, which is a cold current, runs northerly from south of the African continent along the western coast. In the sea at Walvis Bay, influenced by the Benguela current, high atmospheric pressure tends to develop. As the wind is blowing constantly counterclockwise due to the high pressure in the Southern Hemisphere, Walvis Bay faces an almost southern wind toward the north. The data observed at Pelican Point from 1964 to 1992 indicates that more than 90% of the wind blows from SSE to SW. Wind from the north is consequently rare at Walvis Bay. But blowing directly to the bay, a northern wind can cause large waves.

The climate at the Walvis Bay area is characterized by dry conditions with negligible rainfall and fog from the sea. The meteorological conditions are shown in Table 2.6.12.

Table 2.6.12 Meteorological Conditions

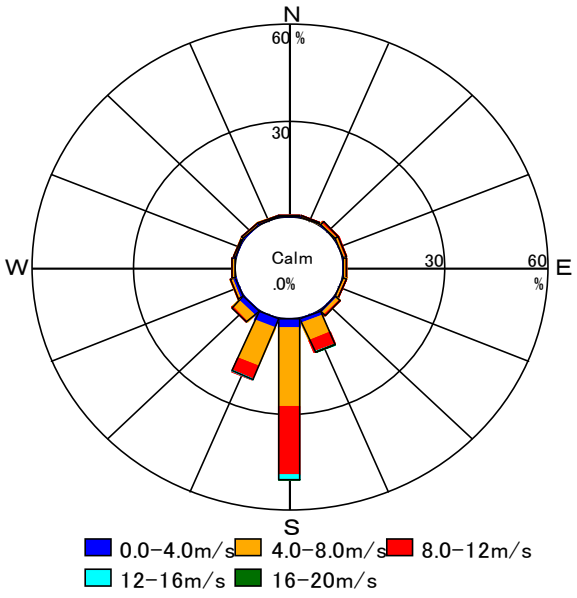
Conditions	Description
Wind	• SE - SW: about 90％ (rarely northern) • Observation data at Pelican Point from1964 to 1992 and at Salt Works from 1987 to 1992 • Hindcast data (Wave Watch III)
Rainfall	• Mean annual rainfall: 13.5 mm • Fog from the sea : approximately 900 hours per year
Pressure	• Sea: tends towards high atmospheric pressure • Land: tends towards low atmospheric pressure

Source: a) Namport, Walvis Bay Local Agenda 21 Project Namibia Coastal Area Study, August 2003; b) Namport, Update of Environmental Impact Assessment and Environmental Management Plan, October 2006; c) Namport, WAVE, WIND AND WATER LEVEL CONDITIONS AT WALVIS BAY, April 2008

Hindcast data are available from a hindcast wave model, Wave Watch III, NOAA (National Oceanic and Atmospheric Administration). These data include wind direction, wind speed, wave direction, wave height and wave period. The data at South latitude 23° S 14°E are extracted and the location of hindcast point is indicated in Figure 2.6.5. Hindcast data are analyzed from 1997–01 to 2009–07. The scatter diagram of offshore wind speed is mentioned in Table 2.6.13 and the offshore wind direction is shown in Figure 2.6.6.

Source: Google Earth

Figure 2.6.5 Locations of Hindcast Points by Wave Watch III



Source: Wave Watch III, NOAA

Figure 2.6.6 Offshore Wind Speed over Direction

Table 2.6.13 Scatter Diagram of Offshore Wind Speed

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
0.0-2.0m/s	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%	0.4%	0.5%	0.4%	0.4%	0.3%	0.2%	0.2%	0.2%	3.8%
2.0-4.0m/s	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.6%	1.2%	2.6%	2.7%	1.7%	0.9%	0.5%	0.4%	0.3%	0.2%	12.4%
4.0-6.0m/s	0.1%	0.2%	0.3%	0.3%	0.3%	0.3%	0.7%	2.7%	8.8%	6.2%	1.9%	0.5%	0.2%	0.1%	0.2%	0.1%	23.0%
6.0-8.0m/s	0.0%	0.1%	0.4%	0.3%	0.2%	0.2%	0.5%	3.5%	15.6%	6.6%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%	28.6%
8.0-10m/s	0.0%	0.0%	0.2%	0.2%	0.0%	0.0%	0.1%	2.6%	15.0%	3.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	22.1%
10-12m/s		0.0%	0.0%	0.0%			0.0%	0.9%	6.4%	0.7%	0.0%				0.0%	0.0%	8.2%
12-14m/s								0.2%	1.4%	0.0%							1.6%
14-16m/s								0.0%	0.2%	0.0%							0.2%
16-18m/s								0.0%	0.0%								0.0%
18-20m/s								0.0%	0.0%								0.0%
	0.5%	0.6%	1.3%	1.2%	0.9%	1.0%	2.1%	11.5%	50.5%	20.4%	5.0%	1.9%	1.1%	0.8%	0.8%	0.6%	100%

Source: Wave Watch III, NOAA

(2) Oceanography

At Walvis Bay area there is a peninsula which is developing at the rate of 1 million m^3/year towards the north. Sheltered by the peninsula against the southern strong wind, the port maintains good conditions for loading and navigation. Direction of offshore waves at Walvis Bay is approximately south to southwest, and the waves from the south are diffracting the peninsula, coming inside the port area. Therefore offshore southern waves turn north-western inside the peninsula, and then they turn into waves with low wave heights and long periods near the port. The short period waves, which are induced by the southern wind in the bay, are also found inside the peninsula. The oceanographic conditions are shown in Table 2.6.14.

Table 2.6.14 Oceanographic Conditions

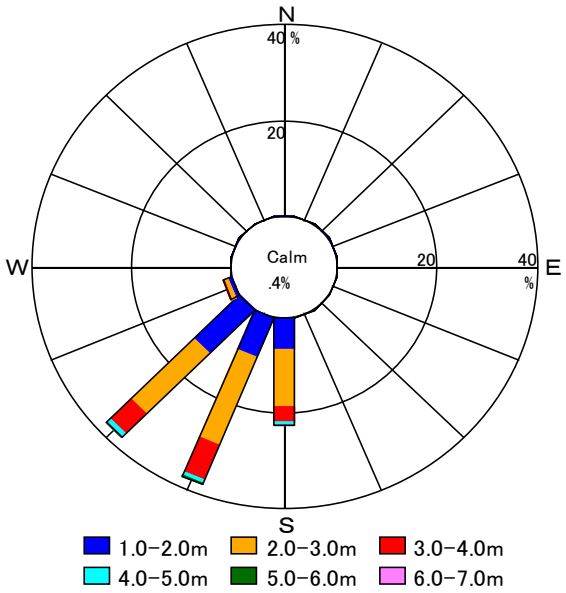
Conditions	**Description**
Waves	• S - SW: more than 90％ (S: 60%, SSW: 23%, SW: 7%) • Hindcast data only • Two patterns of waves in the bay: 1. long period waves diffracting the peninsula, 2. short period waves induced by southern wind in the bay
Tidal level	• −0.05 m CD (LAT) - +1.92 m(HAT), difference: 1.97 m
Ocean current	• Benguela current to run north along the peninsula and coast of Namibia: 0.25 m/s – 0.35 m/s
Tidal current	• Negligible except the inlet of lagoon (1.5–2 m/s)

Source: a) Namport, Walvis Bay Local Agenda 21 Project Namibia Coastal Area Study, August 2003; b) Namport, Update of Environmental Impact Assessment and Environmental Management Plan, October 2006; c) Namport, WAVE, WIND AND WATER LEVEL CONDITIONS AT WALVIS BAY, April 2008

Hindcast wave data of Wave Watch III (WW3) for 11years are analyzed as wind speed data done. The scatter diagrams WW3 and wave height (Figure 2.6.6) and period rose (Figure 2.6.7) are below.

As the wave heights for WW3 hindcasting data (Figure 2.6.6), waves from S – SW are about 98%. As the wave periods for WW3data (Figure 2.6.7), most waves from WSW – S are relatively long period and the others are rare and short period. So the berth availabilities of future layouts should be analyzed by using the frequency distributions of S – SW waves.

As Figure 2.6.8, waves of 2–3m heights and 6–14s periods have half of all wave heights. When the berth availabilities are computed, wave periods are divided into some sections according to the frequencies of WW3 data.



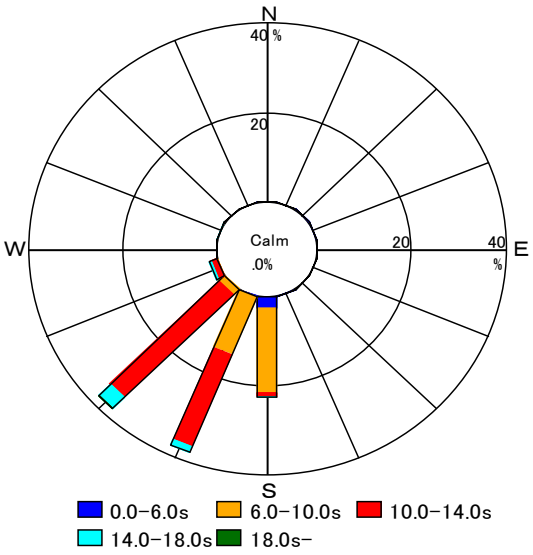
Source: Wave Watch III, NOAA

Figure 2.6.7 Offshore Wave Height over Direction

Table 2.6.15 Scatter Diagram of Offshore Wave Height

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
0.0-1.0m									0.1%	0.0%	0.2%	0.0%		0.0%			0.4%
1.0-2.0m	0.0%		0.0%	0.0%				0.0%	6.6%	8.9%	12.8%	0.9%	0.0%	0.0%			29.2%
2.0-3.0m								0.0%	12.2%	20.0%	17.9%	0.9%					51.0%
3.0-4.0m									3.2%	7.7%	5.8%	0.1%					16.8%
4.0-5.0m									0.4%	0.9%	1.1%						2.4%
5.0-6.0m									0.0%	0.2%	0.1%						0.3%
6.0-7.0m									0.0%		0.0%						0.0%
7.0-8.0m																	
8.0-9.0m																	
9.0-10.0m																	
	0.0%		0.0%	0.0%				0.0%	22.5%	37.7%	37.8%	1.9%	0.0%	0.0%			100%

Source: Wave Watch III, NOAA



Source: Wave Watch III, NOAA

Figure 2.6.8 Offshore Wave Period over Direction

Table 2.6.16 Scatter Diagram of Offshore Wave Period

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
0.0-2.0s																	
2.0-4.0s	0.0%		0.0%	0.0%				0.0%	0.0%			0.0%					0.0%
4.0-6.0s			0.0%					0.0%	2.7%	0.2%							3.0%
6.0-8.0s									11.3%	2.1%							13.4%
8.0-10.0s									7.5%	11.6%	1.7%	0.1%					21.0%
10.0-12.0s									0.8%	13.8%	15.3%	0.6%					30.5%
12.0-14.0s									0.1%	8.6%	17.3%	0.7%	0.0%	0.0%			26.8%
14.0-16.0s									0.0%	1.3%	3.2%	0.4%		0.0%			4.9%
16.0-18.0s										0.1%	0.3%	0.1%					0.5%
18.0-20.0s											0.0%						0.0%
	0.0%		0.0%	0.0%				0.0%	22.5%	37.7%	37.8%	1.9%	0.0%	0.0%			100%

Source: Wave Watch III, NOAA

Table 2.6.17 Scatter Diagram of Offshore Wave

	0.0-2.0s	2.0-4.0s	4.0-6.0s	6.0-8.0s	8.0-10.0s	10.0-12.0s	12.0-14.0s	14.0-16.0s	16.0-18.0s	18.0-20.0s	Total
0.0-1.0m		0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.4%
1.0-2.0m		0.0%	2.2%	3.5%	6.4%	11.3%	5.0%	0.7%	0.1%	0.0%	29.2%
2.0-3.0m			0.7%	8.6%	10.3%	15.5%	13.8%	2.0%	0.2%	0.0%	51.0%
3.0-4.0m				1.2%	3.9%	3.3%	6.8%	1.4%	0.1%	0.0%	16.8%
4.0-5.0m				0.0%	0.3%	0.3%	1.1%	0.6%	0.0%		2.4%
5.0-6.0m					0.0%	0.0%	0.0%	0.2%	0.0%		0.3%
6.0-7.0m						0.0%		0.0%			0.0%
7.0-8.0m											
8.0-9.0m											
9.0-10.0m											
		0.0%	3.0%	13.4%	21.0%	30.5%	26.8%	4.9%	0.5%	0.0%	100%

Source: Wave Watch III, NOAA

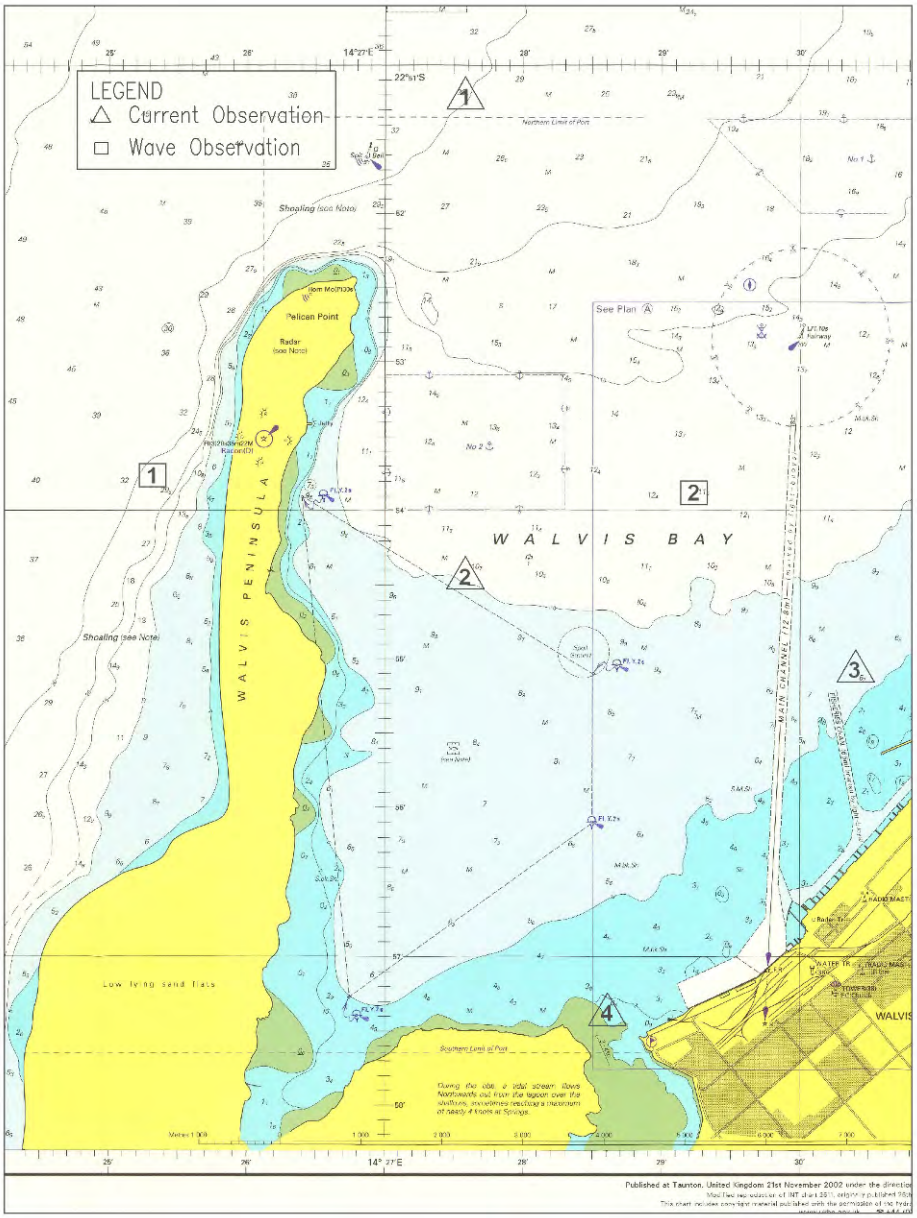
(3) Meteorological and Oceanographic Parameters for Design and Construction of Container Terminals

The important factors for design and construction of the new container terminals are the conditions of the currents and waves. In order to grasp the current and wave conditions at the Port of Walvis Bay, observations are conducted for 15 days from 21 June 2009 to 05 July 2009. To observe currents, four current meters have been installed to cover the whole bay: The 1st point is beside the point of the peninsula, the 2nd point is near the cultivation of oysters, the 3rd point is in front of a fishing port, and the 4th point is at the mouth of the lagoon. For wave observation, in order to observe offshore waves and waves near the port, two wave meters have been installed offshore over the peninsula and at the centre of the bay. The locations of the observation points are shown in Figure 2.6.9.

Table 2.6.18 Measurement Points of Currents and Waves

	Latitude	Longitude	Depth
Current No.1	22° 51.6' S	14° 27.8' E	26m
Current No.2	22° 54.5' S	14° 27.6' E	11m
Current No.3	22° 55.1' S	14° 30.3' E	5m
Current No.4	22° 57.3 S	14° 28.5' E	2m
Wave No.1	22° 53.5' S	14° 25.7' E	22m
Wave No.2	22° 53.7' S	14° 29.1' E	13m

Source: JICA Study Team



Source: The United Kingdom Hydrographic Office

Figure 2.6.9 Locations of Observation Points

As the results, time series of wave heights (Figure 2.6.10), periods (Figure 2.6.11), directions (Figure 2.6.12) and current velocity, directions (Figure 2.6 13) are showed below. The data of current #2 are not good caused by uneven orientation on sea floor. The data of current #4 aren't recorded after 26 June because of muddy flows.

For the observed waves, about 2.0 m wave heights are measured at #1 on 25th June, but wave heights at #2 are at most 0.3 m. That is why the observation point #2 is sheltered by the Peninsula (see Figure 2.6.10). From Figure 2.6.11, wave periods at #1 and 2 are almost same as wave period are little influenced by diffraction. On the other hand, wave directions are much influenced by diffraction from the Peninsula. Then wave directions outside of peninsula are almost east and that of inside the Bay are almost north.

For the observed currents at #1, the velocity and directions at all three layers are almost same (see Figure 2.6.13). Current velocities are partially related to wave heights, but in some case, small wave heights arriving, high current velocities are measured such as the results on 26th June.

For currents in the bay, numerical simulations for currents will be conducted to recognize currents after the new container terminal is constructed. Current simulations will be done for three layouts of contingent alternatives. Simulation models are adjusted to match the results of the observations.

For waves at the port, numerical simulations of wave transformations will be carried out to calculate the operation rates for new berths. Wave simulations will be done for three layouts of the above-mentioned alternatives. The appropriateness for the results of simulations will be confirmed by comparing with the results of the observations being conducted at present.

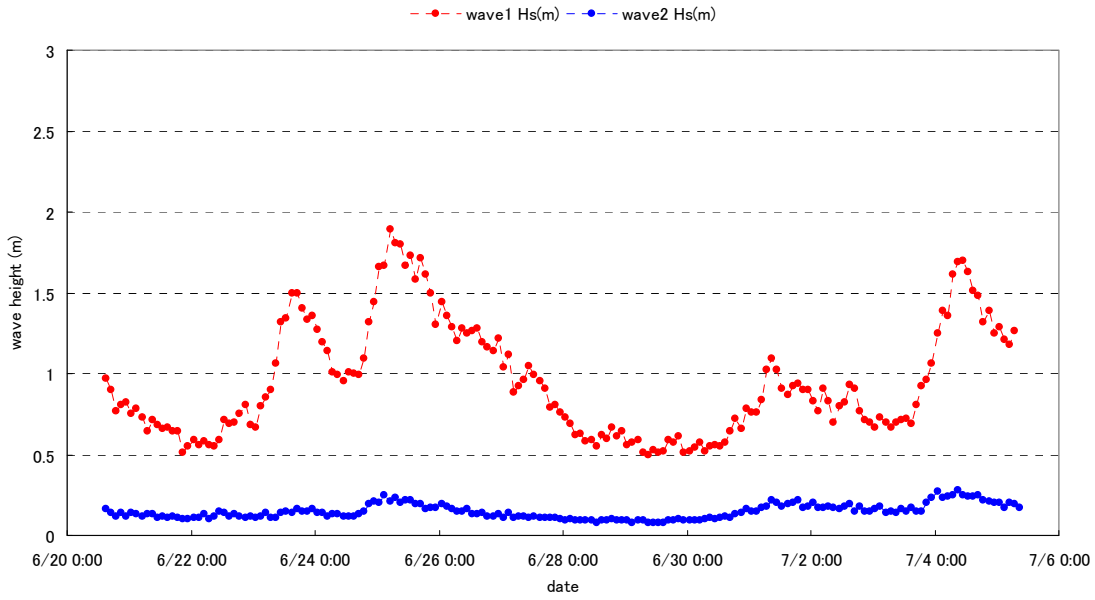


Figure 2.6.10 Time Series of Observed Wave Heights

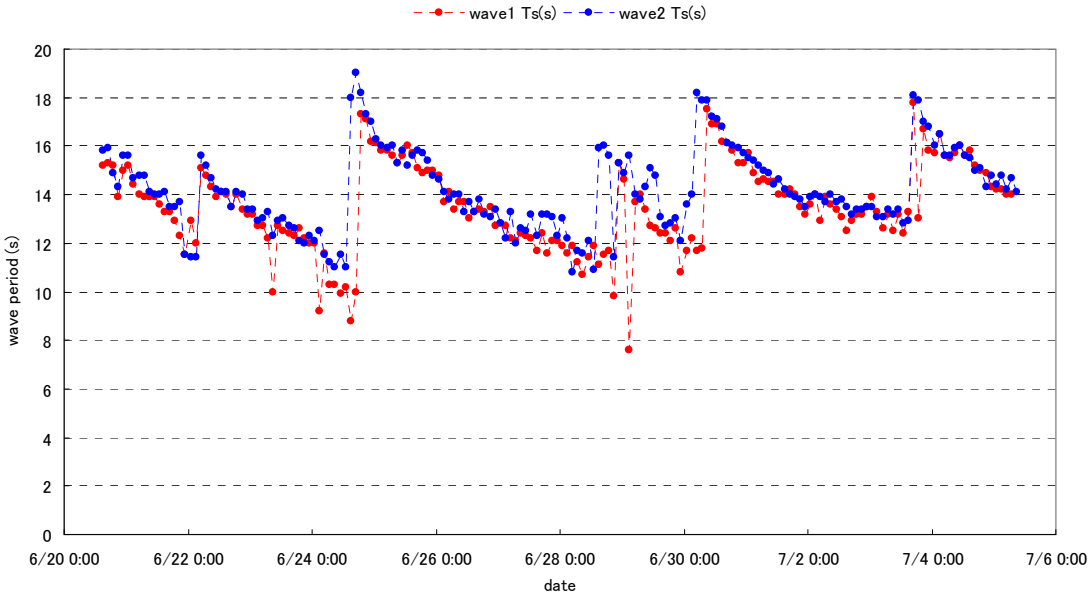


Figure 2.6.11 Time Series of Observed Wave Periods

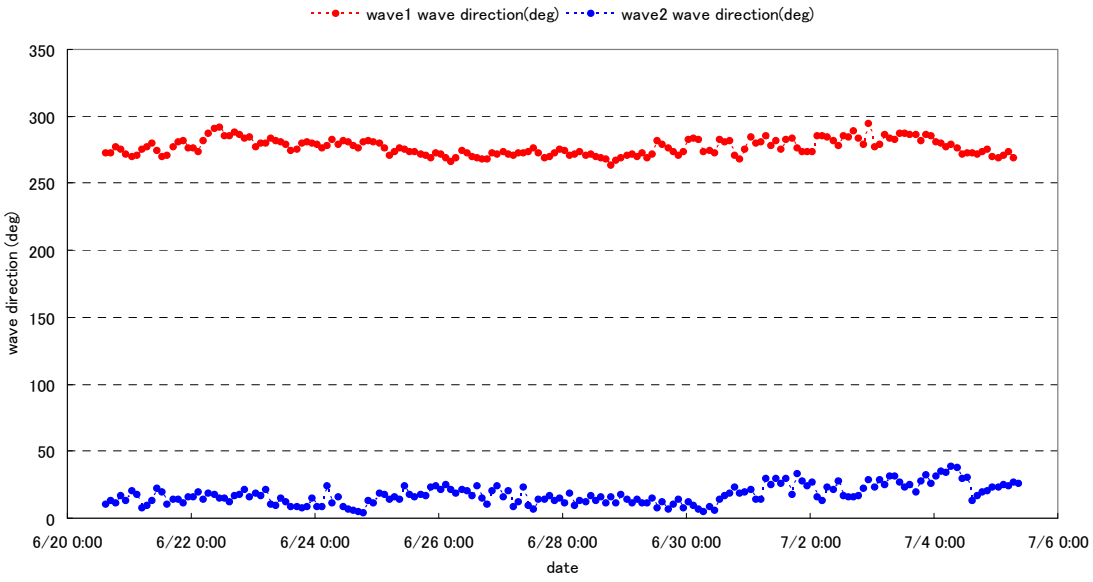


Figure 2.6.12 Time Series of Observed Wave Directions

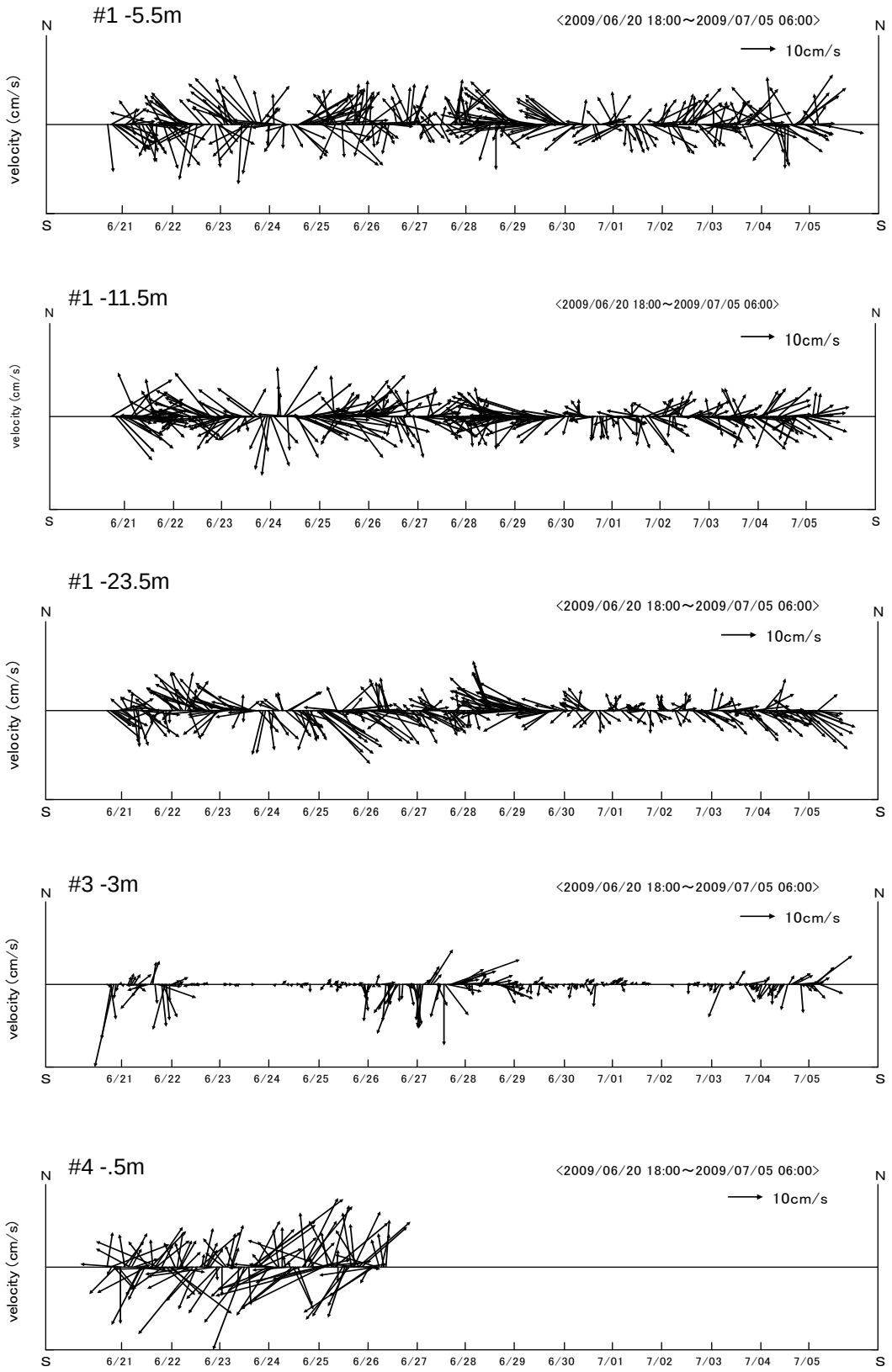


Figure 2.6.13 Time Series of Observed Currents

2.7 Environmental and Social Considerations

Namport has engaged a consortium of Consultants to undertake an environmental impact study. The purpose is to assess proposed project's potential impacts on the Walvis Bay Port and adjacent bay waters, lagoon, tidal flats, and mudflats, as well as adjacent terrestrial areas. The contract study also entails undertakings of necessary environmental clearance procedures mandated by the *Namibian Environmental Policy, 1995 and in harmony with the Environmental Management Act (EMA), 2007.*

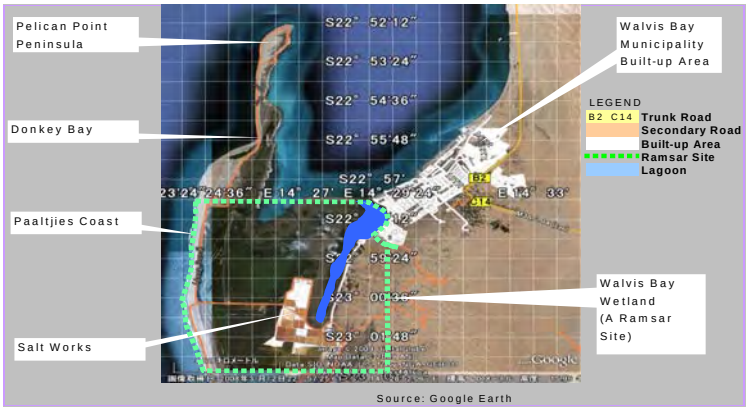
The JICA Study component of the environmental due diligence task, which output is presented here is to have an oversight in view of the JICA Environmental Guidelines[25]. It stipulates the manner an assessment procedure is to be conducted in observance of internationally acknowledged procedure, thematic topics to be reviewed, and in particular, the manner information is disclosed to the public and their comments and opinions solicited to be reflected into proposed project's design, so that anticipated impacts, temporal and persistent, are to be mitigated.

2.7.1 Present State of Natural and Social Environmental Setting

This subsection briefly summarizes what is reported by previous studies that are deemed relevant to the purpose of the present survey and outcomes from the field findings. Both aspects of the environment – natural environment as well as socio-demographic aspects - are covered, to the extent they are relevant in comprehending the existing environmental situation (environmental baseline). The exercise will be useful in providing an environmental state of reference, upon which exerted are the project's potential impacts, whether they may be of temporal or persistent, local or area-wide, reversible or irreversible nature.

(1) The Spatial Dimensions of Targeted Survey Area

For the purpose of the JICA environmental due diligence task, the target survey area is to include Walvis Bay Port, dictated by the Namibian Ports Authority Act 2 of 1994, and adjacent bay waters, lagoon, tidal flats, and mudflats, as well as adjacent terrestrial areas that include the Ramsar-registered Wetland. More specifically Namport's jurisdictional area is bounded by the high-water marks of: South of latitude 25º 52′ S and West of longitude 14º 32′ and North of the latitude 23º 05′ S and West of longitude 14º 32′. It is shown in Figure 2.7.1.



Source: Google Earth

Figure 2.7.1 Target Survey Area

[25] More specifically, it refers to "JBIC Guidelines for Confirmation of Environmental and Social Considerations, April, 2002"

(2) Natural Setting

1) Climatic Conditions

The survey area is controlled by Namib's extremely arid climate, affected by the south-easterly winds, the cold upwelling waters of the Benguela current system, and dominated by the Namib Desert, threatening the southern and south-western periphery of the survey area. Mean annual temperatures are remarkably constant around 17°C. The average summer and winter temperatures differ by approximately 5°C. February is usually the hottest (The mean maximum daily temperature: over 21°C) and August the coldest (The mean maximum daily temperature: 15°C). The mean annual precipitation amounts to some 15mm, characterizing the survey area's extreme aridity. Most rain falls between January and April with the wettest month being February or March. Fog is a distinctive feature of the survey area. It usually forms when moist maritime air is advected over cold upwelled water adjacent to the coast. It occurs an average of 139 days at Pelican Point. The above information is sourced from "Integrated Overview of the Coastal Environment: Congo River to Cape Agulhas, Thematic Report No.5, Benguela Current Large Marine Ecosystem, October, 1999, UNDP".

In order to understand the survey area's sediment dynamics, it is important to note that wind, waves and currents exercise a dominant power in determining the sediment transport and dynamics. Large areas surrounding the Bay and the Ramsar-registered are, where dry and loose sand without vegetation, subjected to the Aeolian transport. This is thought to be the cause of the progressive sedimentation phenomena observed at the Lagoon.

The Walvis Peninsula, a roughly 10km long sand spit, undergoes perpetual landform due to sand conveyed by the strong Benguela Current flowing North-east along the Western side of the Peninsula. It is reported that the net northbound long shore transport rate is estimated to be 883,000 M^3/year.

With respect to the sediment dynamics in the Bay, it is sheltered from the south-west waves prevailing offshore the Bay, however, a low southwards drift is observed. Most of the waves occurring in the bay are generated by local winds. As current velocities are less than 0.25m/sec in the Bay, neither mud erosion nor sand transport will be generated by these currents. (Source: EIA for the Dredging of the Port of Walvis Bay). The lagoon sediment dynamics is driven by tidal currents and wind-generated waves on the shallow muddy flats. Tidal velocities at the Lagoon Mouth are reported to be less than 0.4m/sec, which is insufficient to erode sand or mud.

2) Biogeographic Region

The survey area lies within the broader "Namib Coastal Ecoregion", stretching from the Skeleton Coast to the North to the Walvis Bay and its periphery to the South. The Ecoregion is characterized by the coastal zone with largely ephemeral rivers. The Ecoregion accommodates two Ramsar-designated wetlands.

Vegetation cover: Within the study area, many different vegetation types occur, including specially adapted suites of plants growing on the desert and coastal dunes, and the saline wetlands. The vegetation ranges from low, sand-covered shrubs interspersed with grass tufts through low, flat-growing perennial species to those adapted to hyper-saline wetland.

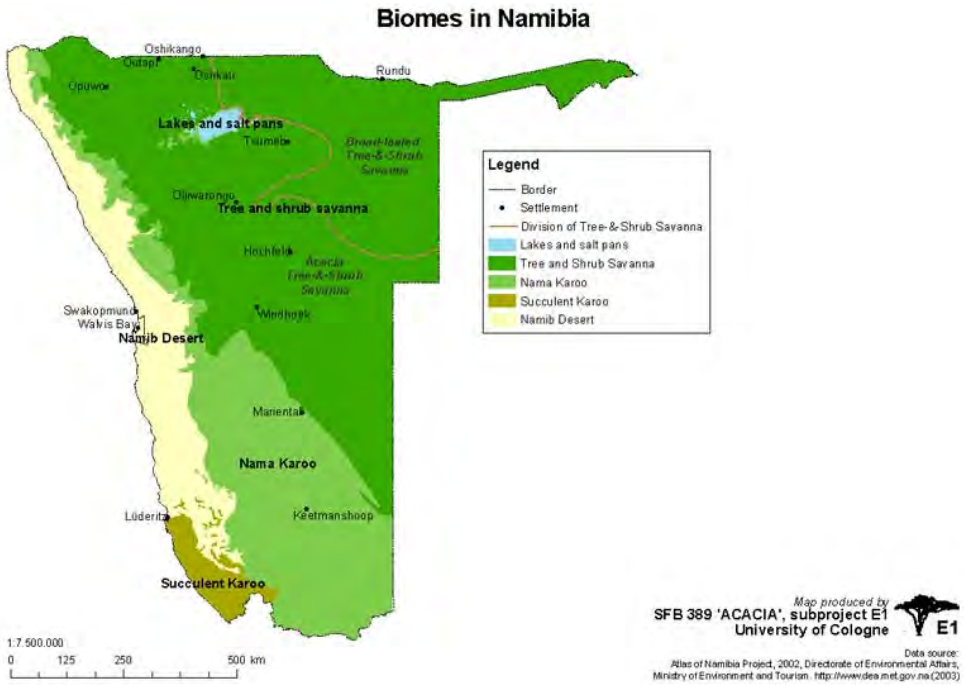
- ***Coastal and Desert Dunes*:** The coastal stretch consists largely of dunes and is very sparsely vegetated. Near the coast, the predominantly succulent dwarf shrubs collect wind-blown sand between their branches to form shrub-coppice dunes. The vegetation serves as "cushions" on dunes, when it grows on top of dunes. Most of these species come from the genus Salsola belonging to the Chenopodiaceae family. Common salsola

species found along the coast are: *Salsola tuberculatiformis, Salsola aphylla, Salsola nollothensis.* Other species that forms hummock is the *Arthraerua leubnitziae*. These species grow into mounds of 1 to 2m.

- ***Hyper-saline Wetland:*** In the littoral zone on saline soils and margins of salt-pans, specially adapted species such as *Salsola nollothensisi, and Sarcoconia perennis* occur.

The Study area lies in the Namib Desert biome amongst the five typical biomes in Namibia (Figure 2.7.2) — i.e. the ephemeral therophyte-dominated Namib Desert, succulent-shrub-dominated Succulent Karoo, grass and shrub co-dominated Nama Karoo, tree and shrub co-dominated savanna, and the Lakes and Salt Pans of Etosha.

The Namib Desert biome extends from the Orange River mouth in southern Namibia, to the Kunene River mouth in northern Namibia. It is characterized by hyper-arid climate, receiving less than 50 mm of rain per year. Plants and animals in this biome have adapted to survive with very little water. It is shown in Figure 2.7.2.



Source: Ministry of Environment and Tourism

Figure 2.7.2 Namib Desert – Biomes in Namibia

(3) National Parks and Protected Areas surrounding the Study Area

1) National Parks

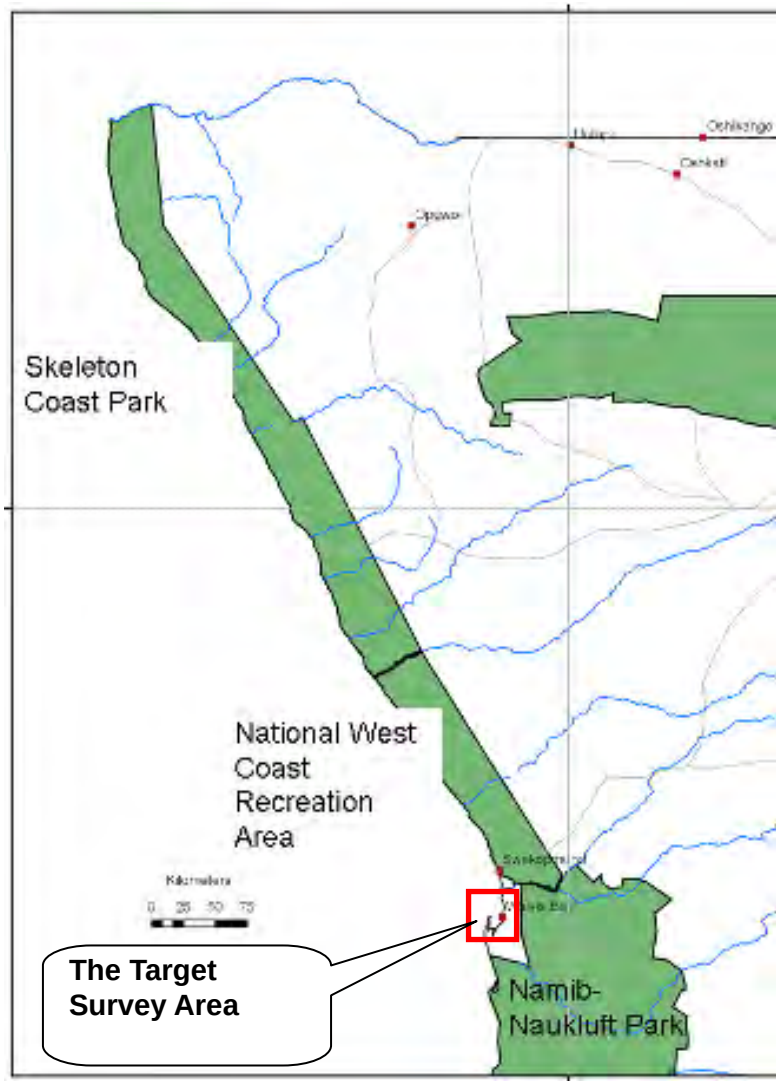
Part of the study area is embraced by the Namib Naukluft Park, which represents one of the 20 National Protected Areas (PA) in Namibia.

These national PAs consist of 16 game parks, 2 nature reserves proclaimed under *the Nature Conservation Ordinance (No 4 of 1975)* and 2 tourist recreation areas proclaimed under the *Accommodation Establishments and Tourism Ordinance (No 20, 1973). The Nature Conservation Ordinance* establishes two types of national PAs: game parks and nature reserves. Tourist recreation areas are created to offer recreational opportunities for the public, and despite

the sensitivity of some areas (part of the West Coast Recreation Area), they are less intensively managed in view of biodiversity conservation.

Namib-Naukluft Park covers an area of almost 50,000 km2 and protects some of the most varied and extraordinary ecosystems in Namibia. The Namib-Naukluft provides a sanctuary to large mammals including the Black Rhino, Hartmann's Mountain Zebra, Leopard, and Cheetah. Moreover, a Ramsar registered wetland lies to the south-west of the Study Area. The map below shows the location and boundary of the Namibian National Parks.

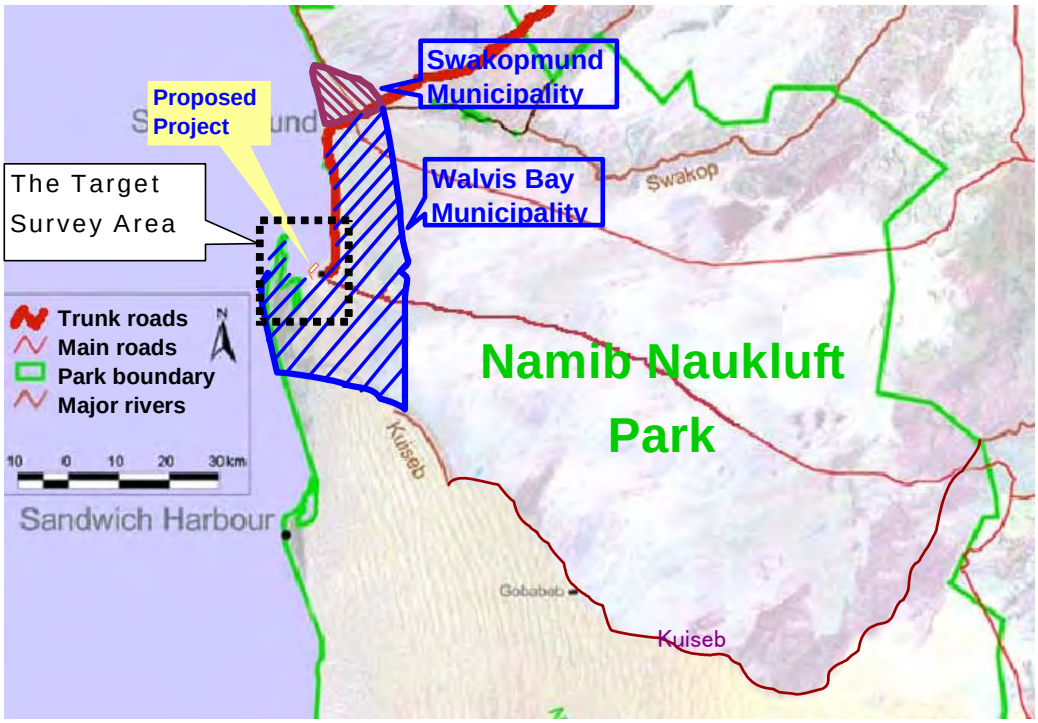
The target area under review by the present survey is shown in Figure 2.7.3.



Source: SEA for the Coastal Areas of the Erongo and Kunene Regions, NACOMA, January, 2008

Figure 2.7.3 Two Adjacent Parks Embracing the Walvis Bay Municipality

Focusing more closely on the Target Survey Area, it is seen to be embraced by the present Namib Naukluft Park, as shown by Figure 2.7.4.



Source: JICA Survey Team

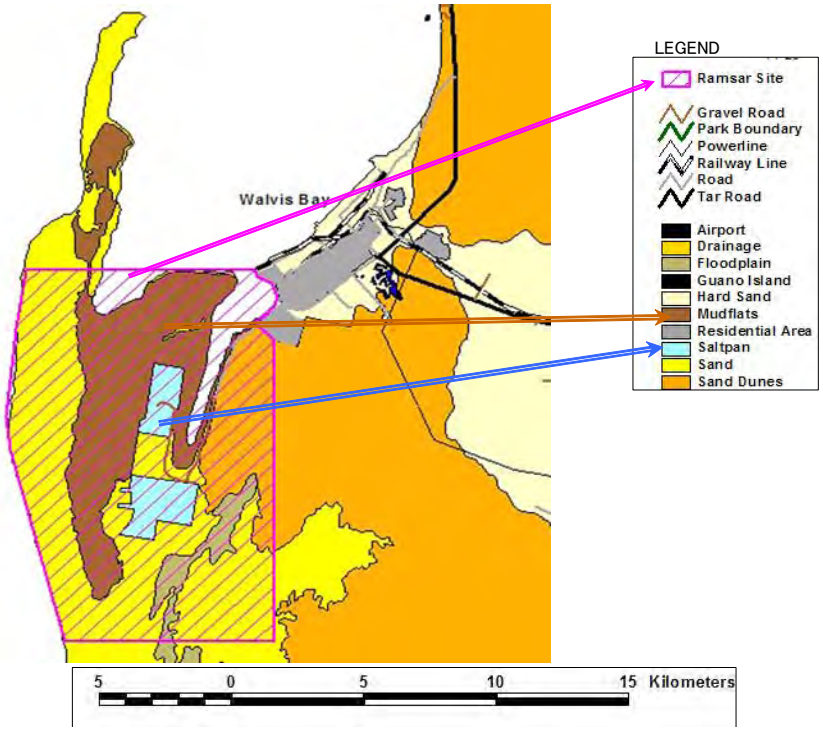
Figure 2.7.4 Geographical Setting of the Target Survey Area Embraced by the Namib Naukluft Park

2) The Walvis Bay Wetland

The Walvis Bay Wetland, an internationally recognized conservation area registered by the Ramsar Convention in the year 1995, lies in immediate adjacency to the Port of the Walvis Bay. The whole Ramsar Convention designated area of 142,000 ha comes under the demarcated area of the Namib Naukluft Park. It is schematically shown in Figure 2.7.5.

The Walvis Bay Wetland is one of the country's four Ramsar Sites and is located on the Kuiseb river delta, approximately halfway down the Namib desert coast, some 55 km north of Sandwich Harbour (which is also a registered wetland). The Kuiseb River no longer flows into its own delta, having been dammed off in 1962 to prevent flooding of the town. The wetlands, south and west of the built-up area of the Walvis Bay Municipality, make up the natural areas of Walvis Bay lagoon, including inter-tidal mudflats and the eastern half of a 10-km-long north-south sand-spit called Pelican Point; this spit provides protection for the bay from the Benguela Current. A salt refinery company, under a mining license from the Ministry of Mines and Energy (MME), before the Wetland is Ramsar-registered in 1995, has since been operational at the southern end of this lagoon; its licensed (valid until 2020) area (South of 22°58′S, West of 14°30′E) of some 4,000 ha lies within the Ramsar-registered area. The salt refinery company's location and operation area are shown, respectively as “Salt Pan” and “Mudflats” in Figure 2.7.5.

BirdLife International, an organization dedicated to avi-fauna conservation worldwide, has also designated the Wetland as one of the Important Bird Areas (IBAs) in Namibia, with the code number NA013, for an area of 4,000 ha, within the demarcated Ramsar Site. Included in this IBA (NA013) are the artificially flooded evaporation ponds, shown as mudflats (brown color) in Figure 2.7.5, of the salt works, as well as the occasionally flooded areas to the south of the salt works, which provides habitats for waterfowls.



Source: Ministry of Environment and Tourism

Figure 2.7.5 The Walvis Bay Wetland – the Area Registered by the Ramsar Convention

Wetlands International[26]gives the data sheet regarding the Walvis Bay Wetland as shown in Table 2.7.1.

Table 2.7.1 Data Sheet of the Walvis Bay Wetland

No.	Subject	Description
1.	Country	Namibia
2.	Registered Date	24th July, 1995
3.	Wetland International Reference	1NA001
4.	Name of Compiler	Holger Kolberg, Ministry of Environment and Tourism (MET)
5.	Name of Wetlands	Walvis Bay Wetlands
6.	Date of Ramsar Designation	19 June 1995
7.	Geographical coordinates (Site Centre)	23°00'S 14°27'E
8.	General location:	On the west coast, just south of Walvis Bay
9.	Area	12,600ha
10.	Wetland Type	A1*, A7*, A10* (*: see footnotes below the table) Alternately, it is also given following wetland types. • Inter-tidal mud, sand or salt flats (G) – a dominant type • Estuarine waters; permanent water of estuaries and estuarine systems of deltas (F) • Sand, shingle or pebble shores; includes sandbars, spits and sandy islets; includes dune systems and humid dune slacks (E)
11.	Altitude	Sea Level

[26] Wetlands International (WI) is an independent non-profit entity. It provides the Ramsar Secretariat with scientific expertise for the sustainable protection of wetlands and waterfowls.

12.	Overview: The site consists of the natural areas of Walvis Bay lagoon, Pelican Point up to its extreme northern tip and the adjacent inter-tidal areas. It also includes the Walvis Bay saltworks and the area to the south of it.
13.	Physical features: The underlying geology is of the Damara sequence covered by the Namib sand sea of Quaternary origin. The lagoon is in one of several old channels of the Kuiseb river; it is tidal in its entirety. The climate at the site is that typical of arid coasts. Annual precipitation ranges between 2 and 38mm.
14.	Ecological features: The most important feature of the site is the mudflats exposed at low tide. There are several sandbars which serve as roosting sites. Very little natural vegetation occurs, but the town of Walvis Bay adjacent to the site is well vegetated.
15.	Land tenure/ownership of: (a) site: State land, town lands. (b) surrounding area: State land
16.	Conservation measures taken: The entire wetland and surrounding area have been proclaimed as a nature reserve.
17.	Conservation measures proposed but not yet implemented: no information available
18.	Current land use: (a) site: Recreation, salt production. (b) surroundings/catchments: no information available
19.	Disturbances/threats, including changes in land use and major development projects: (a) at the site: Residential development along the edge of the lagoon may have a slight effect on the bird populations. Natural siltation may eventually lead to the infilling of the site. (b) in the surroundings/catchment: no information available
20.	Hydrological and physical values: no information available
21.	Social and cultural values: no information available
22.	Noteworthy fauna: Regular bird counts have shown that numbers of wetland birds vary from 37,000 to 79,000 individuals. Significant numbers of several red data species occur; about 6,900 chestnut-banded plovers *CHARADRIUS PALLIDUS*, 33,000 lesser flamingos *Phoeniconaias minor* and 23,000 greater flamingos *Phoenicopterus ruber*. Eleven red data species are regularly found.
23.	Noteworthy flora: no information available
24.	Current scientific research and facilities: Wetland bird counts are done twice a year.
25.	Current conservation education: Several boards showing the diversity of birds in the lagoon have been erected.
26.	Current recreation and tourism: The lagoon is used by windsurfers and dinghy sailors. There is a pedestrian walkway along the eastern shore of the lagoon. Many tour operators bring tourists to photograph the masses of flamingos.
27.	Management authority: Ministry of Environment & Tourism, Private Bag 13306, Windhoek, Namibia.
28.	Jurisdiction: As above.
29.	Bibliographical references: See attached list.

Source: http://ramsar.wetlands.org/Database/Searchforsites/tabid/765/Default.aspx

Note: Nomenclature with the right shoulder asterisks in the above item 11 have been designated by the Ramsar Convention Secretariat to classify wetland types; "A1", "A7", and "A10" respectively, stand for "Marine waters—permanent shallow waters less than six metres deep at low tide; includes sea bays, straits", "Inter-tidal mud, sand or salt flats", and "Brackish to saline lagoons and marshes with one or more relatively narrow connections with the sea".

3) Biodiversity at the Walvis Bay Wetland

Walvis Bay Wetland is endowed with rich diversity in biota. IUCN cites species of terrestrial mammalia, amphibia and avi-fauna in view of international conservation importance.

With respect to terrestrial mammalia, only *Oryx* and *Gemsbok,* are known to occur as rare and important species and are classified by IUCN, respectively as CD (Conservation Dependent) and NT (Near Threatened).

With respect to amphibia**,** *Tandy's sand frog, Marbled rubber frog*, and *Common plantanna* are known to occur as rare and important species and are classified by IUCN, as LC (Least Concern).

In terms of numbers and species of avi-fauna, the Walvis Bay Wetland is the most important coastal wetland in southern Africa, and is one of the three most important coastal wetlands in Africa. It regularly supports over 100,000 birds in summer (maximum 162,000) and 50,000 in winter. Most birds (c.90% by number) which use the wetland in summer are non-breeding intra-African and Palearctic migrants. The area is vitally important for Palearctic waders and flamingos, which make up the majority of the numbers. Between 80-90% of the sub region's flamingos winter here, utilizing especially the evaporation ponds of the salt refinery works.

Waterfowl species of special concern with habitats at the Walvis Bay Wetland are shown below in Table 2.7.2 with respective conservation status. As of the year 2009, Dr. C. J.Brown and R.E. Simmons of Namibian Nature Foundation have compiled existing observation results and extensive literature to produce a draft Namibian Red Data List. From this comprehensive national list, extracted are those with habitats at the coastal wetlands (in the Erongo and Kunene Regions), and are screened in view of their occurrences at the Walvis Bay Wetland to be shown in Table 2.7.2.

However there seems to be much argument by Namibian ornithologists in finalizing the conservation status of waterfowls in the Erongo and Kunene Regions. It is noted that Critically Endangered (CE) species are not known at Walvis Bay Wetland. At the Endangered class, which ranks above the "Vulnerable" status, only the *Bank Cormorant* and the *Cape Gannet* are classified under this category.

Table 2.7.2 Important and Rare Species Observed at the Walvis Bay Wetland

Avi-fauna Species		Conservation Status	
Common Name	**Academic Name**	**Namibian Red Data[27]**	**BirdLife International**
Bank Cormorant	*Phalacrocorax nelectus*	Endangered	Globally Vulnerable
Cape Cormorant	*Phalacrocorax capensis*	Near Threatened	Globally Near Threatened
Crowned Cormorant	*Phalacrocorax coronatus*	Near Threatened	Globally Near Threatened
Greater Flamingo	*Phoenicopterus rubber*	Vulnerable	n/a
Lesser Flamingo	*Phoeniconaias minor*	Vulnerable	Globally Near Threatened
Cape Gannet	*Morus capensis*	Endangered	Globally Vulnerable
Black-necked Grebe	*Podiceps niricollis*	Near Threatened	Conservation Status not given
Hartlaub's Gull	*Larus Hartlaubii*	Vulnerable	Conservation Status not given
African Black Oystercatcher	*Haematopus moquini*	Near Threatened	Globally Near Threatened
Great White Pelican	*Pelecanus onocrotalus*	Vulnerable	Conservation Status not given
Chestnut-banded Plover	*Charadrius pallidus*	Near Threatened	Conservation Status not given
Caspian Tern	*Sterna caspia*	Vulnerable	Conservation Status not given
Damara Tern	*Sterna balaenarum*	Near Threatened	Conservation Status not given

Source: Namibian Coastal/Marine Bird Action Plan, April, 2008 and Namibian Red Data Book, compiled by Dr. Chris Brown and R.E. Simmons, Namibian Nature Foundation.

[27] Communication with Dr. Chris Brown, the Namibian Nature Foundation.

The above cited avi-fauna species are observed to have habitats, whether they may be migratory or migratory, at various types of wetlands at the Walvis Bay area, not just the Lagoon, but such sites as "Outer Lagoon", Pelican Point, Paaltjies, and Salt Works. Bird Species habitats occurred at the Walvis Bay Wetland, which observation data is compiled by Mike Scott and Ann Scott, July 2004, is shown in Table 2.7.3. The geographical locations of those wetlands are later shown in Figure 2.7.7.

In view of adjacency of those various types of wetland – mudflats and tidal flats (the Outer Lagoon), shorelines of the Atlantic Ocean (Paaltjies), and sand spit (Pelican Point), t is seen that project impacts should not be focused to the Lagoon only, but should also address to those wetlands of diverse nature, where they serve as important birds' habitats. It is noted that not all important and rare bird species in Table 2.7.2 appear in the occurrence Table 2.7.3, as occurrences fluctuate by the season and the year of observation.

Table 2.7.3 Bird Species Occurred at the Walvis Bay Wetland

Common Name	Scientific Name	Occurrences at the proposed WB Nature Reserves						
		Pelican Point	Lagoon	Outer Lagoon	Harbour	Paaltjies	Salt Works	Kuiseb Delta
Intra-African migrants								
Greater Flamingo	*Phoenicopterus ruber*	X	X	X			X	
Lesser Flamingo	*Phoenicopterus minor*	X	X	X			X	
Blacknecked Grebe	*Podiceps niricollis*	X	X	X	X		X	
Damara Tern	*Sterna balaenarum*	X	X	X		X	X	
Chestnut banded Plover	*Charadrius pallidus*	X	X	X			X	
Avocet	*Recurvirostra avosetta*	X	X	X		X	X	
Palaearctic Migrant								
Black Tern	*Chlidonias niger*	X	X	X	X	X	X	
Grey Plover	*Pluvialis squatarola*	X	X	X		X	X	
Ruddy Turnstone	*Arenaria interpres*	X	X	X	X	X	X	
Curlew Sandpiper	*Calidris ferruginea*	X	X	X		X	X	
Little Stint	*Calidris ruficollis*	X	X	X		X	X	
Sanderling	*Calidris alba*	X	X	X		X	X	
Resident								
Caspian Tern	*Sterna caspia*	X	X	X	X	X	X	
Swift Tern	*Sterna bergii*	X	X	X	X	X	X	
Black Oystercatcher	*Haematopus moquini*	X	X	X		X	X	
White-Fronted Plover	*Charadrius marginatus*	X	X	X		X	X	X
Hartlaub's Gull	*Larus hartlaubii*	X	X	X	X	X	X	
Kelp Gull	*Larus dominicanus*	X	X	X	X	X	X	

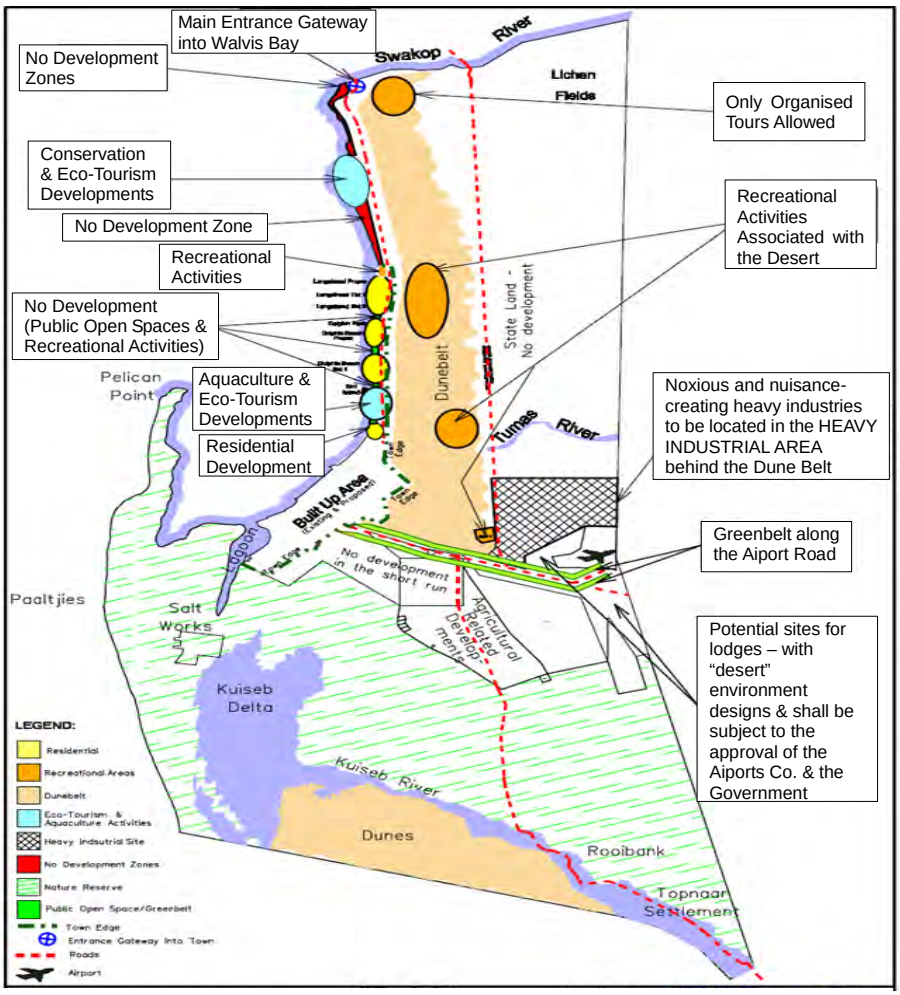
Source: "Walvis Bay Nature Reserve", A Draft Management Plan, Mike Scott and Ann Scott, July 2004.

2.7.2 Walvis Bay Nature Reserve

As the survey's target area lies within the Walvis Bay Municipality's jurisdiction, it is important to comprehend relevant local authority's conservation plan. The environmental conservation zones designated by the Walvis Bay Municipality are reviewed to see their spatial and environmental implications to the target survey area.

(1) The Walvis Bay Municipality Structure Plan

The Walvis Bay Municipality (WBM) has long established the Structure Plan, which covers the whole jurisdictional area of WBM (*Proclamation No 16 of 1994*). The jurisdictional boundary is shown in Figure 2.7.7. Since its proclamation, revisions and updates are done with the latest version as of April 2008. The Structure Plan is to guide, manage and control town development in the Walvis Bay Municipality over the long-term. It is observed that the large space on the south-western corner (shaded by dotted green lines) of the Municipal territory is demarcated as "Nature Reserve", some part of this area is designated Walvis Bay Nature Reserve (WBNR) to conserve the natural environment.



Source: The Structure Plan of the Walvis Bay Municipality, April 2008.

Figure 2.7.6 Nature Reserve Zones Proposed (Green Shade) by the Walvis Bay Municipality Structure Plan

For the conservation purposes of WBNR, land use involved with promoting and preserving the aesthetic, cultural, ecological and environmental attributes of the land can be permitted, provided that these uses are incidental to the predominant use of the land for a conservation purpose and these uses shall be subject to an Environmental Impact Assessment.

As it was originally proposed by the earlier studies, "Walvis Bay Lagoon Integrated Environmental management Plan", Draft version, L. Burger & M. Seely,1998, and later updated for WBM, July, 2004), the WBNR is comprised of 8 zones - Pelican Point, Walvis Bay Lagoon (including the inner and outer lagoon), the waterfront area in the Harbour, the Paaltjies Coast, the salt works concession area (concessionaire: Walvis Bay Salt Refiners Ltd), the Kuiseb Delta and Kuiseb River, and the sand dune and gravel plains north and south of the Kuiseb River down to the boundary of the Namib Naukluft Park. WBNR's disaggregated 8 zones, are shown in Figure 2.7.8. Conservation measures respective WBNR zones are summarized in Table 2.7.4.

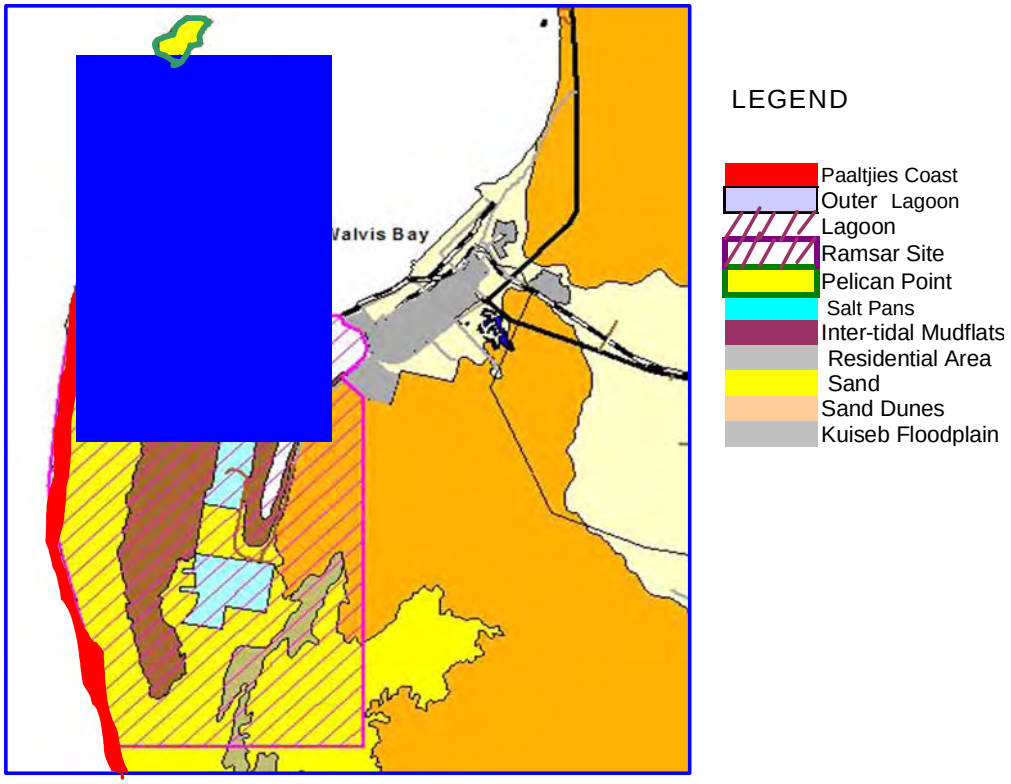
Further, COWI (August, 2005) study proposed that WBNR be managed through a co-operative management programme, consisting of an environmental management board, supported and monitored by an environmental advisory board. Additionally, general participation by stakeholders and local community will be directed through the advisory board.

Table 2.7.4 Proposed Conservation Measures for Respective WBNR Zones

WBNR Zones	Conservation Measures
1. Pelican Point	Motorised vehicles should be controlled. Controlled shore angling is permitted. Information about key features and the vulnerability of the area should be provided.
2. Inner Lagoon	The lagoon ecosystem should be conserved. Introduce disturbance-free zones for birds. Controlled non-destructive and non-consumptive recreational use may be permitted. Visitors' facilities should be provided. A key educational facility, strictly on environmental education, may be permitted.
3. Outer Lagoon	Activities supporting recreation should be encouraged. Fishing, aquaculture and water sports may be allowed, but should be controlled. No further urban development that encroaches into this area. should be permitted without a strict Environmental Impact Assessment. Sustainable and controlled boating (including the use of motorised craft) and fishing activity should be allowed. Controlled commercial eco-tourism ventures should be encouraged in this zone.
4. Harbour	Ensuring harbour activities should not be in conflict with lagoon ecosystems and the WBNR.
5. Paaltjies Coast	Eco-tourism developments may be permitted. Encourage the preservation of roosting shorebirds by means of information. Provide more opportunities supporting mixed recreation activities. Angling from coastline permitted as at present.
6. Salt Works	Encourage the preservation of wetland birds through entering conservation agreement with Salt Works. Encourage environmental education and nature interpretation activities.

WBNR Zones	Conservation Measures
7. Kuiseb River and Kuiseb Delta	Promote the conservation of dry river delta and its habitats, including protection of key natural resources for Topnaars Eco-tourism developments should be encouraged. Motorised vehicles should be controlled and their access restricted along defined tracks.
8. Desert and Dune areas around Kuiseb River	The issuing of lease-holds should be promoted. The mining and borrow pits operators shall restore their sites in order to maintain the aesthetics of the landscape. Off Road Vehicles (ORV) should be restricted to designated areas.

Source: The Structure Plan of the Walvis Bay Municipality, April 2008；Walvis Bay Lagoon Integrated Environmental Management Plan, Draft Final, L. Burger and M. Seely, July 1998.



Source: Ministry of Environment and Tourism

Figure 2.7.7 Walvis Bay Municipality's Nature Reserve Zones Proposed

The Municipal Structure Plan also proposes responsible authorities for the WBNR Zones. They are summarized in Table 2.7.5.

Table 2.7.5 Institutions Proposed for Managing Respective WBNR Zones

WBNR Zones	Institutions/Approximate Area/Main Use
1. Pelican Point	Namport/130 ha/Conservation
2. Lagoon	WBM (MFMR) /1,030 ha/Conservation
3. Outer Lagoon	Namport, MFMR/3,980 ha/Recreation, Mari-culture
4. Harbour	Namport/7,350 ha/Commercial Harbour
5. Paaltjies Coast	WBM/1,250 ha/Eco-tourism, Recreation
6. Salt Works	Walvis Bay Salt Refiners (Pty) Ltd./3,950 ha/Salt Production
7. Kuiseb Delta	Government of Namibia/45,200 ha/Conservation, Eco-tourism

Source: The Structure Plan of the Walvis Bay Municipality, April 2008

However, the Ramsar-registered Wetland, whose designated area spans over the above WBNR zones 2, 3, 5 and 6, is yet to have legally binding conservation status in line with the new Wetland Policy regulations on wetlands. In the absence of any conservation management scheme in force, dedicated to the Walvis Bay Wetland, it is expected to designate Namibia's most diverse and vulnerable wetland as one of the protected areas of national level, empowered with legal provisions.

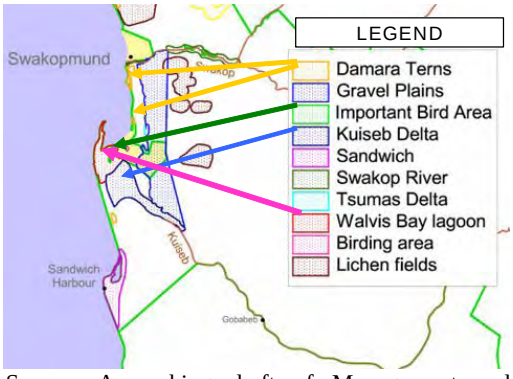
(2) Recommended Management Options for WBNRs

The report *Strategic Environmental Assessment (SEA) for the Coastal Areas of the Erongo and Kunene Regions* (MET, 2008) recommends an action plan to be undertaken by the authorities (listed in the above Table 2.7.5, It calls for institutions for managing respective WBNR Zones by the following manner.

MET should formally designate the Nature Reserve as a protected area. MET, the Walvis Bay Municipality, and the Coastal Environmental Trust of Namibia[28] should ensure further implementation of the national Wetland Policy in the area by adopting the Nature Reserve Management Plan.

However, there is a recent to initiative by MET to consolidate all coastal parks into "National Park" status thereby bringing the environmentally sensitive coastal zones of the Erongo Region and Kunene Region under direct jurisdiction of the Ministry. This move will put cohesive conservation activities in action, in particular targeting the Walvis Bay Wetland, which has hitherto been left as it is without tangible visible efforts by the public sector.

In fact, toward the above end, MET, MFMR and other institutions conducted an exercise in January 2009, with an objective of formulating a *Management and Development Plan (MDP)* for the proposed *Namib-Skeleton Coast National Park (NSCNP)*. The NSCNP will be established (JICA Study Team's communication with MET, as of 2009) in order to improve conservation status of the existing coastal protected areas in the Erongo Region as well as the Kunene Region. Although the outcomes from the exercise are still rudimentary, it gives a thoughtful insight into the JICA Survey in understanding the environmentally sensitive area susceptible to the proposed project impacts.



Source: A working draft of Management and Development Plan for the Proposed NSCNP, MET, January, 2009

Figure 2.7.8 Environmentally Sensitive Zones in the Survey Area

[28] Coastal Environmental Trust of Namibia is an environmental NGO based at the Walvis Bay.

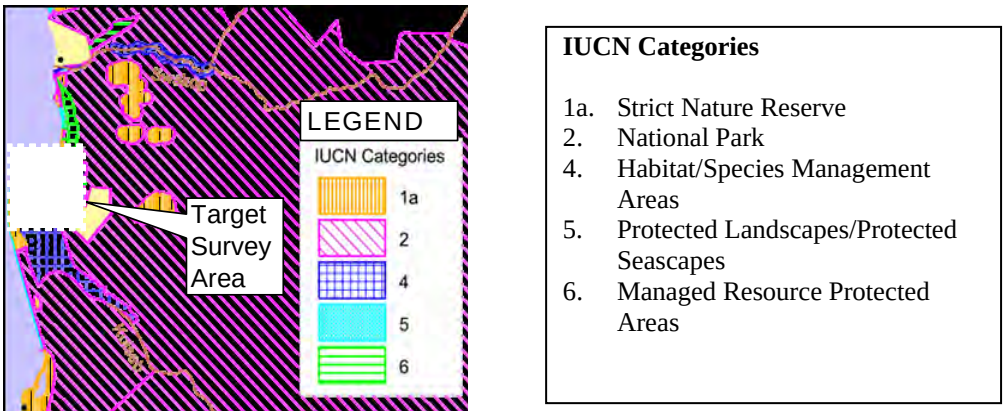
Within the target area of the JICA Survey, the following habitats with rich bio-diversity and unique ecosystems are considered sensitive to any anthropogenic intervention. Distributions of those habitats are schematically shown in the above Figure 2.7.8. The extent of the sensitivity to external interventions by habitat types identified in the JICA Survey Target Area is summarized in Table 2.7.6.

Table 2.7.6 Avi-Fauna Habitats versus Environmental Sensitivity

Category	Habitat	Environmental Sensitivity
Littoral/inter tidal	Sandy Shore/Rocky Shore	Moderate sensitivity. Habitats for shorebirds and waders.
	Walvis Bay Lagoon	High sensitivity. Most important coastal wetland for birds in Southern Africa.
	Walvis Bay Salt Works	High sensitivity. Man-made evaporation pans serve as waterfowl habitats.
Terrestrial	Damara Tern Breeding Sites	Highly sensitive. Some of the gravel plains and shorelines are used by Damara Terns for breeding.
	Kuiseb Delta	High sensitivity. Unique ecosystems of flora and fauna due to ephemeral flush in the arid desert zone.

Source: A working draft of Management and Development Plan for the Proposed NSCNP, MET, January, 2009

The above identified habitats and ecosystems are assessed by applying IUCN categories for Protected Areas. The results of classification by IUCN categories are shown in Figure below.



Source: A working draft of Management and Development Plan for the Proposed NSCNP, MET, January, 2009

Figure 2.7.9 Environmentally Sensitive Zones Classified by IUCN Categories for Protected Areas

The above Figure 2.7.9 indicates that “Walvis Bay Lagoon” and the “Damara Tern breeding areas” are categorized as “Strict Nature Reserve”, while “Walvis Bay Salt works” is ranked as Habitat/Species Management Areas, with all other areas to be classified as “National Park”, excluding any built-up town area of the Walvis Bay.

Table 2.7.7 Proposed Protected Areas versus IUCN Categories

Proposed Protected Areas (IUCN Category)	**Applicable Areas**
Strict Nature Reserve IUCN **Category 1a**	Areas of high environmental value and sensitivity: • Walvis Bay Lagoon • Damara Tern breeding areas
National Park IUCN **Category 2**	The whole area, excluding the demarcated municipal areas. Where no other zone is provided, the zone is taken to be a "National Park"
Habitat /Species Management Areas IUCN **Category 4**	• Walvis Bay Salt Works • Kuiseb River and Delta • Western faces of Dune Belt

2.7.3 Namibian Environmental Assessment Procedure and Environmental Standards

(1) Proposed Project's EA (Environmental Assessment) Procedure

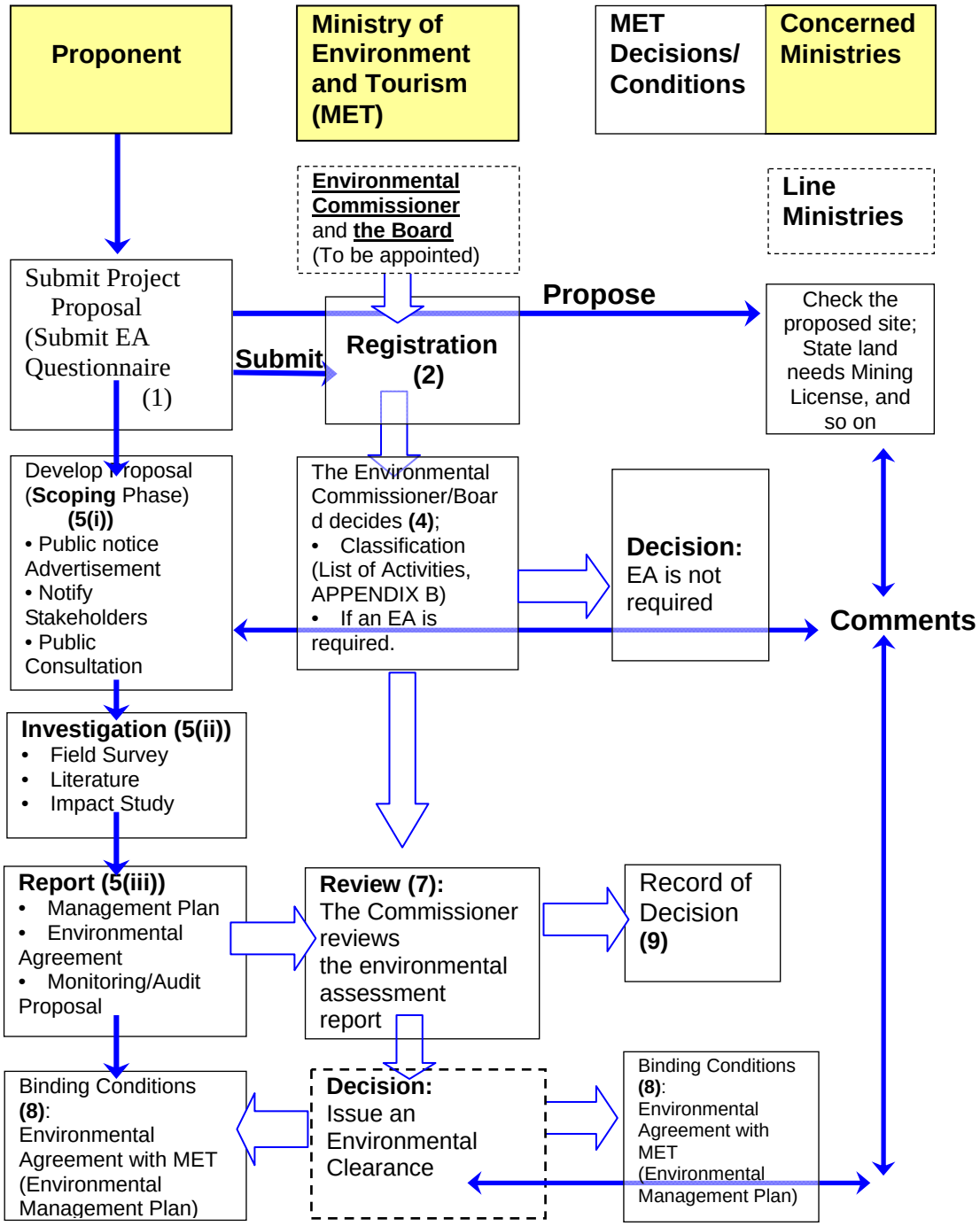
The project proposal is being processed in compliance with the Namibian legal and institutional mandates. The sub-section examines if those mandates are satisfied and intends to point out necessary procedures to meet these requirements.

1) Namibian Policy and Regulations on EIA and the Procedural Mandates

The Namibian Government's *Environmental Assessment (EA) Policy for Sustainable Development and Environmental Conservation* (1995) dictates an administrative procedure mandated for any projects and programmes specified under the list of activities, Appendix B. "Ports and Harbours" falls under the list of activities. Therefore the "Walvis Bay Port Terminal Expansion Project" shall be subjected to the Namibian EA procedure.

Despite the policy statement, there seems an apparent absence of such key elements as "the Commissioner and the Board" in the current institutional setup of MET, which are stipulated to oversee compliance of EA procedure and Environmental Management Agreement, binding the proponent and the MET. However, ongoing EA procedures for the container terminal expansion project, commissioned by Namport comply with *Namibian Environmental Assessment Policy* of 1995. Further, the *Environmental Management Act (2007) (EMA)* was promulgated, followed by a public notice, gazetted in April, 2008 on "Draft Procedures and Guidelines for Environmental Impact Assessment (EIA). The latter two are, in strict legal terms, yet to be effectuated. However, in practice, the principles of EMA and accompanying Guidelines are well accepted by the government executing bodies and are implemented, supplementing rather outdated statements by the above EA Policy. Even in the absence of the line Ministry's (The Ministry of Works, Transport and Communication) directive, Namport is committed to undertaking efforts in harmonizing itself with what are stipulated by EMA and accompanying "Procedures and Guidelines for EIA" since the Fiscal Year 2009/2010 (Communication with the SHREQ (Safety, Health, Risk, Environment and Quality) executive, NAMPORT).

The EA process, as stipulated by ongoing EA Policy, is schematically shown in Figure 2.7.10 below.



Note: Numbers in the parenthesis indicate items stated in the Appendix A, Environmental Assessment Procedure, Namibia's Environmental Assessment Policy, 1995

Figure 2.7.10 EA Process Mandated by the Namibian Environmental Assessment Policy, 1995

2) The JICA Guidelines for Confirmation of Environmental and Social Considerations

JICA has guidelines applicable in reviewing project eligibility in providing project proponent (recipient body) with the Yen Loan. In particular, the "Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Considerations, April, 2002 (herein under the Guidelines in this chapter) applies to the present project study.

In accordance with the said Guidelines, the standard approach is executed under the following exercises. Screening proponent's project proposal will entail a judgement as to the nature of the proposal if it may have either one of such environmental sensitivities as:

- **Sensitive Sectors**: Large-scale infrastructure projects, among others, in the ports and harbour sector,
- **Sensitive Characteristics**: Project's size with sensitive characteristics, among others, large-scale land reclamation, land development and land-clearing; or
- **Sensitive Areas**: Projects in protected areas or their vicinity.

The exercise may result in either one of the Categories of A, B, C or FI, in view of project environmental characteristics. If an initial screening of the proposed project reveals that the proposal is deemed to have one or more of the above environmental sensitivities, it is judged to fall under Category A.

Secondly, the Guidelines mandate that all "Category A Project" to fulfil public consultation process and information disclosure with documents accessible by citizens concerned and stakeholders.

3) NAMPORT's conformance with the JICA Guidelines and the Namibian Environmental Policy

Shown in Table 2.7.8 below is a critical comparison of the extent of NAMPORT's conformity with the JICA Guidelines and the Namibian Environmental Assessment Policy, 1995 in proceeding with the Proposed Container Terminal Expansion Project.

Table 2.7.8 JICA Environmental Mandates versus Namibian Practice

Requirements of JICA Environmental Guidelines	Requirements by the Namibian Environmental Policy, 1995	NAMPORT's Compliance in Proceeding with the Proposed Container Terminal Expansion Project
1. EIA Reports for Category A Projects		
1.1 Compliance with the host country's assessment procedures and obtaining government approval.	The Policy dictates the assessment procedure and procedure for obtaining clearance. On granting a clearance, binding conditions may be imposed by MET (Article 8).	The ongoing EIA process observes the Namibian EIA process and procedure dictated by the Namibian Environmental Policy and the Environmental Management Act. The process is ongoing and is to be complete with the obtaining the environmental clearance.
1.2 Use of official languages in EIA reporting	No specification.	All EIA reports are produced in the official language of English
1.3 Availability of EIA reports to project stakeholders and local residents	No specification.	Copies of EIA report are made available at the Civic library and public libraries.

Requirements of JICA Environmental Guidelines	**Requirements by the Namibian Environmental Policy, 1995**	**NAMPORT's Compliance in Proceeding with the Proposed Container Terminal Expansion Project**
1.4 In preparing EIA reports, consultation with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records, etc. of such consultations must be prepared	During scoping phase, stakeholders are notified and public consultation shall be done (Article 5(i))	During scoping of EIA, local consultations (May/June, 2009) are conducted to solicit opinions and concerns of stakeholders. Draft scoping report in English is made available at the public libraries as well as is uploaded at NAMPORT website in the electronic form. The above process served as a preparatory work before full scope EIA is being planned. The second round of local consultation, presenting the Draft EIA was conducted on 24th., November, 2009.
1.5 Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project.	No particulars on stakeholders' participation in phasing EIA process.	Public consultations are conducted at two occasions of "Scoping" during preparation, and "Full-scope EIA reporting", incorporating stakeholders' opinions and concerns.
2. Items to be covered by EIA reports (Appendix in the JICA Guidelines).		
2.1 Executive Summary	Not specified.	An executive summary is given in the draft EIA report.
2.2 Policy, legal and administrative framework	The Namibian Environmental Assessment Policy, 1995 applies.	The procedure currently undertaken by NAMPORT strictly observes the Namibian Environmental Assessment Policy.
2.3 Project description	Not specified.	The draft EMP contains a project description.
2.4 Baseline data	The article 5(ii) of the Namibian Environmental Assessment Policy, 1995 dictates conduct of an investigation, including field survey and literature survey.	Literature survey on adjacent area's ecosystem and past feasibility reports is conducted. Field measurements are done for bathymetry and bore holing sub-soils at the proposed project site.
2.5 Environmental Impacts	The article 5(ii) of the Namibian Environmental Assessment Policy, 1995, dictates an impact study.	Proposed project's environmental impacts are extensively exploited with the hydro-dynamic simulation modelling.
2.6 Analysis of alternatives	Not specified.	Alternatives are formulated and their viability is assessed.
2.7 Environmental Management Plan (EMP)	The article 5(iii) of the Namibian Environmental Assessment Policy, 1995 dictates formulation of "Management Plan"	A draft CEMP (Construction Management Plan, February, 2010) is submitted.
2.8 Consultation: Record of consultation meetings	Not specified.	All records are made on two times of public consultations held (May/June and November, 2009).

The above comparative exercise indicates that the procedural requirements of the JICA Guidelines are fully satisfied by the NAMPORT's conduct of EIA process, though the process is still ongoing at the time of this report (February, 2010). It is noted that those JICA required items of 1.2, 1.3, 1.5, 2.1, 2.3, 2.6, and 2.8 in the above Table 2.7.8, which are not explicitly stated in the Namibian Environmental Policy, 1995 are also satisfied by NAMPORT's EIA undertakings shown in the right-most column in the above table.

(2) Namibian Environmental Standards

It is important to take note of Namibian environmental standards in reviewing the extent and significance of project's potential impacts, in particular those of effluent and ambient water quality, noise levels, and maximum allowed toxicity level of dredged spoil and solid wastes. Below enumerated are such environmental standards, however, it is noted that surrogate standards/Guidelines, in particular those of the Republic of South Africa, are employed, whenever such standards are yet to be established by the Namibian Government, to supplement lack of norms.

Table 2.7.9 Potential Impacts versus Relevant Environmental Standards

Environmental Baseline/Potential Impacts	Environmental Standards to be Referred
Environmental Baseline • Present Water Quality at the Harbour, Lagoon, and Water Bodies • Present Sediment Quality at the Harbour • Fish Processing Industry Discharge	✓ BCLME[29] Water Quality Guidelines ✓ BCLME Sediment Quality Guidelines ✓ Annexure: General and Special Effluent Standards, the Water Act, 1957
Potential Impacts • Disposal of Dredged Material (Dumping at Sea) • Disposal of Dredged Material (Dumping at Landfill Site) • Perceived Noise Level Rise along the Roads due to Increased Traffic	✓ London Convention 1972/1996 Protocol ✓ BCLME Sediment Quality Guidelines ✓ South African Bureau of Standards (SABS) code 0228. ✓ Acceptable Rating Levels for Noise in Districts, SANS 10103

With respect to effluent water quality, the *Water Act 54*, 1956, designates industrial effluent standards. However, new legislation named *Water Resources Act*, is being drafted.

Table 2.7.10 Effluent Standards Stipulated by the Water Act, 1956

Water Quality Items	Maximum Allowed Concentration
1.1 Colour, odour or taste	Effluent shall not contain any substance in a concentration capable of producing any colour, odour, or taste.
1.2 pH	Between 5.5 and 7.5
1.3 Dissolved oxygen	Shall be at least 75% saturation
1.4 Typical faecal coli	Shall contain no typical coli per 100 mm.
1.5 Temperature	Maximum of 25℃
1.6 Chemical Oxygen Demand	< 30 ppm (Cl corrected)
1.7 Oxygen Absorbed	< 5 ppm (K-permanganate Method)
1.8 Conductivity	
1.8.1 Not to be increased by more than 15% above that of the intake water.	
1.8.2 The conductivity of any water seeping from any area shall not exceed 250 milli-Siemens per meter at 25°C.	
1.9 Suspended Solids	< 10 ppm

[29] Benguela Current Large Marine Ecosystem.

Water Quality Items	Maximum Allowed Concentration
1.10 Sodium content	Not to be increased by more than 50 mg per litre above that of intake water
1.11 Soap, oil, or grease	None
1.12 Other constituents	Maximum allowed concentration of Residual chlorine, Phenol Compounds, and 13 Heavy Metals are designated.

Source: The Water Act, 1956

1) Ambient Water Quality and Sediment Quality

In the absence of the Namibian ambient water and sediment quality standards, it is suggested that Namport refers to BCLME Guidelines, widely acknowledged by the countries in the SADC Region, in assessing the project's impacts on harbour water quality and sediments. The following table shows an essential feature of the BCLME Guidelines applicable to marine aquatic systems.

Table 2.7.11 Recommended Water Quality and Sediment Quality Guidelines by the Benguela Current Large Marine Ecosystem (BCLME)

Type of Quality Guideline		Guideline Values
Water Quality	Objectionable Matter/Aesthetics	Floating materials and residues from land-based sources.
	Physio-chemical Variables	Temperature, Salinity, pH, Turbidity, Suspended Solids, Dissolved Oxygen
	Nutrients	Chlorophyll a, Nutrients
	Toxic Substances (μg/liter)	T-Ammonia N<910, T-Cl<3, CN(-)<4, F(-)<5,000, S(-)<1, Phenol<400, PCBs<0.03
		As(III)<2.3, As(V)<4.5, Cd<5.5, Cr(III)<10, Cr(VI)<4.4, TBT(as Sn)<0.006, Pb<4.4, Hg<0.4, Other metals (Cu, An, Ni, Ag, Zn)are also listed.
		Aromatic Hydrocarbons (C6-C9), Poly-Aromatic Hydrocarbons (<C15), Poly-Aromatic Hydrocarbons (>C15), Pesticides (DDT, Dieldrin, Endrin)
Sediment Quality (Toxic Substances)	Trace Metals* (mg/kg dry weight)	As (7.24/41.6), Cd (0.68/4.21), Cr (52.3/160), Hg(0.13/0.7), Sn (as Tributyl-Sn) (0.005/0.07) Other metals (Cu, An, Ni, Ag, Zn)are also listed.
	Organic Compounds* (μg/kg dry weight)	Total Poly-Aromatic Hydrocarbons (1,684/16,770), Low Molecular Poly-Aromatic Hydrocarbons (312/1,442), High Molecular Poly-Aromatic Hydrocarbons (655/6,676), Total PCBs (21.6/189), Pesticides (Chlordane, DDT, Dieldrin, Endrin)

Source: The Development of a Common Set of Water and Sediment Quality Guidelines for the Coastal Zone of the BCLME (Project BEHP/LBMP/03/04), CSIR, January, 2006

Note: An asterisk "*" at the shoulder of chemical types has the following meaning: The two values each are given in the parentheses, the former representing "Recommended Guideline Value", and the latter being "Probable Effect Concentration". Those values correspond to 20 % value, and 80 % value of cumulative toxicity incidence probability versus toxic material concentration.

2) Sediment Quality (London Convention)

The participating countries of Angola, South Africa, and Namibia have produced the sediment quality guidelines, assisted by UNDP programme named BCLME. According to the BCLME guidelines, an investigative action shall be triggered if any of stipulated toxic substance's concentration is detected to be higher than those prescribed "Prohibition Level" shown in Table 2.7.12. The investigative actions, as customarily practised in the BCLME participating countries, refer to application of the "London Convention 1972" and the "1996 Protocol"

In the report by COWI, 2003, "Coastal Area Study Long-term Monitoring Programme, Walvis Bay Local Agenda 21 Project Namibia", it is stated that "In relation to capital dredging, routine sampling and analysis to be made as prescribed in the LONDON convention (Namibia has not signed the LONDON convention but it is suggested that Namport follows it)….. "In connection with capital dredging and larger maintenance dredging, Namport as part of the dredging budget will prepare an Environmental Impact Assessment (EIA) including sediment samples and analysis taken before and during the work"

Table 2.7.12 Recommended Action List

		Action Level (Moderately Contaminated)	**Prohibition Level** (Highly Contaminated)
Annex I Metals (Prohibited Substances)	Cadmium	1.5–10.0	>10.0
	Mercury	0.5–5.0	>5.0
Annex II Metals (substances and materials requiring special care)	Copper	50–500	>500
	Zinc	150–750	>750
	Chromium	50–500	>500
	Lead	100–500	>500
	Nickel	50–500	>500
	Arsenic	30–150	>150

Source: Annex, LC 27/8, October 2005, London Convention 1972/1996 Protocol

3) Ambient Noise Level

Moreover, in the absence of Namibian noise level standards, the South African National Standards (SANS) are generally applied.

Table 2.7.13 Acceptable Rating Levels for Noise in Districts (Excerpted from SANS 10103)

Type of District	**Equivalent Continuous Rating Level (LAeq, T) for Noise Level dB(A)**			
	Outdoors		**Indoors, with open windows**	
	Daytime (6:00–22:00)	Night-time (22:00–6:00)	Daytime (6:00–22:00)	Night-time (22:00–6:00)
Urban District	55	45	45	35
Urban districts with some workshops, with business premises, and with main roads	60	50	50	40
Central Business District	65	55	55	55
Industrial District	70	70	60	50
Original note: The values given in the above columns are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise.				

Source: Excerpted from the South African National Standards (SANS) 10103.

4) Solid Waste Classification

With respect to land disposal of wastes, the Walvis Bay Municipality has its own landfill site, off Rikunbi Kandana Road, a backyard of the Central Business District, exploiting a large tract of the Namib sand dunes. The site has a well demarcated disposal section dedicated for receiving toxic and hazardous wastes in a manner designated by controlled sanitary disposal, in accordance with the *South African Bureau of Standards (SABS) code 0228*. The Department of Environment, Water and Wastes practices labelling and packaging hazardous and toxic wastes

and contains them in a controlled manner, in compliance with the South African codes *SABS 0299* and *SABS 0233*.

The *SABS Code 0288* has designated hazardous and toxic classes; Class 1: Explosives, Class 2: Gases, Class 3: Flammable Liquids, Class 4: Flammable Solids, Class 5: Oxidizing Substances, Class 6: Poisonous substances, Class 7: Radioactive Substances, Class 8: Corrosives, and Class 9: Others.

2.7.4 Stakeholders' Concerns and Opinions

On behalf of the proponent, NAMPORT, the Joint Venture Environmental Consultants, have conducted local consultations in compliance with the Namibian Environmental Assessment procedural mandates with the following time sequence.

1. Public Notice: Advertisement of Consultative Meeting of June 11th, by the National-circulated commercial newspapers: Namib Times, May 28th, 2009
2. Stakeholders' Meetings, two times at the Namport conference room: May 19th and 20th, 2009
3. Registration of the Proposed Project with MET: June 30th., 2009
4. The First Round of Public Consultation presenting the Draft Scoping Report (DSR) : at the Civic Hall, the Walvis Bay Municipality: June 11th, 2009
5. Public release of the Draft Scoping Report (DSR), and soliciting public comments: from July 10th to 31st, 2009
6. Revised Scoping Report for public review and soliciting comments: from August 10th to 31st, 2009
7. Closure and finalization of the Scoping Report (SR): 30th September, 2009.
8. Presentation of the Interim Report (ITR): 29th September, 2009
9. The Second Round of Public Consultation presenting the Draft Environmental Impact Report (DEIR):November 24, 2009
10. Inviting Public Comments on DEIR: from December 7th., 2009 to January 22nd., 2010

(1) Proposed Project's Stakeholders

People of many trades and services, whether they are directly or indirectly engaged with port activities, and the general public have concerns on the proposed project. The study team has identified the following key stakeholders.

Table 2.7.14 Key Stakeholders

Stakeholders	Interests/Concerns
Tour Operators	Apprehensive of unavailability of some of the bay water areas for mooring and cruising during capital dredging for terminal construction.
Aquaculture Operators	More occasions of chronic algal broom. Apprehensive of degrading sea water quality due to capital dredging and reclamation for the terminal.
A Salt Refiner	Bay water is taken for salt production. Apprehensive of degraded sea water quality.
Fish processing industry	Apprehensive of degraded harbour waters used for fish processing. Discharges of processed water of high waste loads
Municipality	Apprehensive of Lagoon environment as a custodian of the Lagoon.
Residents living adjacent to the Port area.	Apprehensive of degraded amenity of life, mainly due to noise by increasing traffic volume.

Stakeholders	Interests/Concerns
Naturalist/bird watchers	Apprehensive of degraded Lagoon environment as waterfowl habitat
Port users (port cargo transporters, stevedoring, maritime operators)	Looking forward to seeing improved efficiency and increased handling capacity.

(2) Stakeholders Opinions Raised at the Public Meetings

The First Round of Public Consultation presenting theDraft Scoping Report

As stated in the introduction of the section 2.7, a separate Study is underway by the Joint Venture (JV) of CSIR and DMC (hereinafter referred to as JV). JV's EIA process has two phases – the scoping phase and the EIA phase. At the time of this report (ITR), the first round of the public consultation meeting was held on the 11th of June, as a key part of the Scoping process. Notice of the public meeting was advertised by the Namib Times (Walvis Bay local circulation) in the 28th May issue. Posters notifying the venue and dates are shown at major quarters of high public exposure in the town, including one at the Civic Centre of the Municipality.

Opinions raised by the participants ranged a wide area of concerns and interests. Issues raised are reorganized by thematic topics with responses from Namport as shown in Tables 2.7.15 and 2.7.16.

Table 2.7.15 Concerns of the Stakeholders and the Namport Responses (1)

Concerns/Enquiries by Thematic Areas/Particulars	Response by Namport/Third Party Moderator/Presenter of a JV (CSIR)
Project Profile Time scale	• The project envisages 10–15 years ahead.
Impacts	
Magnitude of Impacts If huge impacts are anticipated, will the project be reconsidered?	• If huge impacts are anticipated by this proposal, alternatives will be considered to minimize impacts within tolerant level.
Siltation of Lagoon If the lagoon silt up in 10 years, will the lagoon be dredged?	• Namport will mitigate impacts, so that adverse impacts are mitigated to the extent that they are within tolerable threshold.
Traffic Impacts What will be impacts from traffic from Southern entrance? Noise pollution perceived by residents adjacent to the port area will be high.	• Minor impacts are anticipated during construction.
Contaminated Sediments Sediments are contaminated. What will be impacts from the use of TBT.	• Namport will look at effects from dredging. The EIA report will recommend environmentally sound dredging methods. Current sediments will be sampled to analyze contaminants.
Means of dredging and handling dredged material Will the dredge area be enclosed with an impermeable wall? What are the measures against stinking sulphur released by dredging?	• The dredge work area will be bounded and contained using suction dredger. • Once the stinking substances are brought to the surface, they will quickly be dispersed.
Beach Erosion Regarding beach erosion/siltation, one cannot tell what will happen over 10 years whether it could change the whole bay.	

Concerns/Enquiries by Thematic Areas/Particulars	**Response by Namport/Third Party Moderator/Presenter of a JV (CSIR)**
Alternatives • What are the alternatives? Options shall be shown for such an important project. North of the existing port along the coast shall be one of the alternatives sites. Consider rezoning the area to the North. Site selection is the problem, not the construction. • If you look for alternative sites from the present harbour, it will be likely to be located north of current breakwater to onshore in front of proposed aqua-park site. • Which is the biggest concern, stacking (scarcity of space) or berthing capacity?	• The Municipality has zoned that area (north of the port along the coast) for other purposes. Moreover, the MET has recently promulgated that coastal strip as part of the National Park. • JV of EIA Consultants (CSIR+DMC) is looking into potentiality of alternative sites.
Socio-economic Impacts Such impacts as workers influx, increased demand for housing and water supply need to be addressed.	(Response by CSIR): Those issues are addressed by the Environmental Management Plan (EMP).

The Secondt Round of Public Consultation presenting theDraft Environmental Impact Report

The second round of public consultation was held at the Atlantic Hotel, starting at 18h00, at the Atlantic Hotel, on 24th November, 2009.
Notice of the public meeting was advertised by the Namib Times (Walvis Bay local circulation) in the 28th October issue. Posters notifying the venue and dates are shown at major quarters of high public exposure in the town, including one at the Civic Centre of the Municipality.

Presentations by the joint CSIR/DMC included; Findings from hydrodynamics medeling, noise specialist study, traffic specialist study, marine and acquaculture specialist study, avifauna specialist study, and socio-economic specialist study.

Table 2.7.16 Concerns of the Stakeholders and the Namport Responses(2)

Concerns	**Response by Namport/Third Party Moderator/Presenter of a JV (CSIR)**
Impacts	
Noise levels differ day and night, particularly at 2–4 AM. Movement of empty containers cause "jumping effect" at road and railway crossings. (Andre Burger)	• The Noise Impact Study did measure the noise of vehicles going over train tracks. The report also recommends that all crossings have to be leveled. Further recommendations include putting a 40%–50% rubber content covering on the roads in the port. • Namport has proposed the construction of a new road within the port. The construction of a noise barrier also has to be considered. • With the construction of the container terminal on reclaimed land, distance will be created between the noise source and the residents, thus decreasing the level of noise.(Brett Willliams)

Concerns	Response by Namport/Third Party Moderator/Presenter of a JV (CSIR)
It has been mentioned that by removing the containers from the current stacking area will increase the aesthetics of the area, however, the problem causing the visual impact might only be relocated to the reclaimed area. Thus the problem is not solved as there is only a 'displacement of the visual impact'. (Stephan Marais)	• Your comment is noted (S. van Zyl)
How often will dredging occur? (Neels Dryer)	• Every 5 years. Dredging amounts at the WB port are relatively small compared to other parts of the world. Also, flow conditions are such that sand will not be mobilized during dredging. (Elzevir Gelderbloem)
The study shows that the heavy metals do not mix with water, but what about the sediment to which these metals stick? Will this sediment enter the lagoon? (Neels Dryer)	• This could be, but as the heavy metals are stuck to the sediment it is not easily mobilized. It is also possible that sediment containing heavy metal can be consumed by an organism; however, looking at the scale, this is not really a problem. • This would pose a problem to aquaculture as it will take longer for an organism to reach market size. (Pat Morant)

(3) Critical Issues to be addressed in the EIA process

Some critical issues are raised that need to be squarely addressed in the ongoing EIA process. It is normal, in the earlier stage of project evaluation that alternative projects are to be presented and screening be done, in view of their economic, financial and environmental viability. Since all attention is focused on optimizing the proposed footprint, alternative site options are to be presented, subjected to back track screening and evaluation.

2.7.5 Review of the Draft Scoping Report, the Interim Report and the Draft EIA Report Submitted by the JV (CSIR and DMC)

The JICA Consultant tasked to environmental and social considerations has reviewed the Draft Scoping Report (submitted by the JV on the 27th of July 2009), and the Interim Report (submitted by the JV on the 19th of September 2009). Comments are made through checking them in view of comprehensiveness in dealing with environmental and social elements and conformance with the JBIC Guidelines.

(1) The Draft Scoping Report

Treating alternatives based on stakeholders' requests is not entertained in this report. The particular opinion is listed in one line (5.2 Issues Summary), and it is stated that all stakeholders' comments will be collated in the "Response Trail", Appendix G.

While in the "Project Alternatives" Section 3.3 (pages 60–62), it is seen to deal only with options of:

- Extension of existing container berths northward;
- Reconstruction of existing quay walls;
- Conversion of adjacent general cargo berths and terminal into container berths and terminals;
- Land reclamation in the south of the harbour; and

1) The Lagoon's Sedimentation Process.

Statements below on lagoon sedimentation shall be rectified. They are:

a. The 3rd paragraph of page 79 — the paragraph is interpreted to say, "Lagoon siltation is going to be decelerated with the present anthropogenic activities".
b. The 4th paragraph of page 79 — the paragraph is interpreted to say, "….will reduce tidal flux, hence reduction in waders' habitat" — The paragraph deems to states a critically important conclusion at this early stage before embarking on in-depth specialist study.

It is hoped that the Lagoon siltation process is to be addressed by a respective specialist as it is cited as one of the main issues in Section 5.2, "Issues Summary" of the draft Scoping Report.

2) Measures to Combat against HIV/AIDS Proliferation

It is desired to include the social and health impacts and countermeasures by extending the context of 2.4.8 Socio-economics into 2.4.8 Social Impacts. Under the latter subtitle, it can conveniently treat the critical subject of HIV proliferation more appropriately. The subject also constitutes one of the mandates of JICA Environmental Guidelines.

(2) The Interim Report

The ITR has been produced with the intention of presenting outcomes from the JV's Specialist Study. Contents added since the above scoping report submission constitute a hydrodynamic simulation, ship manoeuvring simulation, and ecological survey. JICA Consultants have made the following general comments.

In assessing environmental impacts for a port-and-harbour project, the harbour water quality (WQ) constitutes, among other environmental elements, one of the most critical in the overall impact assessment perspective. Hydrodynamic and oceanographic water regime dictates harbour water particle movement, eventually affecting pollutant transport and assimilation.

However, the model presented does not embed pollutants movement. Therefore, the simulated water body movement gives us an indirect inference on pollutant transport and dissipation; hence the simulated water particle movements do not give a direct reference for ambient water quality.

Further, a baseline water quality data needs to be updated, since the latest available harbour water quality data has been from COWI's WQ measurements during the 17^{th}–30^{th} of January 2002. Making maximum use of COWI water quality measurements of January 2002, making supplementary measurements to complement old ones, and giving due consideration on adjusted tidal and climatic effects, proposed WQ items shall be chosen from the original WQ items (Chlorophyll-a, Particulate Matter, T-N, T-P) and sampling points chosen from COWI sampling points such as: Bird Rock, Pelican Point, Tanker Berth, Second Lagoon, Bay Centre, and Lagoon Mouth. Additional care must be given to the internationally acknowledged water pollution parameters of chemical oxygen demand (COD), which constitutes the highest priority among other WQ items.

(3) The Draft EIA Report and the Draft Construction Environmental Management Plan (CEMP)

The JICA Survey team received the Draft EIA Report (DEIR) with Draft Construction EMP (CEMP) on 4th February, 2010. At the time of this review, their finalized versions are yet to be delivered.

1) Important conclusions extracted from DEIR are as follows.

Impacts of the new terminal on the hydrodynamics of the bay and the lagoon

- The new terminal will have a negligible influence on the water levels in the bay and the lagoon
- Effluents from the fish factories will be more confined by the new reclamation.
- Sediment transport only change to a minor extent. No significant erosion or accretion patterns are predicted.
- Precautionary monitoring of the suspended sediment concentrations during dredging and reclamation will ensure effective implementation of mitigation measures

Impacts on marine ecology and lagoon avifauna

- It is considered extremely unlikely that any sediment arising from dredging that might be deposited in the lagoon will be detectable.
- Monitoring of bird indicator species (the Grey Plover) is recommended to see long-term impact on lagoon avi-fauna.

Impact of construction noise and terminal operation noise

- The existing ambient noise exceeds the SANS 10103 standards, on which added are elevated traffic noise energy due to increased volume in construction transport (during construction phase) and container-truck traffic (operational phase), for which at a section along the 18th Road there seems to be no other alternative than to rezone it as commercial and business zone.

Socio-economic impacts

- Increased risk for the spread of communicative diseases such as HIV/AIDS, associated with influx of migrant workers.

2) Recommendations of the DEIR are as follows.

- The substance of a Construction Environmental management Plan (CEMP) be communicated to all contractors and their workers and to the Walvis Bay residents.
- Namport to commission a baseline turbidity measurement program that will collect data for at least three months before construction commences.

3) The content of the proposed CEMP is as follows.

An institutional setup for implementing the CEMP for the terminal expansion project will entail;

- The CEMP provides a framework for a management plan for **the Contractors** and Method Statements and Environmental Sub-Plans for **the Sub-contractors**.
- The CEMP shall be an integral part of NAMPORT's existing status of a certified practitioner of ISO 14001 Environmental Management System, and
- NAMPORT shall appoint an Environmental Manager (EM) and an Environmental Control Officer (ECO), held responsible respectively, for main contract document and liaise with the Contractor's Environmental Officer (EO).

One of the particular requirements of CEMP shall include an HIV/AIDS programme that is linked to Namport's Directly Observed Treatment Strategy (DOTS) programme for TB along with its HIV/AIDS programme.

Baseline and Construction Monitoring

- In order to gain an understanding of the natural turbidity of the regime of the bay, Namport shall commission a pre-construction 3-month measurement campaign with optical backscatter instruments by an independent consultant.
- During dredging operations, the same Namport-appointed independent consultant shall conduct real-time monitoring of suspended sediment concentrations with optical backscatter instruments at sensitive sites, i.e. the Lagoon mouth, Salt works intake and aquaculture farms, and intakes for fishing industry.

The Management Sub-Plan for Impact Mitigation shall include, among others;

- Reducing suspended sediment concentrations in the water column including, among others, the use of drag heads that minimize sediment suspension.
- Disposal of spoil at the approved offshore site that include, characterization of changes due to disturbance of bottom sediments at the disposal site through sampling of bottom sediments for particle size and chemical analysis, and water samples for analysis of suspended sediment concentrations.
- Minimizing risks from H2S emissions including, among others, determining if there is any risk of H2S gas escaping in specific areas by obtain information about sediment type from Namport's vibrocore logs.
- Minimizing negative impacts on the environment that are associated with reclamation including, among others, reduction of suspended sediment concentrations in the water column, and appropriate disposal of sediments that contain heavy metal contaminants.

The framework for management of the CEMP is composed of the following systems.

- General Namport procedures
- Namport environmental and safety systems
- General site preparation and management
- Construction of the causeway
- Dredging and reclamation
- Construction of quay, revetment, new terminal buildings and facilities, and site closure.
- Noise
- Traffic

4) Review on DEIR and CEMP

General

The structure and subjects of CEMP is well integrated with what are concluded and recommended by DEIR, binding necessary mitigation measures with actions to be taken by specifying responsible bodies to be engaged in obligatory undertakings. Moreover proposed CEMP is so designed to be harmonized with NAMPORT's enterprise-wide certified engagement to comply with ISO14001. Through executing the proposed CEMP, it is expected that corrective actions will mitigate adverse impacts anticipated and enumerated in the environmental checklist shown below in Table 2.7.17.

DEIR Findings

- Ambient Water Quality at the Fish Harbour

Adverse impact on fish harbour water quality is simulated by the hydrodynamic simulation model. However, this finding of worsening water quality over existing degraded water quality at the fish harbour of the Port of Walvis Bay is not properly addressed by DEIR, nor mitigation measures shown.

Though it is known that fish processing effluents of high wastewater pollutant load are the major contributor to the evident phenomenon, the jurisdictional responsibility as to which body to monitor, control, and enforce, seems to be distributed among NAMPORT, MFMR and Department of maritime Affairs (DMA) of MWTC (Ministry of Works, Transport and Communication).

- Ambient Noise Level at the Residential Districts

Ambient noise measurement results done at those 8 points along the Atlantic Street, the 5th Street and the 18th road are not shown, though it is stated "These rating levels (SANS 10103) indicate that ambient noise in urban districts should not exceed 45 dB(A) at night and 55 dB(A) during the day. However, the field measurements reveal that noise from road traffic causes ambient noise to exceed the recommended rating levels."

The above two incidences indicate those cases when environmental baseline already exceeds current environmental norms (where Namibian regulations are yet to be established).

5) Actions to be taken to supplement the above EIA and CEMP

In view of comprehensiveness in enumerating environmental elements sufficient to assess potential impacts from the proposed project, it is well addressed. However potential impacts' spatial dimensions and the manner treating ambient environmental quality when it exceeds what is perceived as norms are not well addressed. Following actions are to be taken and ambient environmental information, available from baseline measurements be communicated to the stakeholders.

- Enhance pre-construction water quality measurement. It shall include those water pollutant items as COD/BOD in establishing water quality baseline, embracing such points representing the fish harbour, the mouth of the lagoon, and proposed reclamation area.
- Disclosure of ambient noise measurement results along the 5th Street, Atlantic Street and the 18th Street.

2.7.6 Environmental Review by JICA Environmental Checklist

A part of the JICA Study task of environmental and social considerations is to review outcomes from EIA JV's (CSIR and DMC) undertakings of EIA Study in view of the JICA Environmental Checklist for the Port and Harbours Sector.

Potential impacts from *Namport's prototype plan*, during construction and operational phase, were examined using the above JICA Checklist. Extracted from the comprehensive list are: nature protection (protected areas, ecosystems) domain, waste water pollution, solid waste disposal, involuntary relocation, residents' amenity of life, cultural heritage, and indigenous minorities. Made available are collected facts of JICA consultants and outcomes from EIA consultants' impact assessment and mitigation measures (as proposed by Draft EIA, November, 2009).

Table 2.7.17 Environmental Review using JBIC Checklist for the Port and Harbour Sector

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
1 Permits and Explanation	(1) EIA and Environmental Permits	① Have EIA reports been officially completed? ② Have EIA reports been approved by authorities of the host country's government? ③ Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? ④ In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	① Awaiting for finalization of draft EIA. ② Awaiting for submission to MET to obtain clearance. ③ Once finalized EIA Report with EMP is submitted, MET's response on conditionalities to be attached with clearance documents will be known. ④ A permit for an ocean dumping site (off-Pelican Point) needs to be renewed by the 2010 yearend, which is supposed to receive surplus volume of spoil from capital dredging.
	(2) Explanation to the Public	① Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? ② Are proper responses made to comments from the public and regulatory authorities?	① Public consultations during scoping and draft EIA stages are held, respectively on 11th June and 24th., November, 2009 with prior notice to the local newspapers, disclosure of presentation material and opinions raised on the NAMPORT website to solicit public comments. ② Public comments are received and professional responses are given by NAMPORT during local consultations.
2 Mitigation Measures	(1) Air Quality	① Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from various sources, such as ships, vehicles, and the ancillary facilities comply with the country's emission standards and ambient air quality standards?	In the absence of domestic law, Namibia adopts the South African Standards (SANS) for ambient air quality and pollutant emissions. NAMPORT makes it a policy to comply with MARPLOL Annex VI Regulations, May 2005. *Potential Impacts* Air pollutants are discharged from container operation machinery and equipment; gantry cranes, tractors, trainers, fork lift truck, and container trucks. Ships entering/departing the terminal emit air pollutants. *Mitigation Measures* Responsible units of SHREQ, NAMPORT regularly monitor pollutant emissions from vessels at harbour. It enforces violators to take immediate mitigative action. Dusts from the bulk handling yard are regularly monitored.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
1 Mitigation Measures	(2) Water Quality	① Do general effluents from the related facilities comply with the country's effluent standards and ambient water quality standards?	① Effluents from the terminal and related facilities *Potential Impacts* Terminal offices and operators' work facilities represent sources of wastewater discharges.. *Mitigation Measures* Effluents from port-related facilities are collected through the municipal sewer system. Effluents water quality collected through the sewer lines complies with municipal codes, as it is regularly monitored by the municipality.
		② Do effluents from ships and ancillary facilities (e.g., dock) comply with the country's effluent standards and ambient water quality standards?	② Ambient water quality standards are yet to be established, though reference is made to BCLME guidelines. NAMPORT's internal policy mandates ship operators to comply with the MARPOL Guidelines (73/78). *Potential Impacts* Effluents from ships are minimal, since ships are encouraged to abide by the MARPOL Guidelines (73/78) by NAMPORT. Ship repair operation is not the intended function of the proposed terminal expansion.. *Mitigation Measures* Remedial actions are taken by NAMPORT in case of illegal and/or accidental spill of effluents and bunker oil.
		③ Are adequate measures taken to prevent spills and discharges of materials, such as oils and hazardous materials to the surrounding water areas?	③ Ship operators are advised to comply with the NARPOL Guidelines (73/78), which is NAMPORT's internal policy. *Potential Impacts* Risk of oil spill and discharges of hazardous materials. *Mitigation Measures* NAMPORT's emergency environmental unit is always on the alert to cope with oil spill and materials discharge to the port water body. The unit has an emergency oil fence and necessary equipment to cope with accidental discharges to the water body.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
2 Mitigation Measures	(2) Water Quality	④ Is there a possibility that oceanographic changes, such as alteration of ocean currents, and reduction in seawater exchange rates (deterioration of seawater circulation) due to modification of water areas, such as shoreline modifications, reduction in water areas, and creation of new water areas will cause changes in water temperature and water quality?	④ Impacts on oceanography and adjacent shorelines *Anticipated impacts* Negligible reduction in the water exchange rate in the Lagoon The sediment transport only changes to minor extent Fish harbour water body will be more stagnant and it will worsen ambient water quality of the fish harbour. *Mitigation Measures* No particular mitigation measures are proposed to mitigate worsening water quality at the fish harbour.
		⑤ In the case of the projects including land reclamation, are adequate measures taken to prevent contamination of surface water, seawater, and groundwater by leachates from the reclamation areas?	⑤ *Anticipated impacts* Potential leakage of leachate from the off shore reclaimed area *Mitigation Measure* Projected reclamation site is to be enclosed by bunds, whose interior is to be lined with impermeable fabricated sheets to prevent leachates seeping from the reclaimed area.
2 Mitigation Measures	(3) Wastes	① Are wastes from ships and the related facilities properly treated and disposed of in accordance with the country's standards?	① Ship operators are advised to comply with the NARPOL Guidelines (73/78), on pollution by garbage from ships (Annex V), which is NAMPORT's internal policy. *Mitigation Measure* Remedial actions are taken by NAMPORT in case of direct discharge of solid wastes. Wastes generated by ships are collected on demands and disposed of at the municipal landfill site. The landfill (located off Rikumba Kandanga) is maintained by the municipality with reference to the hazardous substance ordinance 17 of 1974, Republic of South Africa and waste classification, SABS code 0228.
		② Is offshore dumping of dredged materials and soils properly performed in accordance with the country's standards to prevent impacts on the surrounding waters?	② *Potential Impacts* Surplus volume of dredged material are generated from Capital dredging of navigating channel and the turning basin, which need to be disposed of. *Mitigation Measure* Surplus dredge volume is disposed of at an approved off-shore dumping site (located NNE of Pelican Point) in a manner defined by the COWI report, "Update of EIA and EMP, Dredging Activities, 2006/2010", October, 2006. However, the environmental clearance of the site needs to be renewed by the 2010 yearend.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
		③ Are adequate measures taken to prevent discharge or dumping of hazardous materials to the surrounding water areas?	③ *Potential Impacts* Toxic metal containing sediments have potential to be dredged during turning basin dredging operation. *Mitigation Measure* Disposal of dredge will be safely conducted at the designated off-shore dumping site (in 30m depth NNW of Pelican Point) when stipulated monitoring activities detects concentration of hazardous material exceeding the recommended value of BCLME guidelines.
2 Mitigation Measures	(3) Noise and Vibration	① Do noise and vibrations comply with the country's standards?	① Noise and vibration during *operational phase* In the absence of Namibian noise and vibration standards, the South African standards (SANS 10103) is referred. *Potential Impacts* Operation of container handling equipment generates a noise as high as 100-110 dBA. Gantry cranes, trailers and tractors also generate noise. *Mitigation Measure* A new route inside the port area is proposed to mitigate increased noise level at adjacent residential area, with the installation of noise-absorbing barriers along the 5th Street and the Atlantic Street..
	(4) Odour	① Are there any odour sources? Are adequate odour control measures taken?	① *Potential Impact* Dredging operation may trigger release of hydrogen sulfide gas from sub-seabed sediments. *Mitigation Measures* Dredging and support vessels shall be equipped with gas masks on the deck, and first aid must be designed to accommodate these occurrences.
	(5) Sediment	① Are adequate measures taken to prevent contamination of sediments by discharges or dumping of materials, such as hazardous materials from ships and the related facilities?	① *Potential Impact* (during *operational phase)* Potential discharges (including accidental) of materials from ships and related facilities will cause sediment contamination. Ship repair operation (with the use of TBT-containing paints) is not envisaged at the container terminal. *Mitigation Measure* Discharges from ships of hazardous and toxic material are prohibited and are monitored by NAMPORT's ongoing environmental management and safety activities undertaken by .SHREQ under ISO14001 certification.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
3. Natural Environment	(1) Protected Areas	① Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	① The proposed project site is located off-shore and it does not interfere with the area demarcated by the Namibian government. However, the Ramsar-registered wetland is located at immediate adjacency in the south west of the proposed footprint. . *Potential Impact* Potential changes in tide level, current velocity, and sediment transport are anticipated to affect the Lagoon's (a part of the designated Wetland) hydrologic regime.. *Mitigation Measures* The impacts are assessed to be not significant.
3. Natural Environment	(2) Ecosystem	① Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? ② Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? ③ If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? ④ Is there a possibility that the project will adversely affect aquatic organisms? If significant impacts are anticipated, are adequate protection measures taken to reduce the impacts on aquatic organisms? ⑤ Is there a possibility that the project will adversely affect vegetation and wildlife of coastal zones? If significant impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	①The site does not embrace part or whole of ecologically important wetland nor habitats. ② The site does not encompass part or whole of habitats, designated to be important, of rare and endangered species. ③ *Potential Impacts on birdlife* Potential disruption of migration and breeding patterns of important avi-fauna species due to changes in hydrological regime, with the consequence of formalization of the Lagoon's shoreline between the Yacht Club and Lover's Hill, reducing available habitat, suited for some waterfowl species. However the impact is assessed to of low significance, even without mitigation. ④ *Potential Impacts on marine ecology* Increased ship traffic may cause increased opportunity of accidental encounter with migrating cetaceans and dolphins in the Bay. However the impact is assessed to of low significance, even without mitigation. ⑤ *Potential Impacts on terrestrial flora and fauna at the adjacent coastal area.* Since the anticipated changes in coastal oceanography are negligible, impacts on the terrestrial ecosystem will be negligible.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
3. Natural Environment	(3) Hydrology	① Is there a possibility that installation of port and harbour facilities will cause oceanographic changes? Is there a possibility that installation of the facilities will adversely affect oceanographic conditions, such as induced currents, waves, and tidal currents?	④ Impacts on oceanography and adjacent shorelines *Anticipated impacts* Negligible influence on water levels in the Bay and the Lagoon. The large-scale eddy is shifted further to the north Negligible reduction in the water exchange rate in the Lagoon Changes in erosion and/or accretion of nearby beaches are simulated to be negligible. *Mitigation Measures* No particular mitigation measures anticipated. as all the impacts are of no significant level.
3. Natural Environment	(4) Topography and Geology	① Is there a possibility that installation of port and harbour facilities will cause a large-scale alteration of topographic and geologic features in the surrounding areas or elimination of natural beaches?	*Anticipated impacts* Large-scale alteration of topographic and geologic features is not expected.
4 Social Environment	(1) Resettlement	① Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? ② Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? ③ Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? ④ Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? ⑤ Are agreements with the affected persons	The proposed project does not envisage any involuntary resettlement, since the proposed site is off-shore and there is no private right for the use proposed water body of the Bay.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
		obtained prior to resettlement? ⑥ Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? ⑦ Is a plan developed to monitor the impacts of resettlement?	
4 Social Environment	(2) Living and Livelihood	① Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	①*Anticipated Impacts* Increased noise level at residential area due to increased freight traffic. Ambient noise level at some sections of the residential area along the 18th Street already exceeds the SANS standards. Increased container tuck traffic worsen the existing situation. *Mitigation measures* NAMPORT shall request the Municipality to rezone the said section to commercial/business District. Noise/vibration caused by gaps in railway crossing shall be rectified with collaborative work with the Municipality.
		② Is there a possibility that changes in water uses (including fisheries and recreational uses) in the surrounding areas due to project will adversely affect the livelihoods of inhabitants?	② The Bay environment suitable for aquaculture will be adversely affected, which then affect residents' livelihood, who depend on oyster-culture. Impact on Bay cruise tourism will be minimal, as behaviours of seals and dolphins in the Bay are already tuned to navigating cruise boats. Therefore the impact is negligible.
		③ Is there a possibility that port and harbour facilities will adversely affect the existing water traffic and road traffic in the surrounding areas?	③ Impact of traffic on the receiving environment Impact of traffic volume increase on existing municipal read network is assessed to be low upto the year 2025 of container terminal operation. Additional heavy traffic is expected to increase by about 9% along 3rd Road/5th Street, about 8% along 13th Road. The significance of the negative impact on the structural capacity of the road infrastructure is assessed to be low. (Source: DEIA, Nov.,2009, NAMPORT)
		④ Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are considerations given to public health, if necessary?	④Walvis Bay had a HIV/AIDS prevalence rate estimated at 21.4%. Walvis Bay has the third highest prevalence rate in Namibia. Contributing factors are the high levels of in-migration, seasonal employment opportunities. NAMPORT's SHREQ has a ongoing program to combat against HIV/AIDS proliferation.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
4 Social Environment	(3) Heritage	① Is there a possibility that the project will damage the local archaeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	There is no possibility that the project will damage the local archaeological, historical, cultural, and religious heritage sites, as the proposed site is located offshore.
4 Social Environment	(4) Landscape	① Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	① *Visual intrusion impacts.* The container stacks will also be a visible to highly visible intrusion on the landscape, and on the view at the location of the proposed waterfront development towards Pelican Point, in particular. Safety and security lighting will similarly impact on the nightscape. The new ship-to-shore cranes will be prominent new landmarks, albeit within the context of an existing port landscape with its tall permanent structures and temporary ones such as visiting oil rigs. *Mitigation measures* Planting shrubs and palms to form a fence between the Namport and public areas.
4 Social Environment	(5) Ethnic Minorities and Indigenous Peoples	① Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples? ② Are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples?	① and ② As the proposed site is offshore and proposed reclamation site is part of the port area, it has nothing to do with indigenous people's rights.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)
5 Others	(1) Impacts during Construction	① Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	*Impacts* Major anticipated impacts are, i) siltation of the Lagoon, ii) spread of pollutants from dredging, and iii) the construction noise. *Mitigation Measures* i) As dictated by the EMP, construction contractors shall abide by criteria of 20 mg/l, and 80 mg/l respectively for warning and suspension of dredging. ii) Construction contractors are advised to adhere to standard mode of dredge operation by monitoring turbidity and regular analysis of sediment samples. iii) An alternative route, which would pass through fewer residential areas with fewer intersections, would eliminate the nuisance of noise from the heavy trucks, as well as start-stop of heavy trucks at traffic lights and stop streets.
		② If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	*Impacts* Potential impact of suspended sediments on fisheries and cetaceans *Mitigation Measures* Baleen whales and Heaviside's dolphins occasioned in the Bay will not be adversely affected by controlled dredging operation.
		③ If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	*Impacts* This project will stimulate an existing trend of in-migration. This puts increased pressure on existing services, such as water, waste and sewage. Since most work seekers and other migrants tend to settle in Kuisebmond, the result of an increased demand for shelter is to an increase in the number of "backyard dwellers". *Mitigation Measures* The adoption of a 'Locals first' policy, which gives preference to people that have been residing in Walvis Bay for more than a year, could act as a deterrent for accelerated in-migration of work seekers.
		④ If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	NAMPORT's SHREQ department regularly organize and provides health and safety education for employees and project personnel.

Category	**Environmental Item**	**Main Check Items**	**Confirmation of Environmental Considerations (Based on Facts as of 31st Jan., 2010)**
5 Others	(2) Monitoring	① Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? ② Are the items, methods and frequencies included in the monitoring program judged to be appropriate? ③ Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? ④ Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	① NAMPORT's SHREQ is developing corporate-wide "environmental care" programme, which is an action agenda under ISO 14001, and is a corporate environmental management plan. Monitoring turbidity and other water quality over the project-affected water body is to be made construction contractors' obligation under proposed Environmental Management Plan (EMP). ② Concrete items to be covered by the EMP are yet to be known. ③ NAMPORT, the proponent, will establish an adequate monitoring framework, guided by the proposed EMP (Draft EMP, NAMPORT, 2009) ④ There are no regulatory requirements on reporting on environmental monitoring by any Ministries such as MET and Ministry of Works, Transport and Communication, and Ministry of Fisheries and Marine. Resources.

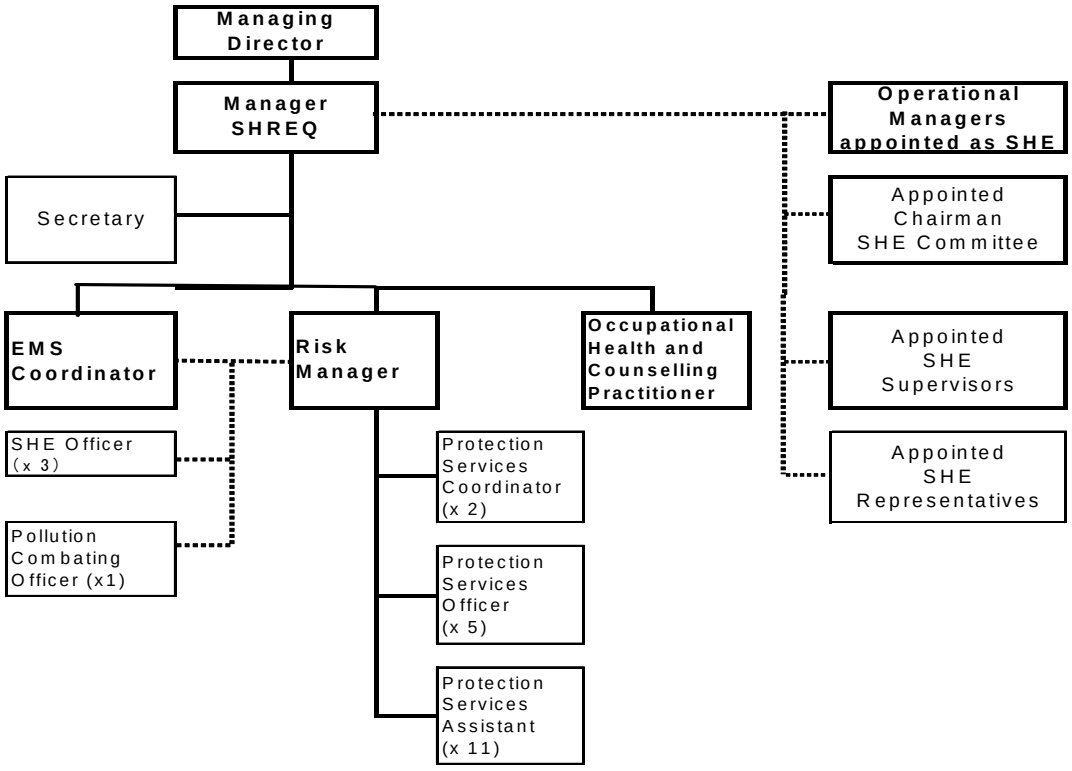
2.7.7 Recommendation

In view of the significance of harbour water quality, priority should be given to maintaining harbour water quality at the internationally acknowledged level as recommended by, for example, BCLME Guidelines. However, in the absence of any enforcement power on the part of the competent authority, some of the port users are not motivated to keep Namibian industrial effluents standards in conducting their business, which represent a single source of anthropogenic pollutants discharged from land-based activities to the Walvis Bay waters.

There seems to be a fundamental weakness in maintaining the "Ambient Water Quality" of the Harbour. There are several reasons for this including that it is a consequence of existing institutions and vested functions. A consolidated driving power binding together distributed responsibilities with respect to maintaining harbour water quality among the authorities is required. To achieve this, current Namport environmental management institutions are reviewed below and recommendations are presented.

(1) Namport "Environmental Care" as an Enterprise Body

Namport has established an Environmental Management Function, since it acquired ISO 14001 certification at the end of 2002. The organizational setup is as follows:



Source: The Namport Manual, Documentation of the Integrated Safety, Health, Environmental and Quality Management System, 2009

Figure 2.7.11 Namport SHREQ (Safety, Health, Risk, Environment and Quality) Organization

As seen in the above organigram, SHREQ's function is to implement an integrated Safety, Health, Environmental and Quality Management System. Moreover, SHREQ Policy states, among others, Namport commitment to environmental management and pollution prevention. In every phase of the company's planning and operating processes, Namport endeavours to:

- Continuously improve environmental protection within our areas of jurisdiction;
- Clearly communicate pertinent environmental information and expectations to employees, to all parties involved, and to the interested public; and
- Based on information about our environmental impacts and aspects, objectives and targets will be set and reviewed on a regular basis.

Under the above stated policy, Namport has produced the "Enterprise Model" in implementing the Integrated Management System (IMS). The scope of Namport's IMS activities is to comply with the requirements of the current versions of ISO 9001 (Quality Management), ISO14001 (Environmental Management), and OHSAS 18001 (Occupational Health and Safety Management).

In harmony with the JBIC Guidelines, it is recommended that Namport undertake environmental monitoring activities in line with the following template.

Table 2.7.18 JBIC Monitoring Form (Indicative Template)

A. Environmental Approval and the Public Consultation
A.1 Acquisition of Project Environmental Clearance: Granted (DD/MM/YY), Valid Until (DD/MM/YY)
A.2 Holding Public Consultations: Venues and Dates (DD/MM/YY)
B. Environmental Pollution Abatement
B.1 Air Quality (Sampling Point, Date, Time, Temperature, Wind Direction and Strength) Including: ➢ Sampling a Volume of Air, Sampling Points, Sampling Frequency ➢ Namibian National Standards (International Standards, if applicable) ➢ Targeted Air Pollutants: SPM, CO, NOX, SO2
B.2 Ambient Water Quality (Sampling Point, Date, Time, Temperature, Wind Direction and Strength, Salinity, PH) Including: ➢ Sampling Water, Sampling Points, Sampling Frequency and Depth ➢ Namibian National Standards (International Standards, if applicable) ➢ Targeted Water Quality: COD, SS (Suspended Solids), Total-Sulphur, Nitrogen
B.3 Noise Level (Measured Point, Date, Time, Temperature, Wind Direction and Strength)
Including: ➢ Measured points, Measurement interval (Day/Night), Traffic counts, ➢ Land-use type (residential, commercial, mix), Street, and Address
C. Natural Environment
C.1 Ecosystems with rich biodiversity: visual observation on flora, fauna at the Lagoon, outer lagoon, and the harbour
D. Social Impact
D.1 Residents' quality of life

2.8 Local Availability for Construction of the Port of Walvis Bay

2.8.1 Local Contractors

The container terminal development project is to consolidate the status of Port of Walvis Bay as a container transhipment hub port and a gateway to the landlocked countries requiring a large-scale infrastructural construction. Having a small population of about 2 million, Namibia has a limited construction market and there are no construction contractors capable of contracting as big a project as the container terminal construction. Namibian contractors are only capable of small scale construction works like that of buildings, pavements and utility works. It will be difficult for the local contractors to carry out this project but they can be engaged as sub-contractors to the prime contractor who would have won the contract. Furthermore, as Namport's intends to procure the civil works as a design build contract or EPC contract; local contractors are unable to offer their bids not only technically but also financially. The prime contractor for this construction work should have adequate technical and financial capabilities. It is also expected for this project that major equipment and special working vessels will be employed overseas.

In view of the above, the role of local contractors is considered very limited in construction and can be disregarded in designing the civil work structures.

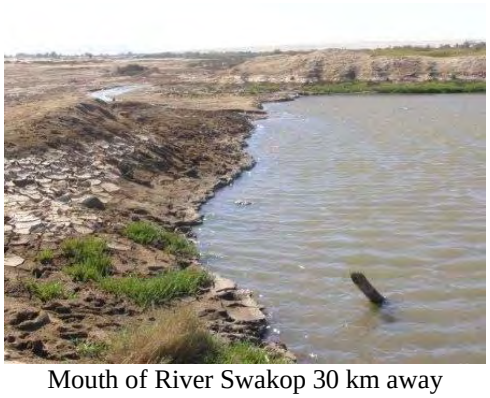
2.8.2 Locally Available Construction Materials

Civil and building materials are mostly imported from neighbouring countries such as South Africa. The materials which are procurable in Namibia are rubble and armour stones for revetment, aggregate, sand and interlocking blocks. Details of these procurable materials are mentioned below.

(1) Rubble, Armour Stones and Aggregate

The 80 hectares area of quarry to supply rocks and aggregates with production capacity of 200 tonnes/hour is located 18 km away from the project site. Various sizes of rocks and aggregates for revetment, concrete and other works including sub-base for road and paving works are available. Sand for concrete can be gained from the River Swakop, located about 30 km away from the project site.

Quarry site located 18 km away from project site



Mouth of River Swakop 30 km away from project site

According to the latest information the local demand of sand and stone over the years increased dramatically. Namibian investors decided to look at a new crusher plant to supply for the future demand. In May 2010 the new crusher plant will be in operation. The new crusher plant should be large enough to supply the required quantities in the time frame for the project.

(2) Cement and Reinforcing Bars

Cement and reinforcing bars are not produced locally and are basically imported from neighbouring countries such as South Africa. These materials are based on SABS (South African Bureau Standard) and should be available through local suppliers and/or agents. However, according to the latest information there will be a cement plant to be located on the Sandberg farm between the towns of Otavi and Tsumeb, about 400 km north of Windhoek. German technology will be transferred to the cement plant and the production capacity of the plant will be 600,000 tons annually.

(3) Ready Mixed Concrete

There is a ready mixed concrete batching plant in the vicinity of Walvis Bay but having a capacity of only 24 m^3 per hour, which is unlikely to be sufficient for all works of the project. For this reason, a batching plant shall have to be considered as part of the scope of works.

(4) Paving Materials

Paving for the existing container terminal yard and roads is constructed from asphalt, concrete or interlocking concrete blocks. The application of concrete interlocking blocks, however, are common in port facilities because of their flexibility and strength in sustaining heavy loads, ease of maintenance and availability. According to the information from the supplier, they can produce 60mm and 80mm thickness blocks and the bearing capacity of 80mm one is 50 MPA. Their plant has the capacity to produce some 40,000 pieces of blocks per day (8 hours), for a placing area of 800 m^2.

Displaying interlocking paving blocks

Asphalt paving works in Walvis Bay

(5) Materials for Mechanical & Electrical and Building Works

Almost all materials for M&E and building works are being imported. For future maintenance purposes, it is highly desirable that these materials should be locally available.

2.8.3 Locally Available Construction Equipment

(1) Plant and Equipment for Civil and Building Works

In general, construction equipment such as excavators, bulldozers, cranes and trucks for ordinary construction of civil and building works are locally available.

(2) Plant and Equipment for Marine Works

Specialized equipment and plants for use in marine construction work such as TSHD (Trailer Suction Hopper Dredger) and CSD (Cutter Suction Dredger), as well as floating equipment for piling works, are not locally available. Similar to the batching plant, these equipment should be mobilized as part of the scope of works of the contractor.

(3) Plant and Equipment for Road Construction

Equipment for road and paving works such as graders and compactors are locally available, but asphalt paving and finishing equipment shall be mobilized. Asphalt is currently being applied manually which is not appropriate for thick asphalt paving. For this reason, the use of interlocking paving blocks is appropriate.